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Thu, 17 Sept 2020

India signed 70 defence contracts last fiscal: MoS Defence Shripad Naik

A total of 38 defence contracts were signed with Indian vendors while 32 contracts were inked with foreign vendors in the last financial year, Shripad Naik said

New Delhi: A total of 70 defence contracts were signed during the last financial year, while 16 deals have been inked this fiscal till July, Minister of State for Defence Shripad Naik said in the Parliament on Wednesday.

A total of 38 defence contracts were signed with Indian vendors while 32 contracts were inked with foreign vendors in the last financial year, Naik said in a written reply to BJP MP Colonel Rajyavardhan Singh Rathore in the Lok Sabha.

The minister also said that during the current financial year up to July, a total of 10 contracts have been signed with Indian vendors and six with foreign vendors.

These contracts are for capital procurement of defence equipment for the armed forces.

Out of the total 48 capital acquisition contracts signed with Indian vendors from April 2019 to July 2020, 18 contracts have been signed with defence public sector undertakings (PSUs), Ordnance Factory Board, Defence Research and Development Organisation (DRDO), Indian Space Research Organisation (ISRO) while 30 contracts have been signed with Indian private vendors.

"All efforts are being made to optimally use budgeted funds for meeting committed liabilities relating to already concluded capital acquisition contracts and for new schemes contracted during the year," the minister said.

Last year maximum expenditure was incurred under Capital Acquisition (Modernisation) of Armed Forces under Defence Service Estimates (DSE) and it stood at Rs 91,128.74 crore.

In the 2018-2019 financial year, it was Rs 75,892.85 crore and in 2017-2018 it was Rs 72,732.20 crore. In 2016-2017, it was Rs 69,280.16 crore and in 2015-2016, it was Rs 62,235.54 crore.

While evaluating competitive bids for defence contracts between defence PSUs and private sector entities, no advantage is given to defence PSUs. The competitive bids are evaluated based on the request for proposal terms and conditions, the minister said.

<https://www.timesnownews.com/india/article/india-signed-70-defence-contracts-last-fiscal-mos-defence-shripad-naik/653713>



Minister of State for Defence Shripad Naik | Photo Credit: ANI

Road to Daulat Beg Oldi will allow tank movement by Oct 15 as army prepares for Ladakh winter

All bridges will bear 70 tons on Darbuk-Shyok-Daulat Beg Oldi Road so that tank plus truck trailers can go upto Karakoram pass
By Shishir Gupta

New Delhi: Preparing for a long winter ahead facing the People's Liberation Army (PLA) in East Ladakh, the Border Roads Organisation (BRO) has decided to allow Srinagar-Zoji La-Kargil Leh axis to be closed only for 45 days from past average 95 days due to snow this year and will strengthen all the bridges on Darbuk-Shyok-Daulat Beg Oldi (DBO) road to bear the load of tank plus truck trailer by next month.

Authoritative government sources told Hindustan Times that the BRO, under the defence ministry, will also keep the new Darcha-Padam-Nimu-Leh road clear of snow throughout December and January 2021 so that military supply route is maintained round the clock. The Modi government is now considering to prepare for the shortest tunnel at Shinku La on Darcha-Padam axis so that this road is snow free throughout the year.



The BRO will ensure that Zoji La is blocked only 45 days instead of 95 days due to snow this winter.

Given that the PLA is showing no signs of abiding with the agreements between the Special Representatives on Boundary Talks (July 5, 2020) and between foreign ministers (September 10, 2020) on total disengagement to restore status quo ante on LAC, the Indian Army is rushing in supplies with the BRO ensuring that 17,580 feet high Chang La pass and 17,582 feet Khardung La on route to contested Pangong Tso is kept snow free throughout the year.

With an aim to keep weapon deployment in East Ladakh to match the PLA build-up in occupied Aksai Chin, the BRO is expected to strengthen all bridges and culverts to Class 70 on the DSDBO road by October 15. Class 70 bridge means that it can bear a load of 70 tons, which is more than the weight of a fully loaded tank trailer. In strategic terms this means that in case of worst case scenario, the DSDBO road can be used to deploy T-90 tanks, infantry combat vehicle and surface to air missiles all along the eastern Ladakh Line of Actual Control with Tibet.

While the BRO is expected to validate the Darcha-Padam-Nimu-Leh axis for heavy vehicle traffic this month, there is intense discussion within the Ministry of Defence on the length and alignment of the tunnel under 16000 feet Shinku La. The National Highways and Infrastructure Development Corporation Limited (NHIDCL) has been tasked to study the shortest possible alignment for the tunnel so that it can be readied in next four years.

Majority of the stake-holders, including ministry of surface transport, are in favour of a shorter 4.5-km tunnel alignment on the current axis rather than a 13-km alignment suggested by Snow and Avalanche Study Establishment (SASE) of the Defence Ministry. The longer alignment will not only delay the project with a host of studies and detailed project report to be completed. It has now been left to Defence Minister Rajnath Singh to take a final call.

<https://www.hindustantimes.com/india-news/road-to-daulat-beg-oldi-will-allow-tank-movement-by-oct-15-as-army-prepares-for-ladakh-winter/story-2DMzLy5y1rZCyWvLWAd6tO.html>

THE ECONOMIC TIMES

Thu, 17 Sept 2020

Carbines, Anti Air Systems for Indian Army to be made in India after MoD cancels import

By Many Pubby

Synopsis

In a special meeting held on Tuesday, chaired by the Defence Secretary, it has been decided that plans to procure close quarter carbines from a UAE based company and a program to import Self Propelled Air Defence systems from South Korea are being scrapped.

New Delhi: The defence ministry has cancelled two arms import contracts for the army worth over \$ 2.5 billion that were in the final stages, preferring to go for the Make in India route. In a special meeting held on Tuesday, chaired by the Defence Secretary, it has been decided that plans to procure close quarter carbines from a UAE based company and a program to import Self Propelled Air Defence systems from South Korea are being scrapped.

The meeting, which was also attended by Chief of Defence Staff Gen Bipin Rawat, concluded that the contracts will now be placed under the Make in India initiative to give a boost to the domestic industry, sources said.

It is not clear under which clause the procurements would proceed but the army has projected an urgent requirement for close quarter carbines and had been processing the deal under a fast track process. As reported by ET, a view within the government was that with recent announcements on Atmanirbhar Bharat, as well as representations from domestic companies promising an equivalent product for sale, the import case needs to be cancelled.

A UAE based arms manufacturer Caracal had been shortlisted to supply 93895 close quarter carbines for the army has written to the defence ministry after it emerged as the lowest bidder for a fast track procurement by the army in 2018.

The case was tricky, given that the Caracal group had not been originally included in the list of companies to which tenders were to be issued in 2018 by the army. It only managed to enter the competition after the Acquisition wing of the Defence Ministry recommended its inclusion. Fed up with delays in the acquisition case that was to be fast tracked, the Army had recommended either the case has to be shut down or should move to the next stage of contract negotiation at the earliest.

The acquisition case for Self Propelled Air Defence Gun Missile System (SPAD-GMS) – the Indian Army wants five regiments of the guns that can be deployed with forward moving forces and can be quickly relocated on the basis of threat perception – has also been cancelled after South Korean company Hanwa's K 30 Biho was shortlisted by the Army.



A file image of Indian Army using its artillery

The estimated \$ 2.5 billion contract for new air defence systems for the Army has been hanging fire since last year after Russia protested that it had been unfairly disqualified from the competition in which the Korean company was shortlisted.

Both the Russian upgraded Tunguska M1 and Pantsir missile systems failed to qualify for the acquisition of 104 system that are needed by the Army, promoting a formal complaint to the Independent Monitors (IMs) set up within the MoD to monitor acquisition cases.

As reported by ET the IMs recommended that the Russians be given another chance to prove the system. This however, was found to be unfair by the acquisition wing that had pointed out that a re-trial opportunity at this late stage would set a dangerous new precedent and would vitiate the principle of a level playing field.

While the recommendation was to expedite the contract negotiation or move for a retrial at the earliest, the contract has now been scrapped keeping in mind new plans under the Make in India initiative.

The two programs would come as a welcome surprise for the Indian industry, particularly the private sector, which has developed capabilities over the past few years to manufacture such systems domestically.

<https://economictimes.indiatimes.com/news/defence/carbines-anti-air-systems-for-indian-army-to-be-made-in-india-after-mod-cancels-import/articleshow/78141347.cms>

THE ECONOMIC TIMES

Thu, 17 Sept 2020

Amid border conflict with China, Indian Army readies Bofors guns for operations

Synopsis

The Bofors gun, which was inducted into the regiment of artillery in the mid-1980s, is capable of firing both in low and high angles will be deployed in Ladakh once they will be serviced.

Ladakh: Amid the ongoing tensions over transgressions by the Chinese in Eastern Ladakh, the Indian Army is keeping its formidable Bofors howitzers ready for operations.

In a visit to the maintenance facilities for the Bofors guns in Ladakh, could see the effort with which the engineers of the force are servicing and maintaining the 155mm Bofors gun in Ladakh.

The Bofors gun, which was inducted into the regiment of artillery in the mid-1980s, is capable of firing both in low and high angles will be deployed in Ladakh once they will be serviced.

In Ladakh, Army Engineers were seen servicing one such Bofors gun which they said that it will be ready to roar in a few days.

According to the officials, the gun required periodical servicing and maintenance to keep roaring for which technicians have been deployed to keep it in working.

Bofors was instrumental in winning many battles of Operation Vijay was displayed in Dras in Jammu and Kashmir recently.

In the workshop, Army Engineers are responsible to maintain and service all such weaponry required in odd situations.



Bofors gun being displayed during the practice of rescue and other operations carried out by Army Engineers, in Leh on Tuesday

"From a firing pin to engine assembly of a tank, Technical store groups job is to provide everything. This vehicle behind is mobile spares van, through this we provide components in the forward areas to repair technicians," Lt Colonel Preeti Kanwar said while briefing about Army's preparation in regards to servicing and maintenance in the forward areas.

The Bofors guns proved their mettle in the Kargil war of 1999 against Pakistan by destroying the bunkers and bases built on high altitude mountains with ease and causing heavy damage to the Pakistan Army.

<https://economictimes.indiatimes.com/news/defence/amid-border-conflict-with-china-indian-army-readies-bofors-guns-for-operations/articleshow/78146706.cms>

THE ECONOMIC TIMES

Thu, 17 Sept 2020

Indian Military puts in place mechanism to ensure uninterrupted, fast delivery of supplies in Ladakh

Synopsis

Forces are using C-17 and IL-76 aircraft along with Chinook helicopters to deliver supplies in forward location, reaching from parts of India to Ladakh. Every day these two, one of the biggest aircrafts get essential supplies like tentages, clothing, food items, water bottles etc to Ladakh from different parts of the country to send them to forward locations.

Ladakh: With a tense situation at Ladakh border, Indian Air Force and Indian Army have adopted a mechanism that ensures uninterrupted and fast delivery of supplies.

Forces are using C-17 and IL-76 aircraft along with Chinook helicopters to deliver supplies in forward location, reaching from parts of India to Ladakh.

Every day these two, one of the biggest aircrafts get essential supplies like tentages, clothing, food items, water bottles etc to Ladakh from different parts of the country to send them to forward locations.

With capacity of transporting tons of goods, these aircrafts and Chinook helicopters operated by Indian Air Force are working in coordination with Indian Army to ensure sufficient and non-interrupted supply of various items.

The process starts when these two big aircraft C-17 and IL-76 bring supplies from different areas to Ladakh. After unloading the supplies, the Army sanitises them and later these are transported to Chinook helicopters.

Helicopters then load the supplies and immediately take off to different locations in forward areas. All day, these helicopters ferry multiple times to supply essential items along with other important goods to jawans and units deployed in forward locations.

According to Indian Army officials, from loading items from a different city or state till dropping the goods to forward areas, it takes hardly couple of hours. This is the fastest mode and anything can be reached in few hours in forward locations.

"Airfield acts as the lifeline for the entire forces in Eastern Ladakh wherein the drills for supply chain management have been optimized and a well-oiled machinery exists to handle both transients and loads. This joint capability (Army and Air Force) is more than adequate to sustain the forces which have been built up. In addition, there is great scope to incorporate the civil resources into the operational logistics chain should there be a requirement," Major General Arvind Kapoor, Chief of Staff 14 Corps said.



The process starts when these two big aircraft C-17 and IL-76 bring supplies from different areas to Ladakh.

Adding to it, Air Commodore DP Hirani said that both aircraft and helicopters are symbol of jointmanship of Army and Air Force. "C-17 and Chinook are symbol of jointmanship utilised for heavy military equipment and logistics. The Air Force and Army have been working in synergy and it exemplifies the quick mobility of men and material in these mountainous terrains," Air Commodore DP Hirani said.

<https://economictimes.indiatimes.com/news/defence/indian-military-puts-in-place-mechanism-to-ensure-uninterrupted-fast-delivery-of-supplies-in-ladakh/articleshow/78152080.cms>

The Tribune

Thu, 17 Sept 2020

Prepared to fight a full-fledged war in winters in Ladakh: Army

"The Indian Army is fully prepared and more than capable of fighting a full-fledged war even in winters in Eastern Ladakh."

By Arun Joshi

Jammu: The Indian Army has drawn comparisons between its preparedness and capacity to weather the extreme conditions in the icy Himalayan heights and declared that it is "well prepared for the prolonged standoff in eastern Ladakh" where PLA troops have created an explosive situation.

A spokesman of the Northern Command said: "Altitudes in Ladakh range from High to Super High Altitude and there is a lot of snowfall, after the month of November up to 40 feet of snow is experienced. Coupled with this, temperature dipping down to minus 30-40 degrees is a usual phenomenon. Wind chill factor makes matters further worse for the troops. The roads also get closed due to the snow. But despite all this, most encouraging part for India is that the Indian soldiers have a huge experience of winter warfare and are psychologically tuned to operate at short notice. While this fact is known to the world, the operational logistics capabilities are hardly known."



Soldiers prepare to load an Indian Air Forces Chinook helicopter with supplies at a forward airbase in Leh, in the Ladakh region, September 15, 2020. Reuters

Rebutting China's state media, particularly Global Times, that the Indian Army would not be able to withstand the harsh conditions in Ladakh heights, the spokesman said that it can be best attributed to the "ignorance" of Chinese media.

"The Indian Army is fully prepared and more than capable of fighting a full-fledged war even in winters in Eastern Ladakh."

The spokesperson said that logistic capability relates to mobility, habitat and billeting, quality services from health, special rations, repair and recovery, heating systems, high-quality weapons, ammunition and quality clothing. While much of this capability existed earlier and troops could simply plug and play, a lot has also been boosted since May this year when China showed first signs of aggression.

The Indian Army has experience in Siachen where conditions are much more demanding than the frontiers with China. Traditionally there were two routes for moving into Ladakh, that is through Zojila and Rohtang Passes.

Recently, India commissioned the third road from Darcha to Leh which is much shorter distance-wise and less prone to closure. Completion of Atal tunnel on the Rohtang route has force multiplied the logistic capacities.

“In addition, we have a large number of air bases with the help of which we can maintain the army well. Modern snow clearing equipment has also been placed on these routes to keep them open beyond November, thus giving us more time for daily maintenance of the troops,” the spokesperson said.

Special fuel and lubricants for tanks and armoured personnel carriers have also been “stocked adequately, including spares for their maintenance”. Water points and tube wells have been established for the troops and animals like mules and yaks. The living barracks have also been prepared which are comfortable and warm. Facilities such as the central heating system are some of the high points of these facilities. Ammunition of various types including small arms, missiles and tank and artillery ammunition have also been adequately stocked. The medical system is also in place for any eventuality.

Compared to Indian troops that are battle-hardened physically and psychologically, Chinese troops are mostly from urban areas and not used to hardships or prolonged deployment under field conditions, the spokesperson said.

"China's concept has always been to win wars without fighting; hence if they create conditions for a war, they will come across a better trained, better prepared, rested and psychologically hardened Indian troops. These worries have been percolating the minds of Chinese troops and are visible in Chinese media," the spokesperson added.

<https://www.tribuneindia.com/news/j-k/prepared-to-fight-a-full-fledged-war-in-winters-in-ladakh-army-141995>



Thu, 17 Sept 2020

To the brink and back in Ladakh

At the heart of China's actions lies a historical strategy that India needs to address with great tact

By Arjun Subramaniam

Realists within India have always argued that the People's Republic of China (PRC) only deals in the currency of power and brushes aside liberal and moralistic underpinnings to negotiations in every realm. Whether the recent talks between India's External Affairs Minister, Dr. S. Jaishankar, and China's Foreign Minister, Wang Yi, will yield any major dividends, or whether it will be another elaborate smokescreen laid by China, is anybody's guess.

A recent editorial in the pro-government *Global Times* in Beijing has put out a clarion call for the people of China to be prepared for 'war with neighbours', without specifically mentioning India. Presciently, this was put out after the Jaishankar-Wang Yi talks and included a reference to the moral conduct of war.

Not often have the Indians realised that at the heart of the PRC's strategy to manage its periphery was another fault line in history. Often referred to as Mao's 'Five Finger Strategy,' the strategy has continuously sought to reassert control over Arunachal Pradesh, or what the PRC calls 'Southern Tibet', Bhutan, Sikkim, Nepal and Ladakh, as part of an effort to secure China's periphery. This has turned into a Chinese obsession that has destabilised South Asia. It can now be argued that despite being surprised and having had to reckon with a successful PLA operation to



change the status quo in several pockets across the LAC in Ladakh, India's refusal to buckle under pressure has given the PLA and Xi Jinping much to think of.

The spontaneous and violent response of the Indian Army during the Galwan clash of June 15, and the well-planned and executed operation to tactically occupy important heights on both the northern and southern banks of Pangong Tso have demonstrated a wide spectrum of capabilities and intent on India's part. While these have not resulted in any gains on the ground, the PLA remains entrenched in 'grey areas' and has been forced to pause and mull over its future actions on the ground, giving India time to build up for the winter and prepare for the long haul.

Some analysts believe that an escalation of some kind seems inevitable, and that it is imperative that the series of meetings at various levels do not infuse a sense of hope that rapprochement is around the corner, unless it is accompanied by a visible change on the ground. Others who have served in the area and observed the trajectory of the PLA build-up argue that there is no way that the deployments, dense as they may be, are enough to support even a localised skirmish. Adding to the difficulties of the PLA in any further operations is the widely accepted military proposition that uphill attacks to dislodge entrenched defenders from the kind of heights now occupied by the Indian Army would require overwhelming force ratios of upwards of 9:1. If one looks back at the heavy losses suffered by the Indian Army during their initial assaults in the Kargil conflict, one may wonder whether the PLA has the appetite to deal with such losses.

Measured approach

A 'hot' LAC will favour the PLA with its greater reserves and will test India to its limits. It is the worst option that India must prepare for, even more than a localised and limited conflict. The latter is a situation that the PLA wants to avoid as it has already achieved several operational outcomes by adopting elaborate coercive methods short of conflict. Hence, the only body language that must go out from the Indian armed forces at present is that it is more than prepared for a limited conflict.

Of greater significance will be a realisation within the PLA leadership that India's emerging combined arms firepower has the potential to inflict significant attrition on the PLA's combat potential in and around the tactical battle area and in medium depth on the Tibetan plateau. This may be coupled with a realisation that in its obsession with learning from the lessons of the 1991 Gulf War, the PLA may have missed out on thinking more about high altitude warfare, something that the Indian Army and the Indian Air Force have gained much experience in over the decades.

There is also a realisation that the Indian Navy's assertive maritime posturing, its willingness to join collaborative groupings to contain an aggressive PLA Navy, and increasing articulation on the need to ensure freedom of navigation reflects a growing willingness on India's part to 'go out and meet an adversary' on the high seas rather than stay in the backwaters.

The biggest stumbling block to rapprochement between the two countries lies within the PLA, which has seriously intellectualised its role as the sword-arm of Chinese national power. It has assiduously developed plans to take down adversaries and rolled out its playbook with a multi-front strategy that will run its course. History looms large again, as the PLA was Mao's principal instrument against Chiang Kai Shek in the late 1940s as he sought to forge a new identity for the Chinese people. This time around, after shaping the global environment with economic muscle, Xi Jinping is now using the PLA as a vanguard in his bid to narrow the gap further with China's principal global competitor, the U.S. India would do well not to become collateral damage in this great power competition.

While diplomatic initiatives and further coercive explorations in the economic domain must continue, pragmatism and realism suggest that in the short-term, it is India's military resolve that offers the most potential for precipitating any kind of conflict mitigation. Several practitioners feel that the current face-off will only be resolved if the PLA is offered a face-saving proposition, and that would need some deft politico-military-diplomatic manoeuvring from India.

What of a fresh boundary agreement with China following this face-off? Two trajectories seem possible. The first will involve a path of least resistance that brings into play a new paradigm and

fresh protocol for managing a stressed but not a ‘hot’ LAC – much like ‘old wine in a new bottle.’ The second would entail a stroke of ‘enlightened statesmanship’ that sees both President Xi Jinping and PM Modi cut through much of the clutter to reach a ‘swap deal,’ the kinds of which are said to have been proposed by Zhou-Enlai in 1959 and Deng Xiaoping in the early 1990s. For Xi, it would mean having to get around an increasingly assertive PLA, while PM Modi would need to get around fractured and jingoistic constituencies across the political spectrum that still hold on to impossible historical probabilities.

(Arjun Subramaniam is a retired Air Vice Marshal from the IAF, a historian and the author of the forthcoming ‘Full Spectrum: India’s Wars 1972-2020’)

<https://www.thehindu.com/opinion/op-ed/to-the-brink-and-back-in-ladakh/article32624934.ece>

THE ECONOMIC TIMES

Thu, 17 Sept 2020

China deploys 10k troops on south bank of Pangong Tso, 50 battalions stationed in Ladakh LAC

By Rahul Tripathi

Synopsis

According to this assessment, the number of battalions deployed in Ladakh by People Liberation Army (PLA) has gone up from 35 in August to 50 in September. Each battalion consists of 1,000-1,200 soldiers. On September 7, PLA troops attempted to come dangerously close to one of the forward positions of Indian Army, which resulted in shots being fired in the air.

New Delhi: China is believed to have brought forward more troops in the past week along the Line of Actual Control (LAC) in Ladakh, taking its total troop deployment to approximately 52,000. Of these, 10,000 troops have been deployed on the southern bank of the Pangong Tso that has witnessed hectic military activity since the manoeuvres of August 29-30.

These details form part of a latest comprehensive assessment by security forces on the “eyeball to eyeball” deployment of Indian and Chinese troops in Ladakh, ET has reliably gathered. The report notes that Chinese aggressive moves have been met with “mirror deployment” on the Indian side.

According to this assessment, the number of battalions deployed in Ladakh by People Liberation Army (PLA) has gone up from 35 in August to 50 in September. Each battalion consists of 1,000-1,200 soldiers. On September 7, PLA troops attempted to come dangerously close to one of the forward positions of Indian Army, which resulted in shots being fired in the air.

“While there have been no fresh incidents of transgression or standoff in past week, there is considerable movement of PLA troops and equipment,” explained a senior official.

Chinese forces, sources said, have been trying to alter the status quo but have so far been thwarted by the Indian Army, which now controls four key features in and around the South Bank of the Pangong Tso. “The increase in the number of friction areas has led to lack of trust among the soldiers. The disengagement will depend upon the outcome of military level talks that is expected to be held this week. Armed forces are on high alert and surveillance is at an all-time high. They will continue to occupy the high peaks until the disengagement talks are completed,” the official added.

Border Tension

PLA deployment in Ladakh has gone up from 35 battalions in August to 50 in September

Each battalion consists of 1,000-1,200 soldiers

Of these, 10,000 deployed on southern bank of Pangong Tso

Chinese moves have been met with “mirror deployment” on the Indian side

Also on the cards is a meeting of the Working Mechanism for Consultation and Coordination (WMCC) between the two countries to discuss the process of disengagement and de-escalation. External affairs minister S Jaishankar and his Chinese counterpart Wang Yi, who is also the Chinese special representative on the boundary issue, reached a five-point understanding on disengagement of troops on September 10 at Moscow, which is expected to lead to a fresh round of talks between senior military commanders.

India has accused PLA forces of blatantly violating agreements and carrying out aggressive manoeuvres, while conversations at military, diplomatic and political levels are in progress. "At no stage has the Indian Army transgressed across the LAC or resorted to use of any aggressive means, including firing," said officials.

<https://economictimes.indiatimes.com/news/defence/china-deploys-10k-on-south-bank-of-pangong-tso/articleshow/78137294.cms>

Science & Technology News



Thu, 17 Sept 2020

ISRO will support MSMEs, start-ups in space sector via SEED, says Dr K Sivan

Indian Space Research Organisation (ISRO) has said that it is working with the Department of Space (DoS) on SEED (Space Enterprise Encouragement and Development), a formal system to support start-ups and micro, small and medium industries (MSMEs) in innovation, research & product development

By Siddarth MP, Edited By Ritesh K Srivastava

Highlights

- 1. The ISRO has said that it is working with the Department of Space (DoS) on SEED, a formal system to support start-ups and micro, small and medium industries (MSMEs) in innovation, research & product development.**
- 2. The announcement in this regard was made by Dr K Sivan, Secretary DoS and Chairman ISRO.**
- 3. This announcement comes barely months after he announced the formulation of a new vertical, In-Space, which is meant to enable end-to-end private participation in India's space programme.**

New Delhi: Indian Space Research Organisation (ISRO) has said that it is working with the Department of Space (DoS) on SEED (Space Enterprise Encouragement and Development), a formal system to support start-ups and micro, small and medium industries (MSMEs) in innovation, research & product development.

The announcement in this regard was made by Dr K Sivan, Secretary DoS and Chairman ISRO.

This announcement comes barely months after he announced the formulation of a new vertical, In-Space, which is meant to enable end-to-end private participation in India's space programme.

Speaking at an International Space conference on 'Ushering the new era in Indian Space Sector,' Sivan mentioned that a comprehensive Space Act and related Policies were in the pipeline. The Conference is organized by the Confederation of Indian Industry (CII) in association with Indian Space Research Organisation (ISRO), Antrix Corporation Limited and supported by NewSpace India Limited (NSIL)

“Entire gamut of activities is to be covered by policies and we are going to add Launch vehicle policy, space exploration policy etc. Existing space policies on satcom and remote sensing data policy are also being amended for greater inclusivity and transparency” Dr Sivan said. It is notable that with the new policies would pave way for insurance sector to render services in space domain, where insurance is an absolute necessity for satellites and launch services.

Making a specific mention of SEED, Dr. Sivan stated that it was a competitive and early-stage opportunity for MSME and start-ups to develop products for ISRO, where ISRO would also offer spin-offs in return.

As per, G. Narayanan Chairman and Managing Director (CMD), NewSpace India Limited (NSIL) there are many start-ups that have entered this field, prior to the reforms they were announced a few months back. He opined that large-scale, independent development of space systems had not happened in India in organizations other than ISRO, probably owing to the lack of technical expertise. However, he added that now with many retired ISRO officials available, cooperation and collaboration are the way ahead to make the country self-reliant in the space sector.

The new policies that are said to be in the works are crucial for the real foray of private players into all domains of the Space sector in India. Currently, various domain experts and entrepreneurs feel that the policies in India need to be revamped to provide much more clarity and business-friendliness to attain its potential.

<https://zeenews.india.com/india/isro-will-support-msmes-start-ups-in-space-sector-via-seed-says-dr-k-sivan-2310098.html>



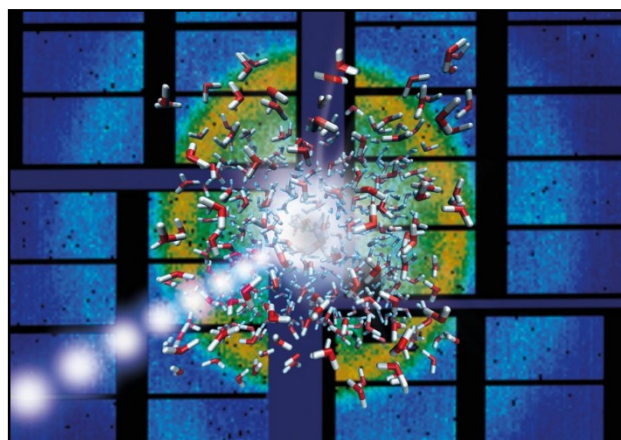
Thu, 17 Sept 2020

Liquid water at 170 degrees celsius: X-ray laser reveals anomalous dynamics at ultra-fast heating

Using the X-ray laser European XFEL, a research team has investigated how water heats up under extreme conditions. In the process, the scientists were able to observe water that remained liquid even at temperatures of more than 170 degrees Celsius. The investigation revealed an anomalous dynamic behavior of water under these conditions. The results of the study, which are published in the *Proceedings of the National Academy of Sciences (PNAS)*, are of fundamental importance for the planning and analysis of investigations of sensitive samples using X-ray lasers.

European XFEL, an international research facility, which extends from the DESY site in Hamburg to the neighboring town of Schenefeld in Schleswig-Holstein, is home to the most powerful X-ray laser in the world. It can generate up to 27 000 intense X-ray flashes per second. For their experiments, the researchers used series of 120 flashes each. The individual flashes were less than a millionth of a second apart (exactly 0.886 microseconds). The scientists sent these pulse trains into a thin, water-filled quartz glass tube and observed the reaction of the water.

"We asked ourselves how long and how strongly water can be heated in the X-ray laser and whether it still behaves like water," explains



The X-ray flashes of the European XFEL (violet) do not only heat the water (red and white molecules), but also produce a diffraction pattern of the sample (background) from which the state of the water can be determined after each flash. This gives a detailed time history of the process. Credit: DESY, Britta Liebau

lead author Felix Lehmkuhler from DESY. "For example, does it still function as a coolant at high temperatures?" A detailed understanding of superheated water is also essential for a large number of investigations on heat-sensitive samples, such as polymers or biological samples.

"With the X-ray flashes, we were able to heat the water up to 172 degrees Celsius within a ten thousandth of a second without it evaporating," reports Lehmkuhler. Such a boiling delay can normally only be observed up to about 110 degrees Celsius. "But that is not the only anomalous feature," the physicist emphasizes. The scientists investigated the movement of silicon nanospheres floating in the water as markers for the dynamics in the sample. "In the extremely overheated water, we observed that the movement of silicon dioxide nanospheres deviated significantly from the expected random Brownian molecular movement. This indicates an uneven heating of the sample," says Lehmkuhler. Existing theoretical models cannot yet satisfactorily explain this behavior because they are not designed for water under these extreme conditions.

Thanks to the rapid flash sequence of the European XFEL, the researchers were able to observe the process in extreme detail. "What makes the European XFEL unique is the high repetition rate, that is, the high number of pulses per second", explains co-author Adrian Mancuso, head of the SPB/SFX instrument at the European XFEL where the experiments took place. "And we have all the instrumentation in place—such as fast cameras, diagnostics and more—to make these experiments possible". For instance, the Adaptive Gain Integrating Pixel Detector (AGIPD) developed by a DESY-led consortium can take around 350 serial images at intervals of only 220 billionths of a second (nanoseconds).

This setup not only allowed the superheated water to be generated, but also enabled the scientists to carry out precisely controlled series of experiments with X-ray flashes of reduced intensity. "Using silicon filters, we fine-tuned the energy of the pulses so that we were able to control exactly how much the water was heated," reports Lehmkuhler. "For example, we were able to determine how strong the X-ray flashes should be so that the temperature of an aqueous sample remains more or less constant".

This enables researchers to better plan experiments with heat-sensitive samples at the X-ray laser, for example. On the other hand, the heating effect can also be used in a targeted manner if its exact course is known. The team plans to further investigate these effects also within the framework of the Centre for Molecular Water Science (CMWS), which is currently being set up at DESY.

"Our results not only provide the surprising observation of an anomalous dynamic, but also draw a detailed picture of how aqueous samples heat up in the X-ray laser," summarizes lead researcher Gerhard Grübel from DESY, one of the CMWS coordinators. "In addition, the investigations prove that such serial images are possible at the European XFEL and that its flashes are extremely uniform in every pulse train".

More information: Felix Lehmkuhler et al, Emergence of anomalous dynamics in soft matter probed at the European XFEL, *Proceedings of the National Academy of Sciences* (2020). DOI: [10.1073/pnas.2003337117](https://doi.org/10.1073/pnas.2003337117)

Journal information: [Proceedings of the National Academy of Sciences](https://phys.org/news/2020-09-liquid-degrees-celsius-x-ray-laser.html)
<https://phys.org/news/2020-09-liquid-degrees-celsius-x-ray-laser.html>

Liquid carbon characterized using a free electron laser

By Anna Demming

From common soot to precious diamonds, carbon is familiar in many guises, but there have been little more than glimpses of carbon in the liquid form. Researchers at the FERMI Free Electron Laser (FEL) source have now not only generated a liquid carbon sample, but have characterized its structure, tracking the ultrafast rearrangements of electron bonding and atomic coordinates that take place as their carbon samples melt. "As far as I know, that is the fastest structural transition in condensed matter," says Emiliano Principi, principal investigator on the project.



Femtosecond pump–probe pulses generate and characterize liquid carbon for the first time in an FEL facility. Credit: Principi

The work fills in some of the gaps in the element's phase diagram—a plot of its phases at different temperatures and pressures. Despite the ubiquity of carbon and the interest it garners in so many facets of science—from sensors and solar cells to quantum computing and space rocket protection systems—knowledge of its phase diagram remains patchy. Typically, as soon as solid carbon can't take the heat, it sublimates to gas. For other materials, researchers can enroll high-pressure cells to prevent the sample expanding straight into a gas at high temperatures, but these are usually diamond, precisely the element the conditions are designed to melt.

Instead, Principi, Claudio Masciovecchio and their team used the FERMI femtosecond pump-probe system to deposit a high-energy load from the pump laser into an amorphous carbon sample and then measure the X-ray absorption spectra by the sample mere hundreds of femtoseconds afterward with a probe laser FEL pulse. Although there have been previous studies of liquid carbon heated using lasers, this is the first that uses laser pulses with a short enough wavelength and time resolution to distinguish the structure of the sample at the timescale of the system's dynamics.

Strung out

What the researchers saw was a distinctive change in bonding and the atomic arrangement. Amorphous carbon is dominated by the kind of electronic bonding found in graphite and graphene described as sp^2 , where each carbon atom bonds to three others, forming planes of tightly interacting carbon atoms. As the laser hit the sample, however, this bonding changed to sp^1 , where each carbon is bonded to just two others, forming strings of carbon atoms. "This is really fascinating in my opinion," says Principi, as he explains that at that point, there is no time for thermalization by means of phonons, so the adjustment of atomic arrangements from planes to strings follows immediately from the changes in electrostatic potential from the modified bonding.

"We have never seen such an ultrafast transition," adds Masciovecchio, head of the scientific programs of FERMI.

The experiments are complemented by a set of *ab initio* calculations of the system dynamics by collaborators Martin Garcia and Sergej Krylow at Universität Kassel in Germany. They found excellent agreement between the calculations and experiments, which is "very rare," as Principi points out, "especially in this class of experiments." With this theoretical work they were able to pinpoint the temperature reached by the process (a whopping 14,200 K) and the interaction strength between the electrons and phonons in the excited carbon system— $17 \times 10^{18} \text{ W m}^{-3} \text{ K}^{-1}$. This parameter quantifying the electron–phonon interaction strength in materials is notoriously difficult to pin down and may be valuable for future simulations.

Short and sweet

The core electrons in carbon absorb at a wavelength of 4 nm, which is why previous experiments using tabletop lasers operating at visible wavelengths have only been able to measure the reflected intensity. Since the experiments generate a plasma, which causes a surge in reflectivity, the sample remains essentially opaque to these measurements. The FERMI FEL can use laser pulses at 4 nm, so the researchers could measure the absorption spectra of core electrons and get a clear idea of how the structure and bonding is affected by the pump pulse. "When you bring the electron into the continuum, the electron will start to see what is going on around it," says Masciovecchio as he describes the advantage of working with X-ray absorption where the electrons are excited, as opposed to the reflectivity spectra. "It's telling you the local geometry and local structure—you get very important structural information."

The set-up at FERMI also has a crucial advantage for time resolution. A free electron laser produces radiation from an electron bunch accelerated to relativistic velocities. Interactions between the electron bunch and undulators—a periodic series of dipole magnets—then amplify the radiation, producing an extremely bright laser source. At FERMI, a table-top laser seeds the free electron laser, and this allows the researchers to synchronize the pump and probe pulse to within 7 femtoseconds compared with around 200 femtoseconds for other free electron laser facilities. This timing precision is key to studies of liquid carbon because of its brief existence—within 300 femtoseconds, the sample starts to thermalize and expand into a gas. "The party is over after half a picosecond," adds Principi.

The results fill some of the gaps in the phase diagram of carbon. Understanding how carbon-based systems at extreme temperatures and pressures behave could potentially be useful for astrophysics, such as in the study of recently observed carbon-based exoplanets. In future work, Principi and colleagues may apply the same approach to the study of other carbon allotropes to see the effects of different starting densities, as well as to the study of other elements entirely, such as silicon or iron.

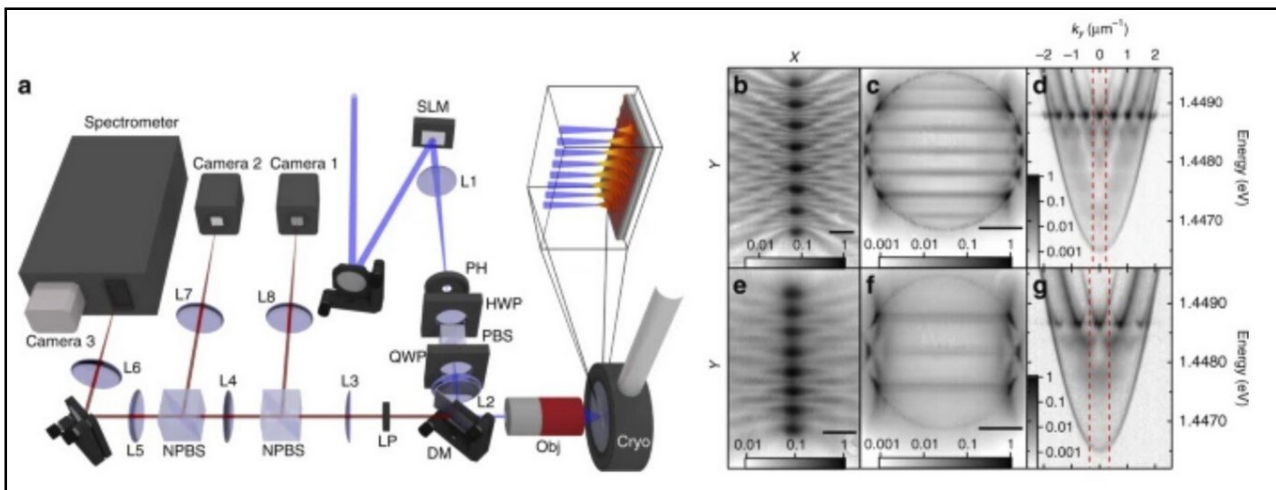
More information: E. Principi et al., Atomic and Electronic Structure of Solid-Density Liquid Carbon, *Physical Review Letters* (2020). [journals.aps.org/prl/accepted/ ... 2c91d808d8582fb32caf](https://journals.aps.org/prl/accepted/.../2c91d808d8582fb32caf)

Journal information: *Physical Review Letters*
<https://phys.org/news/2020-09-liquid-carbon-characterized-free-electron.html>

Researchers synthesize artificial solid-state crystal structures using laser light

Researchers at the Hybrid Photonics Laboratories in Skoltech and Southampton (U.K.), in collaboration with Lancaster University (U.K.), have demonstrated a new optical method to synthesize artificial solid-state crystal structures for cavity polaritons using only laser light. The results could lead to the realization of field-programmable polariton circuitry and new strategies to create guided light and robust confinement of coherent light sources. The results were recently published in the journal *Nature Communications*.

Creating artificial lattices for quantum particles permits researchers to explore physics in an environment that might not be conventionally found in nature. Artificial lattices are especially appealing since their symmetries often lead to exactly solvable models and a transparent understanding of their properties. Designing them, however, is a challenging task with limited flexibility. Materials need to be irreversibly engineered to get the job done, and even optical lattice techniques for cold atoms cannot produce arbitrary lattice shapes.



Schematic representation of an experimental system. Credit: Pickup, L. et. al./Nature Communications

The researchers, Dr. Lucy Pickup (Southampton), Dr. Helgi Sigurdsson (Southampton and Skoltech), Prof Janne Ruostekoski (Lancaster), and Prof Pavlos Lagoudakis (Skoltech and Southampton), overcame this challenge by developing a new method to create arbitrarily shaped and reprogrammable artificial lattices using only structured laser light. The reprogrammability meant that the cavity-polariton system could be changed from one lattice to another without the costly need to engineer a new system from scratch.

When the laser light hits a semiconductor quantum well, it excites electrons and holes, as well as bound states of the two known as excitons. When the quantum well is placed between two mirrors, forming a trap (or a cavity) for the photons, some of the exciton particles become dressed in photons, forming exotic half-light, half-matter quasiparticles known as exciton-polaritons or cavity polaritons.

Exciton-polaritons are interactive and bounce frequently off one another. However, they also bounce off normal electrons, holes and excitons in the background. The researchers showed that by applying laser light in a geometrically structured fashion, the exciton-polaritons started bouncing off the excited electrons, holes, and excitons following the shape of the laser. In other words, the exciton-polaritons started experiencing a synthetic potential landscape imprinted by the laser.

The laser-generated potential landscapes are only felt by the exciton-polaritons and not the photons inside the cavity, distinguishing the system from photonic crystals. By creating a laser pattern with translational symmetry, the researchers produced the fundamental signature of solid-state systems, the formation of crystal energy bands for exciton-polaritons like those for electrons in solid-state materials.

"The results open a path to study dissipative many-body quantum physics in a lattice environment with properties that cannot be reproduced in normal Hermitian quantum systems," Dr. Lucy Pickup, article co-author, says.

Dr. Helgi Sigurdsson adds: "It is an exciting development for the relatively new field of non-Hermitian topological physics."

The produced bands could be reconfigured by simply adjusting the laser pattern, permitting a non-invasive method to access quantum physics in artificial lattices. The results could be useful in a variety of applications, including optical-based communications, information processing, high sensitivity detectors for biomedical purposes and topologically protected lasing. The results also open a path to study fundamental many-body lattice physics in an open (non-Hermitian) quantum environment.

More information: L. Pickup et al. Synthetic band-structure engineering in polariton crystals with non-Hermitian topological phases, *Nature Communications* (2020). DOI: [10.1038/s41467-020-18213-1](https://doi.org/10.1038/s41467-020-18213-1)

Journal information: [Nature Communications](https://phys.org/news/2020-09-artificial-solid-state-crystal-laser.html)
<https://phys.org/news/2020-09-artificial-solid-state-crystal-laser.html>



Thu, 17 Sept 2020

Researchers create better material for wearable biosensors

Biosensors that are wearable on human skin or safely used inside the body are increasingly prevalent for both medical applications and everyday health monitoring. Finding the right materials to bind the sensors together and adhere them to surfaces is also an important part of making this technology better. A recent study from Binghamton University, State University of New York offers one possible solution, especially for skin applications.

Matthew S. Brown, a fourth-year Ph.D. student with Assistant Professor Ahyeon Koh's lab in the Department of Biomedical Engineering, served as the lead author for "Electronic-ECM: A Permeable Microporous Elastomer for an Advanced Bio-Integrated Continuous Sensing Platform," published in the journal *Advanced Materials Technology*.

The study utilizes polydimethylsiloxane (PDMS), a silicone material popular for use in biosensors because of its biocompatibility and soft mechanics. It's generally utilized as a solid film, nonporous material, which can lead to problems in sensor breathability and sweat evaporation.



Human skin structure. Credit: Wikipedia

"In athletic monitoring, if you have a device on your skin, sweat can build up under that device," Brown said. "That can cause inflammation and also inaccuracies in continuous monitoring applications.

"For instance, one experiment with electrocardiogram (ECG) analysis showed that the porous PDMS allowed for the evaporation of sweat during exercise, capable of maintaining a high-resolution signal. The nonporous PDMS did not provide the ability for the sweat to readily evaporate, leading to a lower signal resolution after exercise.

The team created a porous PDMS material through electrospinning, a production method that makes nanofibers through the use of electric force.

During mechanical testing, the researchers found that this new material acted like the collagen and elastic fibers of the human epidermis. The material was also capable of acting as a dry adhesive for the electronics to strongly laminate on the skin, for adhesive-free monitoring. Biocompatibility and viability testing also showed better results after seven days of use, compared to the nonporous PDMS film.

"You can use this in a wide variety of applications where you need fluids to passively transfer through the material—such as sweat—to readily evaporate through the device," Brown said.

Because the material's permeable structure is capable of biofluid, small-molecule and gas diffusion, it can be integrated with soft biological tissue such as skin, neural and cardiac tissue with reduced inflammation at the application site.

Among the applications that Brown sees are electronics for healing long-term, chronic wounds; breathable electronics for oxygen and carbon dioxide respiratory monitoring; devices that integrate human cells within implantable electronic devices; and real-time, in-vitro chemical and biological monitoring.

Koh—whose recent projects include sweat-assisted battery power and biomonitoring—described the porous PDMS study as "a cornerstone of my research."

"My lab is very interested in developing a biointegrated sensing system beyond wearable electronics," she said. "At the moment, technologies have advanced to develop durable and flexible devices over the past 10 years. But we always want to go even further, to create sensors that can be used in more nonvisible systems that aren't just on the skin.

"Koh also sees the possibilities for this porous PDMS material in another line of research she is pursuing with Associate Professor Seokheun Choi from the Department of Electrical and Computer Engineering. She and Choi are combining their strengths to create stretchable papers for soft bioelectronics, enabling us to monitor physiological statuses.

More information: Matthew S. Brown et al, Electronic-ECM: A Permeable Microporous Elastomer for an Advanced Bio-Integrated Continuous Sensing Platform, *Advanced Materials Technologies* (2020). DOI: [10.1002/admt.202000242](https://doi.org/10.1002/admt.202000242)
<https://phys.org/news/2020-09-material-wearable-biosensors.html>



Thu, 17 Sept 2020

Great progress for electronic gadgets of the future

By Steinar Brandslet

Researchers at the Norwegian University of Science and Technology (NTNU) have found a completely new method to check the electronic properties of oxide materials. This opens the door to even tinier components and perhaps more sustainable electronics.

"We found a completely new way to control the conductivity of materials at the nanoscale," says Professor Dennis Meier at NTNU's Department of Materials Science and Engineering.

One of the best aspects of the new method is that it does not interfere with other properties of the material, like previous methods did. This makes it possible to combine different functions in the same material, which is an important advance for nanoscale technology.

"What's really great is that this project is being run from NTNU and involves people from several departments. We also benefit from key facilities like the NanoLab and the TEM (transmission electron microscopy) Gemini Centre. This interdisciplinary approach shows what we can do when we work together," Meier says.

A new article in the journal *Nature Materials* addresses the findings. The article has attracted international attention even before being printed. The possibilities offered by the discovery were discussed in the August issue of *Nature Materials* by leading experts in the field.

We rarely think about the technology that lies behind turning on a light bulb or our use of electrical appliances. The control of charged particles on a minute scale is simply part of everyday life.

But on a much smaller nanoscale, scientists are now routinely able to manipulate the flow of electrons. This opens up possibilities for even smaller components in computers and mobile phones that use barely any electricity.

A basic problem remains, however. You can simulate nanoscale electronic components, but some of the most promising concepts seem mutually exclusive. This means that you can't combine multiple components to create a network.

"Utilizing quantum phenomena requires extreme precision to maintain the right ratio of different substances in the material while changing the chemical structure of the material, which is necessary if you want to create artificial synapses to simulate the properties of nerve pathways as we know them from biology," Meier says.

Collaborative interdepartmental efforts, led by Professor Meier, have succeeded in circumventing some of these problems by developing a new approach.

"The new approach is based on exploiting 'hidden' irregularities at the atomic level, so-called anti-Frenkel defects," Meier says.

The researchers have managed to create such defects themselves, thus enabling an insulating material to become electrically conducting.

Defects in the material are related to its various properties. However, the anti-Frenkel defects can be manipulated in such a way that changes in the conductivity do not affect the actual structure of the material or change its other properties, such as magnetism and ferroelectricity.

"Maintaining the structural integrity makes it possible to design multifunctional devices using the same material. This is a big step towards new technology on a nanoscale," says Meier.

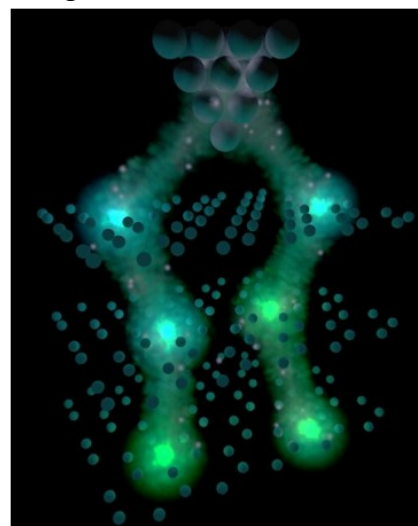
The research team includes Professor S. M. Selbach from the Department of Materials Science and Engineering, Professors Antonius T. J. van Helvoort and Jaakko Akola and Associate Professors Per Erik Vullum and David Gao from the Department of Physics, and Associate Professor Jan Torgersen from the Department of Mechanical and Industrial Engineering.

Another advantage of the new approach is that researchers can erase components on a nanoscale using a simple heat treatment. Then you can change or upgrade the components in the material afterwards. "Maybe we'll be able to use our electronic gadgets longer instead of recycling them or throwing them away. We can just upgrade them instead. This is fundamentally much more environmentally friendly," Meier says. Planning is already underway for further attempts to combine different components. This work will be carried out by the FACET group at NTNU's Department of Materials Science and Engineering.

The work is supported by the European Research Council through an ERC Consolidator Grant that Meier received last year. The renowned Center for Quantum Spintronics (QuSpin) is also involved. The goal is to utilize both charge and spin in the electrons to give us a more environmentally friendly future.

More information: Donald M. Evans et al, Conductivity control via minimally invasive anti-Frenkel defects in a functional oxide, *Nature Materials* (2020). [DOI: 10.1038/s41563-020-0765-x](https://doi.org/10.1038/s41563-020-0765-x)

Journal information: [Nature Materials](https://www.nature.com/materials)
<https://phys.org/news/2020-09-great-electronic-gadgets-future.html>



Using "hidden" defects at the atomic level can change the conductivity of the material while also maintaining its structural integrity. Credit: Nanolayers Research Computing

Thu, 17 Sept 2020

How to train a machine to see 3-D in the dark

Researchers at the Australian National University (ANU) have developed a new way to create an almost perfect hologram in near darkness.

Optical holograms are a clever way of producing a 3-D image of an object. They have a number of uses—from protecting our ID cards from forgery, to real-time imaging of living cells.

The new breakthrough will allow holograms to perform these vital functions and more with a lot less light.

According to Dr. Steve Lee, the quality of an optical hologram is often linked to the brightness of laser light.

"So we asked ourselves, how can we make an optical hologram in almost complete darkness?" Dr. Lee said.

"Usually if you form an optical hologram using an extremely low light, the hologram will look very grainy," Dr. Lee said.

"We call this graininess the 'shot noise limit'—which also occurs when you close your eyes at night. The light speckles you see are actually where your eye is limited by shot noise."

The research team found a way around this problem using machine learning.

"We've shown that using very little light—almost pitch black at sub-millisecond imaging speeds—we can still restore a hologram to close to perfect condition."

Lead author of the study Mr Zhiduo Zhang describes it as like restoring a grainy old photo.

"The details in the photo much like piece of historic artwork can be recovered by an expert," Mr Zhang said.

"Here, our expert is a machine—called the Holo-UNet. The machine masters the look of an ideal hologram through thousands of learning cycles. After training, we then show the machine a hologram with lots of missing optical information. Much like a master painter, the machine remembers how to digitally fill in those missing photons and so restore the hologram to near perfect conditions."

The results of the study could have important implications for biological imaging.

"Biological cells are very sensitive to light and can be easily damaged," Dr. Lee said.

"Existing light microscopes make 3-D images of cells using concentrated light—which is not ideal. Our method can be used to track cells over long periods of time under almost complete darkness without worrying about light damage to the cells. We can now also record holograms of live cells in less than a hundredth of a second with very little light, and see events like cell division with much greater clarity."

The research has been published in the journal *Biomedical Optics Express*.

More information: Zhiduo Zhang et al. Holo-UNet: hologram-to-hologram neural network restoration for high fidelity low light quantitative phase imaging of live cells, *Biomedical Optics Express* (2020). DOI: [10.1364/BOE.395302](https://doi.org/10.1364/BOE.395302)

Journal information: [Biomedical Optics Express](https://phys.org/news/2020-09-machine-d-dark.html)
<https://phys.org/news/2020-09-machine-d-dark.html>



Credit: CC0 Public Domain

Research opens the way to new drugs

Research by a team at Te Herenga Waka–Victoria University of Wellington's School of Biological Sciences dispels the belief that on the assembly line of enzymes there is a "proof-reading" mechanism that ensures molecules are put together in a certain way.

This could pave the way to designing improved anti-cancer compounds or drugs that can treat what are currently antibiotic-resistant superbugs.

"This is quite a big deal, as it opens the way to rationally redesigning antibiotics at a genetic level to counter the spread of antibiotic-resistant superbugs, as well as making analogs of anti-cancer drugs to improve activity or reduce toxic side-effects," says Professor David Ackerley, the university's biotechnology program director.



Credit: Unsplash/CC0 Public Domain

"If we can efficiently make analogs of these compounds by re-engineering the genetic blueprints for the assembly line that makes them, then we can much more rapidly explore new and improved drug candidates. It also offers prospects for a much more cost-effective way of making any improved drugs we discover."

In their paper just published in *Nature Communications*, Professor David Ackerley and his colleagues Dr. Mark Calcott and Dr. Jeremy Owen show they can make new molecules without having to alter the part of the "assembly line that houses the hypothetical proofreading machinery."

They focus on a key mechanism by which many antibiotics are made.

"Most antibiotics currently used in the clinic are based on molecules produced by bacteria to kill other bacteria, to help them compete successfully for limited resources," Professor Ackerley says.

"Throughout evolution this has had a bit of an 'arms race' quality to it—bacteria make a new antibiotic to kill competing bacteria, the competing bacteria then develop resistance to the antibiotic, the first bacteria then modify their antibiotic so it can get around the resistance mechanisms, and so on. One of the aspects that helps bacteria quickly modify their antibiotics is that they build them using little nano-machines called enzymes—in our case 'non-ribosomal peptide synthetase' or 'NRPS' enzymes—which form an assembly line, with each enzyme adding a specific part of the final antibiotic molecule. To change part of the molecule, the producing bacteria don't need to evolve a whole new assembly line, but instead can just swap out the genes that encode a section of the assembly line for compatible genes that encode subtly different enzymatic machinery. This new machinery will then incorporate a different molecular part into the final antibiotic."

Professor Ackerley says for more than 20 years there has been a dominant belief that if scientists want to change part of the assembly line, they also need to swap a neighboring section believed to "proofread" the growing molecule.

"We performed a comprehensive analysis of how NRPS gene clusters have evolved in nature and found no evidence that such a proofreading mechanism exists. We also tried to generate new molecules by mimicking natural evolutionary processes—randomly shuffling genes together and selecting for the hybrid combinations that work, rather than making just a few carefully designed constructs like previous studies—and showed we could indeed make new molecules without having to alter the region of the assembly line that houses the hypothetical proofreading machinery."

To make sure the researchers were not just working with unusually tolerant enzymes, they looked at the original model NRPS system from which the "proofreading" hypothesis was generated, he says.

"By targeting our preferred points in the assembly line, we showed we could make new molecules that should not be possible if there actually was a proofreading mechanism."

Their findings came as a "massive surprise," Professor Ackerley says.

"We had embarked on this study as believers that there was a proofreading mechanism, to try and hunt down exactly which parts of the assembly line had that role. The beauty of mimicking evolutionary approaches is that it doesn't matter how wrong your original ideas are—as long as the experiment is designed correctly, then you will arrive at the 'fittest' solution, even if it was totally unexpected."

More information: Mark J. Calcott et al. Efficient rational modification of non-ribosomal peptides by adenylation domain substitution, *Nature Communications* (2020). [DOI: 10.1038/s41467-020-18365-0](https://doi.org/10.1038/s41467-020-18365-0)

Journal information: [Nature Communications](https://phys.org/news/2020-09-drugs.html)
<https://phys.org/news/2020-09-drugs.html>

COVID-19 Research News



Thu, 17 Sept 2020

Stroke emerging as a symptom of COVID-19 in new research

By Sawyer Bogdan

A new research study from Western University and Lawson Health Research Institute linked strokes in novel coronavirus patients as a side effect of the disease caused by the virus.

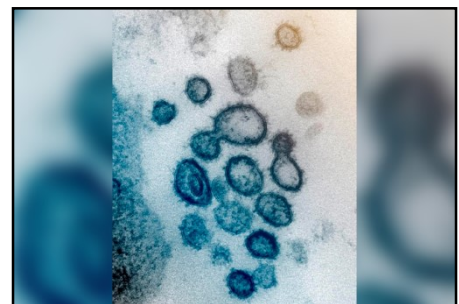
Researchers at Western and Lawson Health, led by Dr. Luciano Sposato, have published a new study looking at the relationship between COVID-19 and stroke in the online issue of *Neurology*, the medical journal of the American Academy of Neurology.

In the study, researchers found that two in every 100 patients admitted to the hospital with COVID-19 will suffer a stroke, and 35 per cent will die as a result of both conditions.

"As stroke neurologists, we need a new mindset to be able to promptly diagnose and treat patients with COVID-19 related strokes," said Dr. Sebastian Fridman, assistant professor, clinical neurological sciences, at Western's Schulich Medicine and Dentistry and a research fellow at Lawson.

Researchers first started looking at the link between strokes in COVID-19 patients after noticing the development of large blood clots that can cause blockages in the arteries that lead to the brain, causing a stroke in patients with the disease.

"One of the most eye-opening findings of this study is that for patients under 50 years old, many were totally asymptomatic when they had a stroke related to COVID-19," said Dr. Sposato, who is the Kathleen and Dr. Henry Barnett Chair in Stroke Research at Western and Scientist at Lawson.



A new research study from Western University and Lawson Health has linked stroke as a side effect of the novel coronavirus. The Associated Press

The researchers reported that in patients under 50 years old, nearly 50 per cent had no other visible symptoms of the virus at the time of stroke onset.

Sposato said that for patients under 50 who were asymptomatic, the stroke was their first symptom of the disease.

“The take-home message here for health care providers is that if you are seeing a patient with a stroke, particularly in those under 50 years old with large clots, you need to think of COVID-19 as a potential cause even in the absence of respiratory symptoms,” Sposato said.

The team examined 160 cases in total, looking at both clinical characteristics and in-hospital mortality of published cases of COVID-19 and stroke and combined that data with 35 unpublished cases from Canada, the U.S. and Iran.

“COVID-19 has changed the stroke landscape worldwide,” Fridman said.

<https://globalnews.ca/news/7338109/stroke-covid-19-symptom/>



Thu, 17 Sept 2020

Substance use disorders linked to Covid-19 susceptibility

People with substance use disorders (SUDs), including those who excessively use tobacco, alcohol, opioid, cannabis, and cocaine, are more susceptible to COVID-19 and its complications, according to a study which assessed the electronic health records (EHR) of millions of patients in the US

Washington DC: People with substance use disorders (SUDs), including those who excessively use tobacco, alcohol, opioid, cannabis, and cocaine, are more susceptible to COVID-19 and its complications, according to a study which assessed the electronic health records (EHR) of millions of patients in the US. The research, published in the peer-reviewed journal *Molecular Psychiatry*, noted that health care providers should closely monitor patients with SUDs, and develop action plans to help shield them from infection and severe outcomes.

According to the scientists, including those from the National Institute on Drug Abuse (NIDA) in the US, while individuals with an SUD constituted 10.3 per cent of the total study population, they represented 15.6 per cent of the COVID-19 cases. They said the EHRs were de-identified to ensure privacy.

The findings revealed that those with a recent SUD diagnosis on record were more likely than those without to develop COVID-19, an effect which the scientists said was strongest for opioid use disorder, followed by tobacco use disorder. They said individuals with an SUD diagnosis were also more likely to experience worse COVID-19 outcomes (hospitalisation and death) than people without an SUD.

“The lungs and cardiovascular system are often compromised in people with SUD, which may partially explain their heightened susceptibility to COVID-19,” said study co-author Nora D. Volkow from NIDA. “Another contributing factor is the marginalisation of people with addiction, which makes it harder for them to access health care services. It is incumbent upon clinicians to meet the unique challenges of caring for this vulnerable population, just as they would any other high-risk group,” Volkow added.

In the research, the scientists assessed the health data of over 73 million patients, of which over 7.5 million had been diagnosed with an SUD at some point in their lives, the researchers said. They said slightly more than 12,000 of the patients were diagnosed with COVID-19, and about 1,880 had both an SUD and a COVID-19 diagnosis on record.

According to the research, the complicating effects of SUD were visible in increased adverse consequences of COVID-19. It noted that hospitalisations and death rates of COVID-19 patients were all elevated in people with recorded SUDs compared to those without.

According to the researchers, the findings underscore the need to screen for, and treat SUDs as part of the strategy for controlling the pandemic. They said further research is needed to understand how best to treat those with SUDs who are at risk for COVID-19, and counsel on how to avoid the risk of infection.

(This story has been published from a wire agency feed without modifications to the text. Only the headline has been changed.)

<https://www.hindustantimes.com/health/substance-use-disorders-linked-to-covid-19-susceptibility/story-M4j2CbuTHLEzVu4YxeiCmI.html>



Thu, 17 Sept 2020

CSIR and Aurobindo Pharma to collaborate for COVID-19 vaccine development

DBT is also supporting Aurobindo Pharma's COVID-19 vaccine development through its wholly-owned US subsidiary Auro Vaccines, under the National Biopharma Mission

The Council of Scientific and Industrial Research (CSIR) and Aurobindo Pharma Limited have announced a collaboration to develop vaccines to protect against SARS-CoV-2, also known as COVID-19.

Under the signed agreement between CSIR-Centre for Cellular and Molecular Biology (CCMB) and Aurobindo Pharma, Aurobindo will partner with CSIR for development of several novel COVID-19 vaccines.

Three CSIR labs namely CCMB Hyderabad, Institute of Medical Technology (IMTECH), Chandigarh and Indian Institute of Chemical Biology (IICB), Kolkata are developing vaccine candidates using different technology platforms. Aurobindo will undertake clinical development and commercialisation of the vaccines.

Commenting on this partnership, Dr Shekhar C Mande, Director General, CSIR, said, "Joining of hands of premier CSIR labs with industry for the development of vaccines will amplify India's efforts in indigenous vaccine development and also help in preparedness for future pandemics".

Commenting on the development strategies for the vaccines, Dr Rakesh Mishra, Director, CSIR-CCMB said, "Our labs are working on novel proteins for vaccine development that have the potential to address the need for a second-generation vaccine. We are happy to partner with Aurobindo who have proven manufacturing and commercialisation capabilities"

N Govindarajan, MD, Aurobindo Pharma, said, "We are proud to join hands with CSIR for developing vaccines to combat the COVID-19 pandemic. This collaboration further strengthens our COVID-19 vaccine development efforts. We are already setting up a large-scale facility in Hyderabad for manufacturing COVID-19 vaccine and other viral vaccines."

Apart from this collaboration, Aurobindo is already developing a vaccine for SARS COV-2 through its wholly-owned US subsidiary Auro Vaccines. The Biotechnology Industry Research Assistance Council (BIRAC), set up by Department of Biotechnology (DBT), Government of India is supporting Aurobindo Pharma's COVID-19 vaccine development under the National Biopharma Mission.

The SARS COV-2 vaccine candidate is based on the company's proprietary replication-competent, attenuated, recombinant vesicular stomatitis (VSV, VesiculoVax) vaccine delivery platform.

Commenting on the collaboration with Aurobindo, Dr Renu Swarup, Secretary, DBT and Chairperson, BIRAC said, “The partnership with Aurobindo is to serve the country’s need for a vaccine to fight this pandemic. The government is focussed on creating an ecosystem that nurtures and encourages new product innovation to address the most relevant issues to our society.”

<https://www.expresspharma.in/covid19-updates/csir-and-aurobindo-pharma-to-collaborate-for-covid-19-vaccine-development/>

