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# समाचार पत्रों से चयित अंश Newspapers Clippings

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology

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## India plans deployment of nuclear-capable Agni-V this year

*By Hemant Kumar Rout*

Bhubaneswar: Riding high on the success of 30 missions in last three months, India plans to deploy its longest range most potent nuclear-capable ballistic missile Agni-V this year. With the 5,000-plus km range missile in its arsenal, India is the eighth nation in the world to have ICBM capabilities.

Although the defence strategists had planned an early induction of Agni-V compared to its medium and intermediate range siblings, the Chinese aggression along the Line of Actual Control (LAC) has fast-tracked the process.

Defence source said the indigenously developed game-changer missile, which is undergoing its pre-induction trials, would be finally deployed at strategic locations as selected by the armed forces. The canisterised Agni-V gives the forces the requisite operational flexibility to swiftly transport as per requirement on a short notice.

“The induction process of the missile, which is under serial production, has already started. It would be officially deployed with the final induction trial in next three to four months. The deployment will pave the way for development of more long range missiles, which are on the drawing board,” the source told The Express.

A symbol of DRDO’s technological excellence, the missile equipped with highly accurate ring laser gyro based inertial navigation and most modern micro inertial navigation system with advanced compact avionics is capable of taking down targets in whole of Asia and half of Europe.

India has also planned to test some new technologies, including the multiple independently targetable re-entry vehicles (MIRV), which allows long range missiles to deliver multiple warheads programmed to destroy different targets hundreds of km away from each other and alternatively launch more than one warhead assigned to one target.

This apart, several missions, including maiden flight trial of beyond visual range Astra Mk II having a strike range of over 150 km, user trial of guided Pinaka rockets and developmental test of an advanced version of home grown subsonic cruise missile Nirbhay have been planned in early 2021.

“Development of new Airborne Early Warning and Control (AEW&C) planes and underwater unmanned vessels (UUVs) along with the Light Combat Aircraft (LCA) Mk-II will be the areas of focus for the DRDO this year,” said a defence official.



Agni-V missile being test fired from Kalam Island off Odisha coast.  
(File | EPS)

The DRDO has already received orders for development of AEW&C Block 2 aircraft under a Rs 10,500 crore project.

[https://www.newindianexpress.com/nation/2021/jan/04/india-plans-deployment-of-nuclear-capable-agni-v-this-year-2245188.amp?\\_twitter\\_impression=true](https://www.newindianexpress.com/nation/2021/jan/04/india-plans-deployment-of-nuclear-capable-agni-v-this-year-2245188.amp?_twitter_impression=true)



*Tue, 05 Jan 2021*

## **Indian navy ships to be fitted with Laser Dazzler to stop suspicious threats**

According to a press release published by the Indian Ministry of Defense, Indian company Bharat Electronics Limited (BEL) has signed a contract with the Indian Navy for the supply of 20 Light Amplification by Stimulated Emission of Radiation Dazzlers (Laser Dazzlers) in New Delhi, December 31, 2020.

The Indian company BEL (Bharat Electronics Limited) had earlier December 200 won the contract beating global Original Equipment Manufacturers (OEMs) in buy global category. These would be manufactured by BEL, Pune plant.

The Laser Dazzler is used as a non-lethal method for warning and stopping suspicious vehicles/boats/aircrafts/UAVs/pirates etc. from approaching secured areas during both day and night. It is capable of dazzle and thereby suppress the person's/optical sensor's action with disability glare in case of non-compliance to orders. It disorients/ confuse/blind a person temporarily. It also dazzles and distracts aircraft/UAVs. It is portable, shoulder operated, and ruggedized for military use in adverse environmental conditions. Laser dazzler technology was developed by Defence Research and Development Organisation (DRDO).



Laser dazzlers were used by the British Royal Navy warships during Falkland's war of 1982. (Picture source LinkedIn Dr. Anil K. Maini)

Laser dazzlers are non-lethal weapons specifically designed for applications where subject vision impairment must be achieved at a specified distance in all ambient conditions including clear sunny day, twilight, and night. Laser dazzlers can be configured for a variety of configurations from handheld to weapon mountable to vehicle mountable.

This unique product is indigenously designed and developed for the first time for the Armed Forces. It will support the 'Atmanirbhar Bharat' initiative of Prime Minister Shri Narendra Modi.

DRDO has developed various laser equipment that may be of use for Three Services and Police Forces for Low Intensity Conflict (LIC) operations. Laser Ordnance Disposal System (LORDS) and Light Detection and Ranging (LIDAR) equipment have been developed for land forces.

Laser Cross Section Measurement and Imaging (LACSMI) technology is being developed for Naval applications. Laser dazzlers, Electro-optic Target Locator (OTL) and chemical, biological and explosive material detection equipment have been developed for counter LIC operations.

<https://www.navyrecognition.com/index.php/news/defence-news/2021/january/9501-indian-navy-ships-to-be-fitted-with-laser-dazzler-to-stop-suspicious-threats.html>

## Centum Electronics Limited receives DRDO's prestigious defence technology absorption award

Bengaluru (Karnataka) [India], January 4. (ANI/BusinessWire India): Bangalore-based Centum Electronics Limited, the leading Electronics Company, was awarded the prestigious Defence Technology Absorption Award by DRDO (Defence Research and Development Organization), India's premier research and development organization for military and defence technology, at a ceremony hosted at the DRDO HQ recently.

The award was handed over to Centum CMD, Apparao V Mallavarapu by Defence Minister Rajnath Singh in recognition of Centum Electronics' outstanding contribution towards the absorption of critical technology in defence space systems and pioneering the development of Space Grade Hardware of onboard Satellite based Electronic Warfare Payload for the Satellite Mission Kautilya.

Apparao V Mallavarapu, Chairman and Managing Director said, "It is a great honour and privilege to receive this wonderful recognition from Rajnath Singh, Defence Minister of Government of India. It

was the extraordinary teamwork and support we received from the Scientists and Engineers of DRDO that enabled us to deliver this State-of-the-Art System of National Importance. There have been many first-time technologies and processes developed by Centum Electronics that made realising this Complex system possible. This is a very proud moment for all of us at Centum."

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[https://www.business-standard.com/content/press-releases-ani/centum-electronics-limited-receives-drdo-s-prestigious-defence-technology-absorption-award-121010401014\\_1.html](https://www.business-standard.com/content/press-releases-ani/centum-electronics-limited-receives-drdo-s-prestigious-defence-technology-absorption-award-121010401014_1.html)



Apparao V Mallavarapu, CMD, Centum receiving the Award from Rajnath Singh

**THE TIMES OF INDIA**

## Army inducts new bridge

By Sandip Dighe

Pune: The Indian Army inducted 10-metre short-span bridge for its operational preparedness in deserts and plain terrains on Wednesday.

The mobile bridging group of the Research and Development Establishment (Engineers) laboratory of the Defence Research and Development Organisation (DRDO) has designed and developed the bridge.

<https://timesofindia.indiatimes.com/city/pune/army-inducts-new-bridge/articleshow/80104439.cms>



Tue, 05 Jan 2021

## China's unorthodox weapons, provocative actions escalated situation in Ladakh: Defence ministry

*The Ministry of Defence, in its year-end review for 2020, has said that Chinese PLA's unorthodox weapons and provocative actions escalated the situation at the Line of Actual Control in Ladakh*

*By Abhishek Bhalla*

New Delhi: The Chinese People's Liberation Army (PLA) used unorthodox weapons in Eastern Ladakh that escalated the situation, prompting the Indian Army to deploy heavy equipment like tanks and guns, the Ministry of Defence has stated in its year-end review for 2020, giving details of the continuing India-China standoff.

"Unilateral and provocative actions by the Chinese to change the status quo by force, in more than one area on the Line of Actual Control (LAC), were responded to in a firm and non-escalatory way, ensuring the sanctity of our claims in Eastern in Ladakh," the defence ministry stated.

Blaming China for the continued tensions, the ministry said that the Indian Army has maintained all protocols and agreements between the two countries. "The PLA escalated the situation by utilisation of unorthodox weapons and amassing large number of troops," the review said.

Referring to the Galwan clash on June 15, the defence ministry said, "20 Indian soldiers lost their lives while preventing PLA troops from ingressing into our territory."

"The Chinese also suffered significant casualties," the MoD year-end review added.

The year-end review gives an account of how things escalated in August-end with the Chinese troops making more attempts to occupy more areas. This was when gunshots were also fired in the air.

"On 28-29 August 2020, own troops in a precautionary deployment, pre-empted Chinese expansionist designs and occupied heights along the southern bank of Pangong Tso," it said.

The Indian Army in a counter operation has occupied crucial heights of the Kailash Range on the southern side of Pangong Lake.

The Ministry of Defence also said that Indian Army, with assistance from IAF, mobilised troops including accretionary forces in a very short duration, including heavy equipment like guns, tanks as well as ammunition, rations and clothing.

India and China have been involved in an unprecedented tussle in Ladakh with both sides bringing in the heavy deployment of troops, artillery guns, tanks and armoured vehicles in close proximity.



An Indian Air Force MiG29 on a mission in Leh

“The standoff in Ladakh started early-May, last year, with Chinese PLA making attempts to change status quo by occupying areas that had been in Indian control,” the ministry said.

The deployment continues even in the peak harsh winter as temperatures have dipped -40 degrees in some of the friction points.

Indian Army constructed roads, accommodation shelters and bridges to assist troop deployment.

“Braving inclement weather, own troops continue to be deployed on these heights. Advance Winter Stocking (AWS) and winter preparations for the enhanced strength has been completed and troops are well entrenched to counter any misadventure by the Chinese forces. While the Indian Army is prepared for any eventuality, talks are also progressing to resolve the issue in an amicable manner,” it said.

The tensions started with skirmishes in Pangong Lake in May when troops came to blows on more than one occasion leaving many injured on both sides. On June 15, in an ugly clash in another area called the Galwan Valley, 20 Indian soldiers died, while the Chinese never made their casualty public.

There have been eight rounds of military talks at the Corps Commander-level to find a solution to the standoff that started early-May but the deadlock continues.

Despite the previous talks on November 6 discussing a disengagement plan, there has been no forward movement and no further dialogue has taken place to implement measures discussed to ease out tensions.

<https://www.indiatoday.in/india/story/china-s-unorthodox-weapons-provocative-actions-escalated-situation-in-ladakh-defence-ministry-1755867-2021-01-04>

# The Tribune

Tue, 05 Jan 2021

## IAF mulls indigenising surveillance equipment for its imported aerostats

By Vijay Mohan

Chandigarh: With the surveillance equipment being used in its imported aerostats facing obsolescence and maintenance issues, the Indian Air Force is exploring the feasibility of developing replacements through the indigenous route.

The Air Headquarters is looking at Indian industries, research and development establishments and academic institutes that have the requisite technical expertise and financial capability as well as experience in developing and testing aviation related military grade equipment, IAF sources said.

In the mid-2000s, the IAF had procured aerostats from Israel for surveillance of border areas. An aerostat is an unpowered helium-filled balloon tethered at a certain height above the ground and equipped with surveillance and communication equipment. It can remain deployed for a number of days at a stretch, scan a wide swath of area and is particularly effective for detecting low-flying or surface objects, making it a cost-effective alternative to aircraft in peace time.

The Air Force has had operational and maintenance issues with its aerostats, with the Comptroller and Auditor General in the past taking the IAF to task over the deployment and manner of handling of aerostats.

It was as far back as 1996 that the IAF projected the requirement of six aerostat systems to provide gap-free low-level surveillance coverage over large areas. The procurement of aerostats



Photo for representation only.

was also part of a series of recommendations to streamline border management and enhance surveillance capabilities in the aftermath of the 1999 Kargil conflict.

In 2015, the IAF again drew up plans to procure eight aerostats. There have also been attempts to design and develop aerostats locally.

The equipment being sought to be indigenised by the IAF includes both the airborne segment that detects, intercepts and monitors electronic and communication signals as well as the ground-based segment that is meant for command and control of the airborne platform, analyse and process data, record and disseminate information.

According to senior officers, aerostats are viable means for low-level surveillance in the air as well as maritime domains and a number of such systems are required. With the increasing use of drones for border surveillance as well as smuggling, the constant surveillance cover provided by aerostats would be effective in countering such threats. The Army is also working towards the employment of mini aerostats to keep an eye on mountain passes and remote tracks.

The development of indigenous surveillance equipment would also be an added advantage for current and future projects to develop aerostats systems indigenously, besides having spin-offs in other allied areas, officers said.

<https://www.tribuneindia.com/news/nation/iaf-mulls-indigenising-surveillance-equipment-for-its-imported-aerostats-193551>



Tue, 05 Jan 2021

## Patrolling vessels in the Himalaya! Know all about FPV Indian Army will get to patrol Pangong Tso lake

*According to a contract that has been signed between the Indian Army and the M/S Goa Shipyard Ltd (GSL), these 12 FPVs are expected to be delivered by May this year*

*By Huma Siddiqui*

Amid the continued India-China standoff along the Line of Actual Control (LAC) in eastern Ladakh, the Indian Army has placed an order for 12 Fast Patrol Vessels (FPV) for Pangong Tso Lake. According to a contract that has been signed between the Indian Army and the M/S Goa Shipyard Ltd (GSL), these 12 FPVs are expected to be delivered by May this year. The contract signed is an outcome of GSL's response to a tender which had been floated by the Indian Army a few months ago. There is a need for 24 such vessels, but the Indian Army has placed an order for 12 boats initially.



### Why does the Indian Army need these?

These high speed boats with larger capacity are going to be used for patrolling Pangong Tso Lake and other large water bodies, including those in the high altitudes. These FPVs are expected to match the Chinese vessels.

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These FPVs are expected to match the Chinese vessels.



### **What is special about these vessels?**

According to an official statement released by the GSL, “These boats are going to be constructed a totally new design and will have specialized equipment which will be meeting the requirement of the Indian Army.”

The shipyard has built over 170 GRP boats for other customers including the Ministry of Home Affairs.

The Indian Army has around 17 such boats and with the standoff with China going on, more such boats are going to be required to carry on surveillance in the Pangong Tso Lake which has been the sticking point with the Chinese. Almost two-thirds of the 134-km long-disputed lake is in the Chinese control, and effectively, India controls about 45-km of the lake.

### **More about the boats**

- These are going to be built indigenously at the GSL and will have anti-ramming capabilities.
- It has a capacity to carry more troops.
- The requirement of the Indian Army is at least 24 boats, but the order has been placed for 12 initially.
- These boats with 35 Knots, 50 meters in length, are designed in-house by GSL.
- These boats are used primarily for patrolling, anti-smuggling and anti-terrorist operations.
- The GSL built vessels can be used by the Indian Navy and can be used during wartime as a communication link as well as a coastal convoy escort.
- The hull of the boat is made of steel and is very strong and can withstand heavy sea conditions.
- Though it can carry 35 men on board, based on the Army specifications will be able to carry on more men.
- Three 2720 KW diesel engines driving three independent water jets power the fully air conditioned boat.
- The boat comes with a 30mm Gun at forward position.
- There are machine guns on port & starboard.
- Is equipped with the state-of-the-art Navigation and Communication equipment.
- The Indian Coast Guard has received seven Fast Patrol Vessels from GSL, with higher speed up to 37 knots.

### **Made in India Fast Patrol Vessels: FPVs patrolling Indian Coastline post 26/11**

India has a 7516.6 km coastline, 12 major ports, 184 minor ports involving 13 coastal States/UTs and 1197 island territories, which need to be protected at all times by the Indian Coast Guard and the Indian Navy. Post 26/11, for the Coastal Defence, there is a new strategy in place and this is related to the shipbuilding programme. Focused on smaller but faster and better designed to operate in littoral waters, these specialized boats are being constructed at various shipyards in the country.

<https://www.financialexpress.com/defence/patrolling-vessels-in-the-himalaya-know-all-about-fpv-indian-army-will-get-to-patrol-pangong-tso-lake/2163642/>

## जम्मू-कश्मीर व लद्दाख में बर्फ में चुनौतियों का सामना करने को चौकस हैं भारतीय हवाई योद्धा

**जम्मू के पीइआरओ डिफेंस लेफ्टिनेंट कर्नल देवेन्द्र आनंद का कहना है कि भारतीय वायुसेना जम्मू कश्मीर व लद्दाख में हर हालात में देश की सरहदों की रक्षा करने में सक्षम है। सर्दी हो या गर्मी वायुसेना अपनी जिम्मेवारी का निर्वाह करने के लिए हरदम तैयार रहती है।**

*By Rahul Sharma*

जम्मू: जम्मू-कश्मीर के उच्च पवर्तीय इलाके इस समय बर्फ की सफेद चादर से ढके हैं। केंद्र शासित प्रदेश लद्दाख के लेह व कारगिल जिलों में भी पारा शून्य से काफी नीचे है। ऐसे में हालात में देश की हवाई सीमाओं की सुरक्षा करने के लिए भारतीय वायुसेना के योद्धा हरदम चौकस हैं। भारतीय वायुसेना के लड़ाकू विमान, हेलीकाप्टरों के साथ मालवाहक विमान सैनिकों व उनके साजो सामान को अपनी मंजिल तक पहुंचाने के लिए भी लगातार बर्फीले इलाकों में उड़ानें भर रहे हैं। यही नहीं जरूरत पड़ने पर वे आम लोगों की सहायता के लिए भी हर दम तैयार हैं।

वायुसेना इस समय पूर्वी लद्दाख में चीन से सटी वास्तविक नियंत्रण रेखा व पश्चिमी लद्दाख में सियाचिन ग्लेशियर पर पाकिस्तान के सामने डेरा डाले बैठी भारतीय सेना की सभी जरूरतें पूरी कर रही है। कश्मीर में भारतीय वायुसेना के एयरफार्स स्टेशनों में वायुसेना के विमानों को बर्फ से उड़ाने के लिए तैयार रखने के लिए अतिरिक्त बंदोबस्त किए जा रहे हैं। वायुसेना ने बर्फीले इलाकों में शून्य से नीचे के तापमान में अपने विमानों को उड़ान के लिए फिट रखने हेतु उनके इंजन में कुछ जरूरी बदलाव भी किए हैं।



ऐसे हालात में जम्मू एयरफार्स स्टेशन से वायुसेना के हेलीकाप्टर जरूरी सामान के साथ लद्दाख के लिए लगातार उड़ानें भर रहे हैं। जम्मू के पीइआरओ डिफेंस लेफ्टिनेंट कर्नल देवेन्द्र आनंद का कहना है कि भारतीय वायुसेना जम्मू कश्मीर व लद्दाख में हर हालात में देश की सरहदों की रक्षा करने में सक्षम है। सर्दी हो या गर्मी, वायुसेना अपनी जिम्मेवारी का निर्वाह करने के लिए हरदम तैयार रहती है।

वहीं लद्दाख में इस समय खून जमाने वाली ठंड में भी वायुसेना अपनी जिम्मेवारी का निर्वाह पूरी निष्ठा से कर रही है। लेह व कारगिल के साथ क्षेत्र में वास्तविक नियंत्रण रेखा पर वायुसेना की एडवांस लैंडिंग ग्राउंडों में भी दुश्मन का सामना करने के लिए पूरी तैयारी है। इस समय चीन की चुनौती का सामना करने के लिए पूर्वी लद्दाख में 16,730 फीट की ऊंचाई पर विश्व की सबसे ऊंची एयर स्ट्रिप दौलत बेग ओल्डी पर वायुसेना की गतिविधियां जारी हैं।

इस एयरस्ट्रिप पर सी-130जे सुपर हर्कूलियस जैसे बड़े विमान आसानी से उड़ान भर सकते हैं। लद्दाख में ऐसी तीन एडवांस लैंडिंग ग्राउंडें सेना की ताकत को बढ़ाती हैं।

<https://www.jagran.com/jammu-and-kashmir/jammu-indian-air-force-warriors-are-attentive-to-face-challenges-in-snow-in-jammu-and-kashmir-and-ladakh-21236717.html>

# Indian Army appoints major general as 1st head of its Human Rights Cell

*Human Rights Cell will have an officer from the Indian Police Service of SSP/SP rank*

*By Pradip R Sagar*

Major General Gautam Chauhan, an officer of the Gorkha Rifles, last week took over as the first head of the Indian Army's Human Rights Cell at its headquarters in the national capital. Announced last year, the department aims to examine allegations of human rights violations during the Army's ongoing counter-insurgency operations in Jammu and Kashmir and parts of the Northeast.

The constitution of the Human Rights Cell comes soon after the Jammu and Kashmir Police submitted a charge-sheet in the July 2020 incident at Shopian when three youth from Rajouri were allegedly abducted and killed in an encounter by the Army. Soon afterwards, the Army had also shown recovery of huge cache of arms and ammunition from the 'encounter' site. Captain Bhoopendra Singh of the Indian Army and two civilians have been named in the case by the state police for hatching a conspiracy, kidnapping and killing.



(File) Indian Army soldiers stand outside a house after a gun battle with militants in Hokarsar, on the outskirts of Srinagar | Reuters

"The Human Rights Cell will put in place a more stringent mechanism to look into human rights violations with greater transparency and probity," said an officer, who added that the Human Rights Cell would directly report to the Indian Army vice-chief.

Official said that, as per the mandate, the Human Rights Cell will have an officer from the Indian Police Service of the SSP/SP rank on deputation to provide investigative expertise and also facilitate the necessary coordination with other organisations including the ministry of home affairs, as the department will be the nodal point to examine any human rights violation complaints.

Over the years, the Army has been accused of human rights violations in Jammu and Kashmir and the Northeast, where it operates under the Armed Forces Special Powers Act (AFSPA). AFSPA allows the Army to deal with most complaints against military personnel through internal mechanisms at the level of local commanders. These mechanisms have sometimes been criticised for lack of transparency.

Several cases are pending with the Union home ministry for approval to investigate alleged human rights violations against Army officers. However, majority of those complaints turn out to be false or motivated after probe, an Army source claimed, while adding that human rights is a tool used by forces inimical to India to put the Army on the defensive.

As a next step towards the Indian Army's commitment to probity and transparency, an additional director general (vigilance) will also be appointed in the coming days. Last year, the MoD had approved an independent vigilance cell under the office of the Indian Army chief that will have three colonel-level officers—one each from the Army, the Indian Air Force and the Navy—to look into cases of corruption in the force.

<https://www.theweek.in/news/india/2021/01/04/indian-army-appoints-major-general-as-1st-head-of-its-human-rights-cell.html>

## India-China standoff: China deploys tanks along LAC opposite Indian posts

### Story Highlights

*After the Galwan clash, Chinese and Indian military commanders had held several rounds of talks to deescalate tensions, however, China has continued its troop presence along the LAC.*

Amid tensions along the Line of Actual Control (LAC), China has reportedly deployed tanks in front of Indian posts opposite Rezang La, Rechin La and Mukhosri locations.

Reports say at least 30 to 35 tanks have been deployed by the PLA at the LAC.

The heights were captured by the Indian army on August 29 and 30 last year. The Chinese tanks are currently positioned against Indian positions, reports say.

The tanks are reportedly lightweight and have been made using modern technology. The Indian Army has also deployed tanks at the hills of Rezang La, Rechin La and Mukhosri.



China's Type-15 lightweight tanks at Galwan  
Photograph:( AFP )

Tensions between India and China has been at fever pitch ever since the forces of the two countries clashed at Galwan Valley in June-15-16 last year leading to the death of 20 Indian soldiers, although the Chinese Army had suffered casualties as well, however, the Chinese foreign ministry has refused to divulge its casualty list.

After the Galwan clash, Chinese and Indian military commanders had held several rounds of talks to deescalate tensions and ensure troops from both countries pull back, however, China has continued its troop presence along the LAC.

India's ministry of external affairs (MEA) had said that India-China commander-level talks had led to "stability on the ground" and that more efforts would be made to restore peace even as tens of thousands of troops have been deployed by both sides in the Ladakh region and the Chinese-held Tibetan plateau.

However, several rounds of talks have failed to significantly ease tensions along the LAC.

<https://www.wionews.com/india-news/india-china-standoff-china-deploys-tanks-along-lac-opposite-indian-posts-354426>



**Press Information Bureau  
Government of India**

**Ministry of Earth Science**

*Mon, 04 Jan 2021 4:41PM*

## **40th Indian scientific expedition to Antarctica launched**

**The chartered ice-class vessel MV Vasily Golovnin will make this journey and will reach Antarctica in 30 days**

**After leaving behind a team of 40 members, it would return to India in April 2021. On return, it will also bring back the winter team of the preceding trip.**

India today launched the 40<sup>th</sup> scientific expedition to Antarctica. This Indian expedition marks four decades of country's scientific endeavour to the southern white continent. The 40th expedition journey will be flagged off from Goa on January 5, 2021, with 43 members onboard. The chartered ice-class vessel MV Vasily Golovnin will make this journey and will reach Antarctica in 30 days. After leaving behind a team of 40 members, it would return to India in April 2021. On return, it will also bring back the winter team of the preceding trip.

The Indian Antarctic expeditions began in 1981. The first trip comprised of a team of 21 scientists and support staff led by Dr SZ Qasim. After a humble beginning, the Indian Antarctic programme has now credited to have built three permanent research base stations in Antarctica—named Dakshin Gangotri, Maitri, and Bharati. As of today, India has two operational research stations in Antarctica named Maitri and Bharati. The National Centre for Polar and Ocean Research (NCPOR), Goa, manages the entire Indian Antarctic program.

The preceding 39<sup>th</sup> Indian Scientific Expedition to Antarctica was launched in November 2019. It mounted 27 scientific projects, focusing on climate process and its linkages with climate change, crustal evolution, environmental processes and conservation, the ecosystem of terrestrial and near shore regions, observational research, and polar technology. Two additional collaborative projects with the National Institute of Polar Research, Japan were also undertaken. After completing its mission mandate, it returned to India in May of 2020. It also replenished the annual supplies of food, fuel, provisions, snowmobiles, and spares for operations and maintenance of life support systems at Maitri and Bharati. It cruised a team of 48 members to Antarctica for winter operations.

The scientific and logistic activities of the 40<sup>th</sup> Indian Antarctic expedition are limited due to the existing challenges associated with COVID-19 pandemic. The focus is to support the ongoing scientific projects on climate change, geology, ocean observations, electric and magnetic flux measurements, environmental monitoring; resupplying of food, fuel, provisions and spare; and accomplishing the return of the winter crew. India is committed to maintaining the continent of





Antarctica free of COVID-19. The expedition will duly follow all protocols for the deployment of men and material as per Council of Managers of National Antarctic Programs (COMNAP). Extra precautions of sanitizing the cargo, mandatory fourteen days of quarantine (pre-, and post-expedition), and RT-PCR testing before boarding the ice-class vessel is also being conducted.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1685978>



*Tue, 05 Jan 2021*

## Hard magnetic coatings for high-precision microscopy

Microscopy is at the forefront of the fight against the coronavirus. Special microscopes, which enable scientists to view minute cell structures, are an indispensable tool in the development of vaccines and new therapies. Such equipment comprises not only a microscope with high optical resolution but also a high-precision microscope stage. Hard-magnetic coatings from the Fraunhofer Institute for Surface Engineering and Thin Films IST also play a key role here. They help enable the examination of minuscule cell structures in precise detail and at great speed.

Microscopes and related lab equipment are a vital weapon in the fight against viruses and bacteria. They help scientists in their search for vaccines and therapies to combat, for example, SARS-CoV-2. At Fraunhofer IST in Braunschweig, researchers are developing hard-magnetic cobalt-samarium (CoSm) coatings for magnetic linear scales. These are used in the microscope stages produced by the company ITK Dr. Kassen GmbH. In combination with sensors and an evaluation algorithm, these linear scales enhance the positioning accuracy of the microscope stage, upon which the sample is placed in preparation for viewing. "Biological material such as cells can move," explains Dr. Ralf Bandorf, research associate at Fraunhofer IST. "But I still need to be able to steer to the right position with a precision on the micrometer scale." Microscope stages that use a magnetic positioning system generally have a very compact design. They are used in microscopes from renowned manufacturers such as Leica or Zeiss. The CoSm coatings have been developed in close cooperation with industry partner ITK Dr. Kassen GmbH.



Microscope stage with magnetic positioning.  
Credit: ITK Dr. Kassen GmbH

### A position resolution on the nanometer scale

Dr. Bandorf and his team apply a CoSm coating to nonmagnetic metal strips. This endows the strips with a defined magnetic structure that can be encoded with a signal pattern. In turn, this functional coating can be read by a sensor so as to determine the precise position of a strip. "In combination with the integrated sensors, which read the signals, our coatings enable a position resolution of 5 nanometers," explains Bandorf, an engineer by training. With their integrated measurement system, the microscope stages are able to determine the precise position of a sample without the need for referencing. A repeatability of plus/minus 100 nanometers can be achieved. This is especially important for the examination of living objects, where the time available for viewing is often limited, and rapid positioning is therefore vital.

CoSm coatings are used in place of galvanized cobalt coatings, production of which requires the use of environmentally harmful chemicals. Robust and durable, they also have very good magnetic properties, which ensures a more powerful magnetic signal than can be realized with cobalt coatings. This signal is strong enough to be measured using a contactless system, which makes

such coatings suitable for use in sealed components such as hydraulic cylinders, where optical systems are not an option.

At the same time, CoSm coatings are much less easily demagnetized than pure cobalt coatings and they are unaffected by interference fields. Similarly, very fine layer thick-nesses can be achieved. Furthermore, they can be used for measurements in dirty environments. And they are also suitable for measuring angular positions and radial movements, which is of relevance for robotic applications in, for example, the automotive industry. "If a fine CoSm coating is applied to a component such as a roller bearing, it is then possible to obtain additional information about that component," Bandorf explains. Demand for high-precision magnetic measurement systems is also growing in the field of electromobility.

### Environmentally friendly coating process

The CoSm coatings are created with a process known as hollow-cathode gas flow sputtering, a vacuum deposition method developed at Fraunhofer IST. Unlike galvanization processes, this method does not involve the use of toxic substances.

Provided by [Fraunhofer-Gesellschaft](#)

<https://phys.org/news/2021-01-hard-magnetic-coatings-high-precision-microscopy.html>



Tue, 05 Jan 2021

## Studying abstract mathematical equations using tangible surfaces

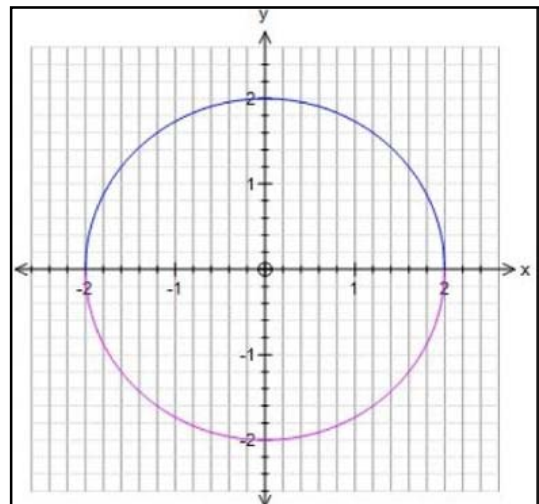
By Dorine Schenk

On January 5, Rosa Winter will obtain her doctorate in arithmetic geometry. She researched solutions of equations that define so-called 'del Pezzo surfaces.' "I like geometry because I can imagine and draw the shapes and objects," says Winter. "That makes abstract mathematics feel more tangible."

In mathematics, it is sometimes useful to study abstract equations using geometric objects, such as circles, spheres, octahedra, or even higher-dimensional objects. The field that connects geometry with abstract equations is called arithmetic geometry. Ph.D. candidate Rosa Winter applied this specific type of geometry in her thesis.

### Drawing surfaces

Mathematical equations can define geometric objects, which means that it is possible to study solutions to those equations using geometry. For example, if you want to know which numbers you can enter to make  $x^2+y^2$  equal 4, you can draw all the points (solutions) for which  $x^2+y^2=4$ . This results in a circle with radius 2, which shows, for example, that the point  $x=2, y=0$  is a solution. You can also look for specific solutions, like points on the circle where  $x$  and  $y$  are fractions ( $1/3$ rd,  $1/5$ th, but also, 0, 2, etc.). Those fractional solutions are called rational points. Winter studied rational points on surfaces. "Surfaces are always two-dimensional, even if they live in eight dimensions," says Winter. "Which means I can draw surfaces, making the abstract mathematics more intuitive for me."



Credit: Leiden University

### Million-dollar question

Finding rational points on geometric objects is rarely easy. This is shown, for example, by the so-called "Birch and Swinnerton-Dyer conjecture." This yet unproven mathematical conjecture is part of the Millennium Prize Problems. The Clay Mathematics Institute awards a million dollars to a correct solution to any of these problems. The conjecture is about rational points on elliptic curves. Like circles, elliptic curves are geometric objects defined by certain equations. When you draw them, they look like curved lines. Winter: "Even on elliptic curves, which we know quite a bit about, it is not easy to determine the set of rational points."

### Del Pezzo surfaces

Unfortunately, Winter did not collect the million dollars during her Ph.D. research. She did not work on rational points on elliptic curves, but on so-called 'del Pezzo surfaces of degree 1.' Winter: "From a geometric point of view, these are not the most difficult, most complicated surfaces but they still hold unanswered mathematical questions." She showed for part of this family of surfaces that it contains an infinite number of rational points which do not cluster; they can be found scattered around the surfaces. If rational points were visible as red dots and you could walk across such a del-Pezzo surface, you would see red rational points everywhere you look.

Since September, Winter has been working as a postdoc at the Max Planck Institute for Mathematics in the Sciences in Leipzig. Here she learns, among other things, how to apply geometry and abstract mathematics in other sciences, like biology and physics.

Provided by [Leiden University](#)

<https://phys.org/news/2021-01-abstract-mathematical-equations-tangible-surfaces.html>

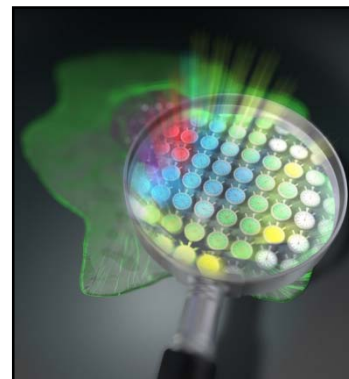


*Tue, 05 Jan 2021*

## Comb of a lifetime: A new method for fluorescence microscopy

Fluorescence microscopy is widely used in biochemistry and life sciences because it allows scientists to directly observe cells and certain compounds in and around them. Fluorescent molecules absorb light within a specific wavelength range and then re-emit it at the longer wavelength range. However, the major limitation of conventional fluorescence microscopy techniques is that the results are very difficult to evaluate quantitatively; fluorescence intensity is significantly affected by both experimental conditions and the concentration of the fluorescent substance. Now, a new study by scientists from Japan is set to revolutionize the field of fluorescence lifetime microscopy.

A way around the conventional problem is to focus on fluorescence lifetime instead of intensity. When a fluorescent substance is irradiated with a short burst of light, the resulting fluorescence does not disappear immediately but actually "decays" over time in a way that is specific to that substance. The fluorescence lifetime microscopy technique leverages this phenomenon, which is independent of experimental conditions, to quantify fluorescent molecules and changes in their environment. However, fluorescence decay is extremely fast, and ordinary cameras cannot capture it. While a single-point photodetector can be used instead, it has to be scanned throughout the sample's area to be able to reconstruct a complete 2-D picture from each measured point. This process involves movement of mechanical pieces, which greatly limits the



2-D arrangement of 44,400 light stopwatches enables scan-less fluorescence lifetime imaging. Credit: Tokushima University

speed of image capture.

In this recent study, published in *Science Advances*, the team of scientists developed a novel approach to acquire fluorescence lifetime images without the need for mechanical scanning. Professor Takeshi Yasui, from Institute of Post-LED Photonics (pLED), Tokushima University, Japan, who led the study, says, "Our method can be interpreted as simultaneously mapping 44,400 light-based 'stopwatches' over a 2-D space to measure fluorescence lifetimes—all in a single shot and without scanning."

One of the main pillars of their method is the use of an optical frequency comb as the excitation light for the sample. An optical frequency comb is essentially a light signal composed of the sum of many discrete optical frequencies with a constant spacing in between them. The word "comb" in this context refers to how the signal looks when plotted against optical frequency: a dense cluster of equidistant spikes rising from the optical frequency axis and resembling a hair comb. Using special optical equipment, a pair of excitation frequency comb signals is decomposed into individual optical beat signals (dual-comb optical beats) with different intensity-modulation frequencies, each carrying a single modulation frequency and irradiated on the target sample. The key here is that each light beam hits the sample on a spatially distinct location, creating a one-to-one correspondence between each point on the 2-D surface of the sample (pixel) and each modulation frequency of the dual-comb optical beats.

Because of its fluorescence properties, the sample re-emits part of the captured radiation while preserving the frequency-position correspondence. The fluorescence emitted from the sample is then simply focused using a lens onto a high-speed single-point photodetector. Finally, the measured signal is mathematically transformed into the frequency domain, and the fluorescence lifetime at each "pixel" is easily calculated from the relative phase delay that exists between the excitation signal at that modulation frequency versus the one measured.

Thanks to its superior speed and high spatial resolution, the microscopy method developed in this study will make it easier to exploit the advantages of fluorescence lifetime measurements. "Because our technique does not require scanning, a simultaneous measurement over the entire sample is guaranteed in each shot," says Prof. Yasui, "This will be helpful in life sciences where dynamic observations of living cells are needed." In addition to providing deeper insight into biological processes, this new approach could be used for simultaneous imaging of multiple samples for antigen testing, which is already being used for the diagnosis of COVID-19.

Perhaps most importantly, this study showcases how optical frequency combs, which were only being used as "frequency rulers," can find a place in microscopy techniques to push the envelope in life sciences. It holds promise for the development of novel therapeutic options to treat intractable diseases and enhance life expectancy, thereby benefitting the whole of humanity.

**More information:** T. Mizuno et al. Full-field fluorescence lifetime dual-comb microscopy using spectral mapping and frequency multiplexing of dual-comb optical beats, *Science Advances* (2021). DOI: [10.1126/sciadv.abd2102](https://doi.org/10.1126/sciadv.abd2102) , [advances.sciencemag.org/content/7/1/eabd2102](https://advances.sciencemag.org/content/7/1/eabd2102)

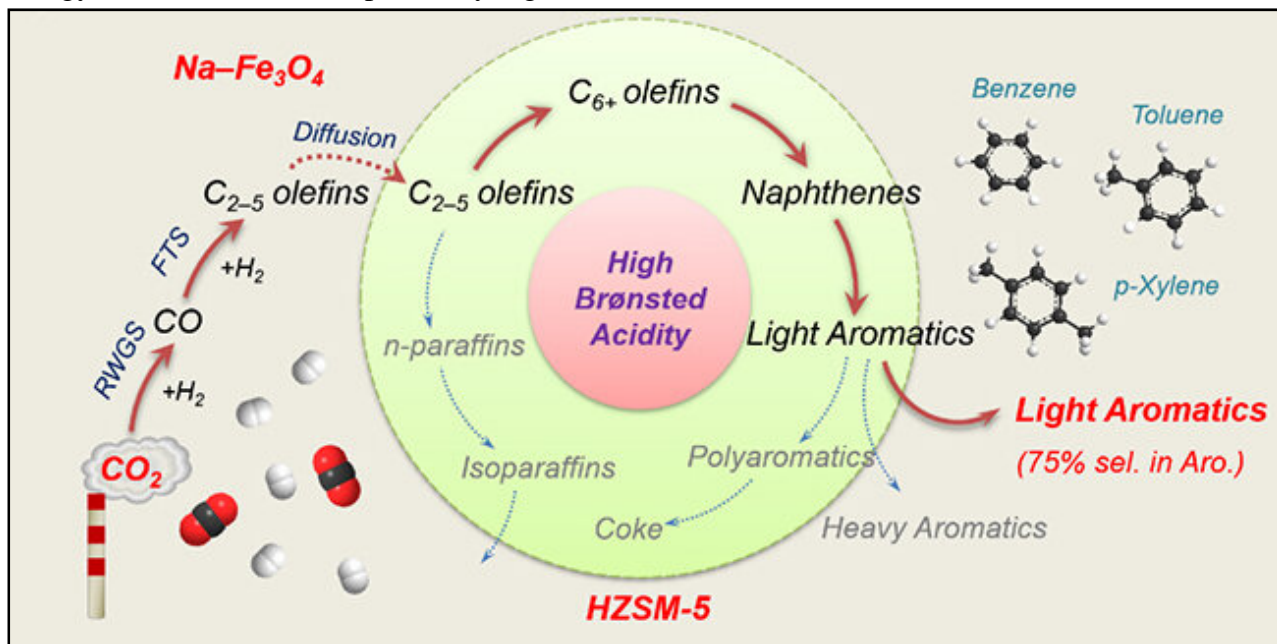
**Journal information:** [Science Advances](https://www.science.org)  
<https://phys.org/news/2021-01-lifetime-method-fluorescence-microscopy.html>



# Researchers synthesize light aromatics from carbon dioxide hydrogenation

By Li Yuan

Aromatics are usually produced from petroleum via chemical conversion processes, which are energy-intensive and accompanied by high CO<sub>2</sub> emissions.



Precisely regulating Brønsted acid sites to promote the synthesis of light aromatics via CO<sub>2</sub> hydrogenation. Credit: WEI Jian and YAO Ruwei

Using CO<sub>2</sub> as the feedstock for sustainable production of aromatics through catalytic hydrogenation is an economically and environmentally viable approach to address the pressing challenges of energy demand and global warming.

A research team led by Assoc. Prof. Sun Jian, Prof. Ge Qingjie and Assoc. Prof. Wei Jian from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences synthesized light aromatics from CO<sub>2</sub> hydrogenation by precisely regulating Brønsted acid sites (BAS).

This study was published in *Applied Catalysis B: Environmental* on Oct. 17.

The scientists studied a series of composite catalysts comprising Fe-based component and ZSM-5 zeolites with distinct Brønsted acidities to explore the influence of BAS on the light aromatic synthesis and coke formation in CO<sub>2</sub> hydrogenation.

They found that BAS of ZSM-5 were the main active sites for aromatization, and the increasing of Brønsted acidity significantly promoted the synthesis of aromatics, especially light aromatics. The further passivation of the external BAS of HZ(25) zeolite by silylation process could inhibit the alkylation of light aromatics and the isomerization of xylene.

The results showed that light aromatics accounted for up to 75% of aromatics, which was the highest value reported in CO<sub>2</sub> hydrogenation, and p-xylene could make up as high as 72% of xylene. Moreover, a larger density of BAS, which promoted the formation of highly condensed, carbon-rich, and hard-to-oxidize coke, would accelerate the coke formation, degrade their physico-chemical properties, and shorten the catalyst lifetime.

This work provides a promising strategy to directly synthesize high-valued light aromatics from CO<sub>2</sub> and H<sub>2</sub>, which is important to cope with energy and environmental problems.



**More information:** Jian Wei et al. Precisely regulating Brønsted acid sites to promote the synthesis of light aromatics via CO<sub>2</sub> hydrogenation, *Applied Catalysis B: Environmental* (2020). DOI: [10.1016/j.apcatb.2020.119648](https://doi.org/10.1016/j.apcatb.2020.119648)

**Journal information:** *Applied Catalysis B: Environmental*  
<https://phys.org/news/2021-01-aromatics-carbon-dioxide-hydrogenation.html>

## COVID-19 Research News



Tue, 05 Jan 2021

### Study: Individuals recovering from Covid-19 helpful for Sustained cellular immune dysregulation

*A recent study has determined that Covid-19 patients might be helpful for clinicians to better understand how the unknown SARS-CoV-2 virus acts*

Birmingham [UK]: January 3 (ANI): A recent study has determined that Covid-19 patients might be helpful for clinicians to better understand how the unknown SARS-CoV-2 virus acts.

According to a study published in the Journal of Clinical Investigation, many infected patients remain asymptomatic or have mild symptoms. Others, especially those with comorbidities, can develop severe clinical disease with atypical pneumonia and multiple system organ failures.

Since the first cases were reported in December 2019, the SARS-CoV-2 virus that causes Covid-19 has surged into a pandemic, with cases and deaths still mounting. Ongoing observational clinical research has become a priority to better understand how this previously unknown virus acts, and findings from this research can better inform treatment and vaccine design.

The University of Alabama at Birmingham researchers, led by first-author Jacob “Jake” Files and co-senior authors Nathan Erdmann, M.D., Ph.D., and Paul Goepfert, M.D., have now reported their observational study, “Sustained cellular immune dysregulation in individuals recovering from SARS-CoV-2 infection.”

In a commentary on the UAB study, published in the same issue, Phillip Mudd, M.D., Ph.D., and Kenneth Remy, M.D., both of Washington University, wrote, “The importance of these studies to provide context for the interpretation of immune responses generated by participants in Covid-19 vaccine trials, including how those responses change over time, cannot be over-emphasized. This information will be key in potential modifications to existing Covid-19 vaccines and treatments.”

The UAB researchers obtained blood samples and clinical data from 46 hospitalized Covid-19 patients and 39 non-hospitalized individuals who had recovered from confirmed Covid-19 infection. Both groups were compared to healthy, Covid-19-negative controls. Importantly, most individuals in the hospitalized group had active SAR-CoV-2 viruses in their blood and were in the hospital at the time of sample collection. All individuals in the non-hospitalized group were convalescent at the time of sample collection.



According to a study published in the Journal of Clinical Investigation, many infected patients remain asymptomatic or have mild symptoms.(Unsplash)

From the blood samples, researchers were able to separate specific immune cell subsets and analyze cell surface markers. From this complex information, immunologists can analyze how each individual's immune system is responding during infection and during convalescence. Some of these results can reveal whether immune cells have become activated and exhausted by the infection. Exhausted immune cells may increase susceptibility to a secondary infection or hamper the development of protective immunity to Covid-19.

In addition, the researchers were able to analyze changes over time, in two ways. The first was observing changes in surface markers over time, defined as days since the onset of symptoms for non-hospitalized samples. The second was directly comparing the frequencies of these markers between the first and second clinic visits for non-hospitalized patients who had blood samples collected at two sequential time points.

The most surprising finding involved non-hospitalized patients. While the UAB researchers saw upregulated activation markers in hospitalized patients, they also found several activations and exhaustion markers were expressed at higher frequencies in non-hospitalized convalescent samples.

Looking at these markers over time, it was apparent that immune dysregulation in the non-hospitalized individuals did not quickly resolve. Furthermore, the dysregulation of T cell activation and exhaustion markers in the non-hospitalized cohort was more pronounced in the elderly. "To our knowledge," the researchers reported, "this is the first description of sustained immune dysregulation due to Covid-19 in a large group of non-hospitalized convalescent patients."

For details of the comprehensive look at immune cells subsets during and after Covid-19 infection in hospitalized and non-hospitalized people, see the study, which includes an in-depth characterization of the activation and exhaustion phenotype of CD4+ T cells, CD8+ T cells, and B cells.

The B and T cells from both patient cohorts had phenotypes consistent with activation and cellular exhaustion throughout the first two months of infection. And in the non-hospitalized individuals, the activation markers and cellular exhaustion increased over time. "These findings," Mudd and Remy said in their commentary, "illustrate the persistent nature of the adaptive immune system changes that have been noted in Covid-19 and suggest longer-term effects that may shape the maintenance of immunity to SARS-CoV-2."

A question now being explored, the UAB researchers say, is whether these observed immunologic changes are associated with symptoms experienced well beyond the acute infection, often described as "Long Covid."

<https://www.hindustantimes.com/health/study-individuals-recovering-from-covid-19-helpful-for-sustained-cellular-immune-dysregulation/story-eiiJ7Fvz1RRGnpW7K1IJ.html>

