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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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## DRDO top team in Jammu for taking up new projects of future technologies

*Counter-drone technology developed, orders taken from forces*

Jammu: Looking for development of future technologies in collaboration with academic institutions and industry, top team of Defence Research & Development Organization (DRDO) is currently visiting Jammu for taking up new projects.

“We are looking for development of future technologies. The direction from the Government is very clear that we should come out with first of its kind technologies from this country,” said DRDO Chairman Dr G Satheesh Reddy, while talking to media persons on sidelines of the foundation stone-laying ceremony of the DRDO-sponsored Kalam Centre for Science and Technology (KCST) at the Central University of Jammu in Rahya-Suchani in Samba district.

KCST is the nodal centre, which will be working with various academic institutions on this part of the country, like IIT Jammu, Jammu University, Central University of Jammu etc.

“From this centre, lots of projects will be given to these academic institutions and then the specific areas where the strength lies, the institution will be working,” said DRDO Chief.

Reddy, who is also Chairman of the KCST Governing Council, will review the progress of the projects going here and discuss the new projects to be taken up. “That is the mission here. I have come here along with my team, including two Director Generals. Visiting the university and IIT Jammu to interact with faculty and see what can we take forward with these institutions. That is the main focus to come here,” he elaborated.

Stressing the need to work on the basic and upright research for coming out with first of its kind technologies, the DRDO chief informed that besides collaborating with academic institutions, industry was also brought together so that quickly the product can also be realized.

Replying to a query, Reddy informed that the DRDO has developed counter-drone technology and transferred it to industries, which have taken orders from the armed forces and security forces of the country.

“This technology has all the necessary elements required to counter drones, whether it is detection, tracking or surveillance and even a process called software and hardware,” he explained, adding that capability of the anti-drone system has been demonstrated multiple times and it was deployed on the Independence Day and the Republic Day parade also.



DRDO Chairman Dr G Satheesh Reddy talking to mediapersons at Jammu on Thursday. — Excelsior/Rakesh

The KCST foundation stone laying ceremony took place in the presence of CUJ Vice Chancellor Prof Ashok Aima; Hari Babu Srivastava, Director General (TM); Dr Sudhir Kamath, Director General (MED & CoS); Amit Sharma, Advisor Cyber (Govt of India); Dr Shiv Kumar, Director, ER & IPR; Kailash Kumar Pathak, Director, DFTM; U Jeya Santhi, Director, SAG; Rajesh Pillai, Scientist G, SAG; J S Rawat, SSPL; Renu Sharma, Scientist F, DFTM; Deepak Gupta, Scientist E, Office of Advisor (Cyber), and other distinguished scientists of DRDO headquarter and SAG and SSPL DRDO Labs.

Speaking on the occasion, the Chairman DRDO emphasised the importance of two verticals in KCST; Computational System Security and Sensors in the present scenario. He also mentioned that the protection of Cyber-Physical System and Data Security during the routing is of utmost importance and emphasized the need for skill development in computational security. Further, he mentioned that sensors developed in this research centre should come as a product with state-of-art technology. He wished that in two and a half years, KCST will emerge as a focussed research centre and prominent work centre in the country.

Vice-Chancellor Prof Ashok Aima said that such collaboration of CUJ with DRDO would unfold in times to come to a new institutional collaboration by synchronizing experience and expertise to create a new pathway for research and innovations in this region.

<https://www.dailyexcelsior.com/drdo-top-team-in-jammu-for-taking-up-new-projects-of-future-technologies/>

INDIA  
TODAY

Fri, 15 Oct 2021

## Counter-drone technology developed, transferred to industries: DRDO Chief

*DRDO G Satheesh Reddy said on Thursday that the organisation has developed counter-drone technology and also transferred it to industries*

Defence Research and Development Organisation (DRDO) has developed counter-drone technology and transferred it to industries, which have taken orders from the armed forces and security forces of the country, a senior official of the organisation said on Thursday.

"DRDO has developed anti-drone technology. It has all the necessary elements required to counter drones, whether it is detection, tracking or surveillance and even a process called software and hardware," DRDO Chief G Satheesh Reddy said.

He was speaking to reporters on the sidelines of the foundation stone-laying ceremony of the DRDO-sponsored Kalam Centre for Science and Technology (KCST) at the Central University of Jammu in Samba.

Reddy said the technology has been transferred to multiple industries, which have taken orders from the armed forces and security forces of the country.

"They are providing it to them. They will be delivering it to them (security and armed forces) to tackle the drones that are coming in (from across the border)," he added.

Reddy said the capability of the anti-drone system has been demonstrated multiple times, adding, "It was deployed on Independence Day and Republic Day also.

<https://www.indiatoday.in/india/story/counter-drone-technology-industries-drdo-chief-g-satheesh-reddy-1864980-2021-10-15>



DRDO has developed anti-drone technology | Representative Image

## **Anti-drone technology developed, transferred to industries: DRDO Chief**

### *Lays foundation stone of Kalam Centre for Science and Technology*

Jammu: DRDO has developed counter-drone technology and transferred it to industries, which have taken orders from the armed forces and security forces of the country, a senior official of the organisation said on Thursday.

“DRDO has developed anti-drone technology. It has all the necessary elements required to counter drones, whether it is detection, tracking or surveillance and even a process called software and hardware,” Defence Research and Development Organisation (DRDO) Chief G Satheesh Reddy said.

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“They are providing it to them. They will be delivering it to them (security and armed forces) to tackle the drones that are coming in (from across the border),” he added.

Reddy said the capability of the anti-drone system has been demonstrated multiple times, adding, “It was deployed on the Independence Day and the Republic Day also.”

Earlier, Defence R&D Secretary and DRDO Chairman Dr G Satheesh Reddy laid the foundation stone for construction of the Kalam Centre for Science and Technology (KCST) in the campus of Central University of Jammu.

He said that KCST will emerge as a focused research and prominent work centre in the country.

During the foundation stone-laying ceremony, Reddy was flanked by CUJ Vice-Chancellor Ashok Aima and Director General (TM) Hari Babu Srivastava, Director General (MED & CoS) Sudhir Kamath, Advisor Cyber (GoI) Amit Sharma and others.

Reddy emphasised the importance of two verticals in KCST — computational system security and sensors — in the present scenario.

He also said that the protection of cyber-physical system and data security during routing is of utmost importance and emphasized the need for skill development in computational security.

The CUJ VC thanked the DRDO chairman for this venture which would open up a new chapter in the university.

The governing council unanimously sanctioned three research projects of Rs 30 crore under the computational system security vertical.

<https://thekashmirimages.com/2021/10/15/anti-drone-technology-developed-transferred-to-industries-drdo-chief/>

## विकसित एंटी ड्रोन तकनीक उद्योगों को की जा रही हस्तांतरित: डीआरडीओ प्रमुख

रेड्डी ने कहा कि इस तकनीक को कई उद्योगों में स्थानांतरित कर दिया गया है जिन्होंने देश के सशस्त्र बलों और सुरक्षा बलों से आदेश लिया है। उन्हें यह तकनीक मुहैया मुहैया करा रहे हैं ताकि सीमा पार पाकिस्तान से आने वाले ड्रोन से निपटा जा सके।

By Lokesh Chandra Mishra

जम्मू: डीआरडीओ ने एंटी ड्रोन तकनीक विकसित की है और इसे उद्योगों को हस्तांतरित कर दिया है, जिन्होंने देश के सशस्त्र बलों और सुरक्षा बलों से आदेश लिया लिए। संगठन के एक वरिष्ठ अधिकारी ने वीरवार को जम्मू के सांबा जिले में मीडिया से रुबरू के दौरान यह यह शब्द कहे। रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) के प्रमुख जी सतीश रेड्डी ने कहा, डीआरडीओ ने एंटी ड्रोन तकनीक विकसित की है।

इसमें ड्रोन का मुकाबला करने के लिए आवश्यक सभी आवश्यक तत्व हैं, इससे ड्रोन का पता लगाना, ट्रैकिंग या निगरानी और यहां तक कि एक प्रक्रिया जिसे सॉफ्टवेयर और हार्डवेयर कहा जाता है, से सब कुछ जानकारी अब आसानी से मिल सकेगी। डीआरडीओ प्रमुख जी सतीश रेड्डी सांबा में जम्मू के केंद्रीय विश्वविद्यालय में डीआरडीओ द्वारा प्रायोजित कलाम विज्ञान और प्रौद्योगिकी केंद्र (केसीएसटी) के शिलान्यास समारोह के मौके पर पत्रकारों से बात कर रहे थे।



वीरवार को जम्मू के सांबा जिले में मीडिया से रुबरू के दौरान यह यह शब्द कहे।

रेड्डी ने कहा कि इस तकनीक को कई उद्योगों में स्थानांतरित कर दिया गया है, जिन्होंने देश के सशस्त्र बलों और सुरक्षा बलों से आदेश लिया है। उन्हें यह तकनीक मुहैया मुहैया करा रहे हैं ताकि सीमा पार पाकिस्तान से आने वाले ड्रोन से निपटा जा सके। रेड्डी ने कहा कि ड्रोन रोधी प्रणाली की क्षमता का कई बार प्रदर्शन किया गया है, इसे स्वतंत्रता दिवस और गणतंत्र दिवस पर भी तैनात किया गया था।

अब तक 23 बार जम्मू कश्मीर की सीमा लांघ चुका है ड्रोन :

जम्मू एयरफोर्स स्टेशन परिसर में 27 जून को ड्रोन हमला हुआ था। इसके बाद से जम्मू कश्मीर में पाकिस्तान से ड्रोन से मादक पदार्थों और हथियार व गोला बारूद गिराने से पाकिस्तान की खुफिया एजेंसी आइएसआइ बाज नहीं आ रही है। बीते 6 माह में जम्मू कश्मीर में पाकिस्तान से 23 बार ड्रोन भारतीय क्षेत्र में घुस चुका है। बीते दो माह पहले अखनूर के कानाचक्क में सुरक्षाबलों ने ड्रोन मार गिराया था। बीते माह जम्मू के साथ लगते सीमावर्ती क्षेत्र फलाएं मंडाल में ड्रोन से हथियार गिराए गए। इससे पहले जिला सांबा और घगवाल में भी हथियार व गोला बारूद ड्रोन से गिराया गया

<https://m.jagran.com/lite/jammu-and-kashmir/jammu-drdo-chief-said-developed-entry-drone-technology-being-transferred-to-industries-22113617.html>

## ड्रोन हमला करने से पहले दस बार सोचेगा दुश्मन, DRDO ने तैयार की एंटी ड्रोन टेक्नॉलजी

डिफेंस रिसर्च एंड डेवलपमेंट ऑर्गनाइजेशन (DRDO) ने एक ड्रोन हमलों से रोकने और अलर्ट करने वाली टेक्नॉलजी को तैयार किया है। एंटी-ड्रोन सिस्टम का देश की सुरक्षा के लिहाज से बड़ा फायदा होगा और ऐसे हमलों को नाकाम करने में बड़ी मदद मिलेगी।

Edited by अभिषेक शुक्ला

जम्मू: बीते दिनों जम्मू के एयरफोर्स स्टेशन पर ड्रोन से हुए हमले के बाद इस तरह के हमलों को लेकर चिंता काफी बढ़ गई है। भारत में पहली बार इस तरह का हमला किया गया था। इसी बीच डिफेंस रिसर्च एंड डेवलपमेंट ऑर्गनाइजेशन (DRDO) ने ड्रोन हमलों से रोकने और अलर्ट करने वाली टेक्नॉलजी (Drdo Made Anti Drone System) तैयार की है। देश की सुरक्षा के लिहाज से एंटी-ड्रोन सिस्टम से बड़ा फायदा होगा और ऐसे हमलों को नाकाम करने में बड़ी मदद मिलेगी।



सांकेतिक तस्वीर

डीआरडीओ के एक वरिष्ठ अधिकारी ने बृहस्पतिवार को कहा कि संगठन ने ड्रोन हमले को रोकने की टेक्नॉलजी विकसित कर इसे उन उद्योगों को ट्रांसफर किया है, जिन्हें देश के सशस्त्र बलों और सुरक्षा बलों से ऑर्डर मिले हैं।

DRDO ने तैयार की एंटी-ड्रोन टेक्नॉलजी

डीआरडीओ के प्रमुख जी सतीश रेड्डी ने कहा, 'डीआरडीओ ने एंटी-ड्रोन टेक्नॉलजी विकसित की है। इसमें ड्रोन का मुकाबला करने के लिए सभी आवश्यक चीजें हैं, चाहे ड्रोन का पता लगाना हो, ट्रैकिंग या निगरानी करना हो।'

टेक्नॉलजी को कई उद्योगों को किया गया ट्रांसफर

रेड्डी सांबा में जम्मू केंद्रीय विश्वविद्यालय में डीआरडीओ द्वारा प्रायोजित कलाम सेंटर फॉर साइंस एंड टेक्नोलॉजी (केसीएसटी) के शिलान्यास समारोह के मौके पर पत्रकारों से बात कर रहे थे। उन्होंने कहा कि टेक्नॉलजी को कई उद्योगों को ट्रांसफर कर दिया गया है, जिन्होंने देश के सशस्त्र बलों और सुरक्षा बलों से ऑर्डर प्राप्त किए हैं। डीआरडीओ प्रमुख ने कहा, 'उद्योग उन्हें यह मुहैया करा रहे हैं। वे इसे (सीमा पार से) आने वाले ड्रोन से निपटने के लिए उन तक (सुरक्षा और सशस्त्र बलों) पहुंचाएंगे।'

<https://navbharattimes.indiatimes.com/state/jammu-and-kashmir/jammu/drdo-transferred-to-industries-by-developing-anti-drone-technology/articleshow/87022544.cms>

## Dr Suri Bhagavantam: Remarkable contributor to Hyderabad, Defence and Indian science

By M Somasekhar

If Hyderabad can today boast of having one of the largest cluster of Defence Laboratories and some reputed departments of science in the Osmania University, a good measure of the credit should go to Dr Suri Bhagavantam, a rare breed of scientist-administrator.

A research student of Nobel Laureate, Dr C V Raman, Dr Bhagavantam wore many hats, sometimes simultaneously in the Indian Scientific, education and administration spheres during the 1940-80 period. He has left an indelible mark on building up the country's defence research and indigenous technology capabilities.

As the second Scientific Adviser to the Defence Minister, V K Krishna Menon during 1961-69, Dr Bhagavantam was instrumental in the setting up of 15 national laboratories under the Defence Research and Development Organisation (DRDO). Of these, the DRDL, DMRL, DLRL in Hyderabad and NSTL in Visakhapatnam were established.

The defence and aerospace cluster has grown into international recognition with the addition of the Missile Complex—RCI (Research Centre Imarat), ASL (Advanced Systems Laboratory) and the BrahMos centre. All these were a fall out of the IGMDP (Integrated Guided Missile Development Programme), launched in 1983 under Prime Minister, Indira Gandhi. The former President, A P J Abdul Kalam, who led the IGMDP and Dr V S Arunachalam, who was the SA to Defence Minister and Chief of the DRDO were mainly responsible for the rapid expansion of facilities in Hyderabad in the last few decades.

Describing Dr Bhagavantam as the architect of defence research in independent India, Dr V K Saraswat, SA and DG of the DRDO said, "He opened up the horizons of the DRDO and helped develop major systems like radars, missiles, tanks for which India had to depend on imports."

He was speaking at the Birth Centenary Celebrations of Dr Bhagavantam at the Osmania University in 2009, where he delivered the first commemorative lecture on the theme of 'New Vistas in Defence R&D' as the chief guest.

In terms of his scientific contributions, Dr Bhagavantam was a pioneer developing simple and effective methods to measure elastic constants in Crystals. He did work in scattering of light rays with Dr Raman, while obtaining his M Sc degree too. Later he worked in Ultrasonics, Radio Astronomy, Solid State Physics etc. He guided over 50 PhD scholars and published many papers and authored a couple of books which gained international acclaim.

"Dr Bhagavantam was a scholar in Telugu and Sanskrit. He could recite poems in both languages and compose poems in the former. He was a man of wit and humour and ready repartee, who was known to defuse tense situations in meetings with an apt joke and warm heartedness. Though he looked serious and not easy to approach," recalls, Dr M Krishnamurthi, a long term associate in a biographical note in the Defence Science Journal.

His Administrative skills took him to responsibilities in public sector units like the Bharat Electronics Limited (BEL) and the Hindustan Aeronautics Limited as their Chairman. He was also on the Board of the State Bank of India.

### Impactful tenure at OU, AU and IISc:

Dr Bhagavantam, whose 112th birth anniversary falls today, is a rare combination of academic brilliance and administrative strengths. As the youngest Vice Chancellor of the Osmania University





at the age of 42, he pushed the departments of Physics, Geophysics and Astronomy to international reputation. The Rangapur Observatory with its 48 inch Telescope was set up on the outskirts of Hyderabad during his tenure of 1952-57.

A student of the City College High School and Degree from Nizam College, Dr Bhagavantam built the branches of Cosmic Rays, Radio Astronomy, and Spectroscopy in Physics to repute in the OU. He came to the University from London in 1949 to head the Physical Laboratories as its Director. In 1952, he was made the VC.

He was a brilliant Physicist. In 1928, at the young age of 20, as a winner of an essay he joined Prof C V Raman as a research scholar to work in the Indian Association for the Cultivation Science. On the advice of Dr Raman, Suri Bhagavantam joined the Physics department of Andhra University in 1932. He was just 23. The Vice Chancellor at that time was Sir S Radhakrishnan, who was impressed with the young man's credentials. Very soon, he rose to become the youngest Professor at 28 and then Head of Department. In a 15 year association with the AU, he was instrumental in initiating the setting up of the Departments of Meteorology, Oceanography and Geophysics. The University got global recognition for the alumni and the work it produced over the decades.

As the Director of the Indian Institute of Science, Bengaluru, he ensured that it got a Deemed University status in the 1950s, says Dr BV Subbarayappa, the official historian of the Institute in a citation in the Indian National Science Academy.

### **Personal life**

Dr Bhagavantam was born into a well to do family in Akiripalli village in Krishna district of Andhra Pradesh in 1909. He married Sita Mahalaxmi and had four sons and a daughter. Three of his sons—Dr Balakrishna, Dr Radhakrishna and Dr Ramakrishna became scientists. He passed away in 1989 at the age of 80.

During the 1980s, I used to meet Dr Suri Balakrishna, Assistant Director, National Geophysical Research Institute (NGRI) at scientific meets. A Geologist, Balakrishna was a good organiser of national and international scientific events at the NGRI and also the Andhra Pradesh Akademi of Sciences. His father's reputation too helped in putting together these events, I felt. In contrast, his efforts to make it to the Director post at the Institute did not succeed, though he was acting Director on two occasions.

During the last years of his life Dr Bhagavantam, an associate of the Sai Baba of Puttaparthi, spent time on spirituality and service of the ordinary people. He headed the COSTED (Committee on Science and Technology in Developing Countries) created by the ICSU (International Council of Scientific Unions) for nearly a decade. Incidentally, he was succeeded in the position by Dr Y Nayudamma, another distinguished Scientist-Administrator from Andhra Pradesh.

*(Somasekhar Mulugu, former Associate Editor & Chief of Bureau of The Hindu BusinessLine, is a well-known political, business and science writer and analyst based in Hyderabad)*

<https://www.siasat.com/dr-suri-bhagavantam-remarkable-contributor-to-hyderabad-defence-and-indian-science-2208132/>

## **Adopt ‘trench farming’ to grow herbs, vegetables in Ladakh: Assocham**

*The industry chamber also moots greenhouse cultivation on a largescale, launching of organic mission*

Chennai: Farmers in the Union Territory of Ladakh should be informed about alternatives to greenhouses, such as low tunnel technology or trench farming, to help them cultivate herbs and vegetables, a report by Assocham in association with Primus Partners has said.

The report also recommends taking up greenhouse cultivation of Indian and exotic vegetables and flowers on a large scale, launching “Ladakh Organic Mission” and investing in infrastructure to tap the union territory’s full potential in farming.

Trench farming could be considered until the administration takes up the installation of commercial greenhouses. “This technology is not just low-cost, but also portable. The farmers have the ability to relocate the tunnel to whatever location they want. In high mountain locations like Changthang, they may also be utilised to cultivate herbs and vegetables,” the report said.

### **Adopting Trench farming**

Some farmers have adopted this technique and are now growing up to 28 different varieties of vegetables, up from the previous ten. “This has not only allowed people to make more money from their agricultural products, but it has also ensured that the community has access to a variety of healthy veggies. Therefore, there is a need to carry out capacity building activities to build acceptance of this technology. The administration, in collaboration with DRDO, can look at popularising this technology in the region,” it said.

Calling for setting up at least one or two greenhouses in every village, the report pointed to how Tibetan region farmers, who have similar climatic conditions, had adapted to greenhouses.

The study said that the commercial cultivation of Indian and exotic vegetables and flowers can be taken up in large greenhouses to meet local demand and then supply to local hotels and army bases on a contractual basis. Post these developments, these produce could be supplied to the rest of the country at a premium since India imports some of these vegetables such as broccoli and bell pepper.

### **Favourable climate**

It said climatic conditions were favourable for the development of high-quality apricot and apple in the Union Territory, where large-scale seabuckthorn cultivation has the potential to be a critical instrument for Ladakh’s cold desert’s long-term development.

Pointing out that current primary processing of the seabuckthorn berry is being done in Ladakh, the study said various components such as the pulp, seed and hull are sold to firms located outside the region for further value-addition.

“There is an opportunity for development of value-added products in this area. Hence, the government needs to create a favourable environment for the investors through partial support in the form of subsidies, training and skill development on value-added products,” the Assocham report said.

### **Adding value to products**

The study said wastage of apricot and apples — that are abundantly produced during warm weather and in lower regions such as Sham, Nubra and Kargil — was high due to poor market linkages.

Therefore, the government could consider setting up processing units that will also employ women who could be organised into self-help groups to produce jams, jellies, oil from the pulp of these fruits.

Similarly, native herbs and flowers including exotic species, such as Geranium, can be used to produce aromatic and medicinal oils, herbal tea, extracts for soaps and perfumes, scented candles etc, the report said.

The pulp extraction facilities can produce various value-added products from both these fruits and seabuckthorn, besides natural dyes that can be exported or used by the domestic textiles industries.

The report said Ladakh's weather conditions were ideal for seed development of various vegetable crops. The Defence Institute of High Altitude Research (DIHAR) in Leh has developed seed production systems for a variety of temperate vegetable crops.

“Cabbage, onion, leek, beetroot, temperate radish, temperate carrot, turnip, swede, celery, and parsley are vegetable seed crops that can be produced on sandy to heavy soils with enough water and nutrients. If given the right impetus, these have the potential of being exported and grown throughout the world,” the Assocham report said.

### **Going organic**

On the need to launch a “Ladakh Organic Mission” with a vision of the next five years, the report said such a mission should focus on making Ladakh an organic certified region, like Sikkim. Another component of this mission could focus on eco-friendly packaging for the product, creating a unique brand image for its products.

The report called for additional investment in infrastructure with private sector players coming forward to invest in essential infrastructure for agriculture in the region that will have the capacity to transform the sector.

“Solar-powered cold storage, mini food parks, commercial greenhouses etc. are all parts of essential infrastructure that are the need of the hour for the sector. Setting up of small units with food processing facilities will also create more jobs for the locals,” it added.

<https://www.thehindubusinessline.com/economy/agri-business/adopt-trench-farming-to-grow-herbs-vegetables-in-ladakh-assochem/article36999593.ece>

# अमरउजाला

Fri, 15 Oct 2021

## 93.83 प्रतिशत मिली सिविल अस्पताल के प्लांट में तैयार ऑक्सीजन की गुणवत्ता

चरखी दादरी: लंबे इंतजार के बाद सिविल अस्पताल में स्थापित किए गए प्लांट में ऑक्सीजन उत्पादन को हरी झंडी मिल गई है। यहां तैयार की गई ऑक्सीजन की सैंपल रिपोर्ट स्वास्थ्य विभाग के पास पहुंच गई है और गुणवत्ता 93.83 प्रतिशत मिली है। विभागीय अधिकारियों के अनुसार अगले सप्ताह से प्लांट में ऑक्सीजन उत्पादन का काम शुरू कर दिया जाएगा। हालांकि एक करोड़ की लागत से तैयार ऑक्सीजन प्लांट का विभाग करीब दो माह पहले उद्घाटन भी करवा चुका है।

अब जल्द ही सिविल अस्पताल में लगे प्लांट में ऑक्सीजन का उत्पादन शुरू हो जाएगा। इसके लिए स्वास्थ्य विभाग ने यहां तैयार ऑक्सीजन का सैंपल भेजा था। सोमवार को लिए गए इस सैंपल की रिपोर्ट पॉजिटिव आई है। डिप्टी सीएमओ डॉ. संजय गुप्ता ने बताया कि सैंपल में ऑक्सीजन की गुणवत्ता सही पाई गई है। उन्होंने बताया कि डीआरडीओ ने जुलाई महीने में सिविल अस्पताल में ऑक्सीजन प्लांट निर्माण का कार्य शुरू करवाया था। अगस्त में यह प्लांट तैयार हो गया था। उन्होंने बताया कि यहां तैयार की गई ऑक्सीजन की गुणवत्ता जांच न होने के चलते उत्पादन शुरू नहीं हो पा रहा था। उन्होंने बताया कि इसी सैंपल एक टीम दादरी में सैंपल लेने पहुंची थी और उस टीम ने जांच के बाद रिपोर्ट भेज दी है।

सिविल अस्पताल में इस समय करीब 130 बेड की सुविधा है और विभाग की योजना है कि इन सभी बेड पर इंटिग्रेटिड ऑक्सीजन की आपूर्ति की जाए। इसके लिए विभाग ऑक्सीजन प्लांट बढ़ाने की योजना भी तैयार कर चुका है। जल्द ही इस योजना पर काम शुरू होने की उम्मीद है और इसके बाद ऑक्सीजन संबंधी दिक्कत अस्पताल में नहीं रहेगी।

एक मिनट में तैयार होगी 500 लीटर ऑक्सीजन

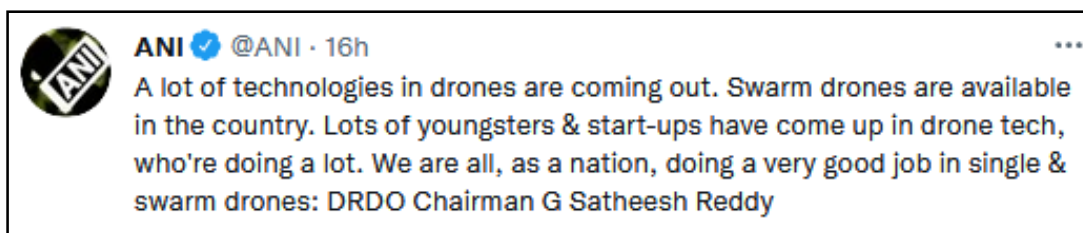
इस प्लांट में तैयार की गई ऑक्सीजन की गुणवत्ता सही पाई गई है। एक करोड़ रुपये खर्च कर लगाए गए इस प्लांट में एक मिनट के अंदर 500 लीटर ऑक्सीजन तैयार होगी। एक दिन की अगर बात करें तो यहां एक एमटी ऑक्सीजन तैयार होगी। कोविड की दूसरी लहर के दौरान जिले में ऑक्सीजन की दैनिक खपत तीन एमटी तक पहुंच गई थी।

वर्जन : प्लांट में तैयार की गई ऑक्सीजन की सैंपल रिपोर्ट आ गई है। इसमें गुणवत्ता काफी सही पाई गई है और जल्द ही प्लांट में ऑक्सीजन का उत्पादन हम शुरू कर देंगे।

डॉ. संजय गुप्ता, डिप्टी सीएमओ

<https://www.amarujala.com/haryana/charkhi-dadri/93-83-percent-milliliter-quality-of-oxygen-prepared-in-civil-hospital-plant-charkhidadri-news-hsr614442232>

## DRDO on Twitter





Press Information Bureau  
Government of India  
Prime Minister's Office

*Thu, 14 Oct 2021 5:44PM*

### **PM to deliver video address in an event to dedicate seven new defence companies to the nation on 15th October**

On the auspicious occasion of Vijayadashami, Prime Minister Shri Narendra Modi will deliver video address in an event organized by the Defence Ministry, to dedicate the seven new Defence Companies to the Nation, on 15th October, 2021 at around 12:10 PM.

Defence Minister, MoS Defence and representatives from the Defence industry associations will be present on the occasion.

#### **About 7 New Defence companies**

The Government has decided to convert Ordnance Factory Board from a Government Department into seven 100% Government owned corporate entities, as a measure to improve self-reliance in the defence preparedness of the country. This move will bring about enhanced functional autonomy, efficiency and will unleash new growth potential and innovation.

The seven new Defence companies that have been incorporated are: Munitions India Limited (MIL); Armoured Vehicles Nigam Limited (AVANI); Advanced Weapons and Equipment India Limited (AWE India); Troop Comforts Limited (TCL); Yantra India Limited (YIL); India Optel Limited (IOL); and Gliders India Limited (GIL).

<https://pib.gov.in/PressReleasePage.aspx?PRID=1763957>



पत्र सूचना कार्यालय  
भारत सरकार

प्रधानमंत्री कार्यालय

Thu, 14 Oct 2021 5:44PM

## प्रधानमंत्री 15 अक्टूबर को सात नई रक्षा कंपनियों को राष्ट्र को समर्पित करने के कार्यक्रम को वर्चुअल माध्यम से संबोधित करेंगे

विजयादशमी के शुभ अवसर पर, प्रधानमंत्री श्री नरेन्द्र मोदी 15 अक्टूबर, 2021 को दोपहर लगभग 12:10 बजे सात नई रक्षा कंपनियों को राष्ट्र को समर्पित करने के लिए रक्षा मंत्रालय द्वारा आयोजित एक कार्यक्रम को वर्चुअल माध्यम से संबोधित करेंगे।

इस अवसर पर रक्षा मंत्री, रक्षा राज्यमंत्री और रक्षा उद्योग संघों के प्रतिनिधि उपस्थित रहेंगे।

सात नई रक्षा कंपनियों के बारे में

सरकार ने देश की रक्षा तैयारियों में आत्मनिर्भरता बढ़ाने के लिए एक उपाय के तौर पर आयुध निर्माणी बोर्ड को सरकारी विभाग से सात शत - प्रतिशत सरकारी स्वामित्व वाली कॉरपोरेट कंपनियों में परिवर्तित करने का निर्णय लिया है। यह कदम बेहतर कार्यात्मक स्वायत्तता एवं दक्षता सुनिश्चित करेगा और विकास की नई संभावनाओं एवं नवाचार का मार्ग प्रशस्त करेगा।

जिन सात नई रक्षा कंपनियों को सूचीबद्ध किया गया है, उनमें शामिल हैं: म्यूनिशन्स इंडिया लिमिटेड (एमआईएल); आर्मर्ड व्हीकल्स निगम लिमिटेड (अवनी); एडवांस्ड वेपन्स एंड इक्विपमेंट इंडिया लिमिटेड (एडब्ल्यूई इंडिया); डूप कम्फर्ट्स लिमिटेड (टीसीएल); यंत्र इंडिया लिमिटेड (वाईआईएल); इंडिया ऑप्टेल लिमिटेड (आईओएल) और ग्लाइडर्स इंडिया लिमिटेड (जीआईएल)।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1763985>



## **Raksha Mantri Shri Rajnath Singh at SCO webinar: Government has taken evolutionary path to ensure equal participation of women in Armed Forces**

*Raksha Mantri: Terrorism is a manifestation of changing concept  
of war; Women too have a role in fighting this menace*

**Key highlights:**

- **Govt has taken several steps to strengthen role of women in the Armed Forces**
- **SCO unequivocally rejected terrorism**
- **Women officers from SCO nations welcome in OTA, Chennai**

Delivering the inaugural address at Shanghai Cooperation Organisation (SCO) webinar on 'Role of Women in Armed Forces', on October 14, 2021 from New Delhi, Raksha Mantri Shri Rajnath Singh said, Government has taken a number of steps to strengthen the role of women within the security setup in general and the armed forces in particular. Women have been serving with pride in Indian Military Nursing Service for over 100 years now. Indian Army had commenced commissioning women officers in 1992. "It has now moved to inducting women officers in most of the branches of the Army. Women are now being accepted for permanent commission and shall be commanding army units and battalions in near future", he added. The webinar was hosted Hq, Integrated Defence Staff of the Ministry of Defence.

Pointing out that induction of women in Military Police has commenced last year, Raksha Mantri said from next year, women shall be able to join the premier tri-service training institute, the National Defence Academy. He wished to see women officers from SCO nations in the Officer Training Academy, Chennai.

Shri Rajnath Singh said that women were inducted in both support and combat roles - in the Indian Navy they pilot Maritime Reconnaissance aircrafts and since last year they were appointed onboard warships. Similarly, Indian Coast Guard has been employing women officers in combat roles which includes pilots, observers and aviation support services. In the Indian Air Force, women fly helicopters, fighter jets and constitute a significant percent of the officer cadre. In UN peacekeeping missions too, women from the Indian Armed Forces participate regularly.

He said that Government's approach to the induction of women in the armed forces has been progressive. "We have taken the evolutionary path of moving from support to combat support and thereafter to combat arms within the armed forces," he added.

Underlining that the concept of security is undergoing a paradigm shift, Shri Rajnath Singh said the changing character of war is bringing threats from our borders to within our society. "Terrorism is just the most obvious and diabolical manifestation of this reality. It has been employed as a weapon of choice by non-state actors and irresponsible states alike for the furtherance of their political objectives. SCO as an organization has unequivocally rejected terrorism in all its manifestations and forms," he added and stressed that "this fight cannot be won by half the population... Women too will remain equal contributors in this fight, both within the armed forces and beyond them."

Shri Rajnath Singh said women have proven themselves in every walk of life, "Many barriers have been broken and many more imagined barriers should break in the years to come."

Raksha Mantri saluted the brave women from all SCO nations who have been selflessly serving their respective nations, working on conflict mitigation, developmental projects and promoting the



cause of peace and prosperity. Exhorting the SCO nations to ensure regional stability, promote peace, ensure gender-equality and work towards betterment of the entire region, Raksha Mantri said, “We look forward to much greater participation and bigger role of women in various tasks of Armed Forces.”

Stressing that Indian customs and traditions revered women as both caregivers and protectors, Raksha Mantri said, “If Saraswati is our Goddess of knowledge, wisdom & learning, Mother Durga remains associated with protection, strength, destruction and war. In fact, we are celebrating Vijay Dashami, the day Goddess Durga defeated & killed demon Mahishasura, across the subcontinent.” He also recalled that women took up arms to protect the country throughout history, “Rani Laxmi Bai is amongst the most revered and respected amongst them. She fought against the imposition of unjust foreign rule till her very last breath, leading her men from the front.”

Chief of Defence Staff General Bipin Rawat delivered the welcome address. The SCO Deputy Secretary-General Muratbek Azymbakiev also addressed Webinar via video link. Delegates of SCO countries shared their experiences with the aim to enrich and inform policy makers and practitioners alike. The webinar was conducted in two sessions. The first session on ‘Historical Perspective of Women’s Roles in Combat Operations’ was chaired by Deputy Chief of Integrated Defence Staff (Medical) Lt General Madhuri Kanitkar. Apart from India, speakers from China, Kazakhstan and Kyrgyzstan shared their perspectives in the session. The Second session on ‘Emerging Trends in Wars and Likely Roles of Women Warriors’ was chaired by Former Foreign Secretary Smt Nirupama Rao Menon. Members from Pakistan, Russian Federation, Tajikistan and Uzbekistan shared their views on the subject.

Closing address was delivered by Chief of Integrated Defence Staff to Chairman, Chiefs of Staff Committee (COSC) Air Marshal B R Krishna. Senior civil and military officials of MoD attended the webinar.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1763954>



Press Information Bureau  
Government of India

Ministry of Defence

Thu, 14 Oct 2021 10:10AM

## **Indian Army contingent departs for 17th edition of Indo-US joint military exercise “Ex Yudh Abhyas 2021” at joint base Elmendorf – Richardson, Alaska (USA)**

As part of the ongoing Indo-US Defence Cooperation, the Joint Military Training Exercise “Ex Yudh Abhyas 2021” will be conducted at Joint Base Elmendorf Richardson, Alaska (USA) from 15 to 29 October 2021. The contingent, comprising of 350 personnel of an Infantry Battalion Group departed on 14 October 2021. Exercise YudhAbhyas is the largest running joint military training and defence cooperation endeavor between India and USA. This will be the 17<sup>th</sup> Edition of the joint exercise which is hosted alternately between both countries.

The previous version of this exercise was held at Mahajan Field Firing Ranges in Bikaner, Rajasthan in February 2021. This exercise is another step in the growing military cooperation between the two countries.

The exercise aims at enhancing understanding, cooperation and inter-operability between two Armies. The joint exercise will focus on Combined Arms Manoeuvres in cold climatic conditions and is primarily aimed at sharing tactical level drills and learning best practices from each other. The exercise will culminate after a 48 hours long validation.



<https://pib.gov.in/PressReleasePage.aspx?PRID=1763787>



पत्र सूचना कार्यालय  
भारत सरकार

रक्षा मंत्रालय

Thu, 14 Oct 2021 10:10AM

## भारतीय सेना का दल भारत-अमेरिका संयुक्त सैन्य अभ्यास "युद्धाभ्यास 2021" के 17वें संस्करण के लिए संयुक्त बेस एल्मेंडोर्फ - रिचर्डसन, अलास्का (यूएसए) रवाना हुआ

भारत और अमेरिका के बीच जारी रक्षा सहयोग के अंतर्गत संयुक्त सैन्य प्रशिक्षण अभ्यास "युद्ध अभ्यास 2021" 15 से 29 अक्टूबर 2021 तक संयुक्त बेस एल्मेंडोर्फ रिचर्डसन, अलास्का (यूएसए) में आयोजित किया जाएगा। भारतीय दल जिसमें एक इन्फैंट्री बटालियन के 350 कर्मी शामिल हैं 14 अक्टूबर 2021 को रवाना हुआ। युद्ध अभ्यास भारत और अमेरिका के बीच सबसे बड़ा संयुक्त सैन्य प्रशिक्षण और रक्षा सहयोग प्रयास है। यह संयुक्त अभ्यास का 17वां संस्करण होगा जिसे दोनों देशों के बीच बारी-बारी से आयोजित किया जाता है।

इस अभ्यास का पिछला संस्करण फरवरी 2021 में राजस्थान के बीकानेर में महाजन फील्ड फायरिंग रेंज में आयोजित किया गया था। यह अभ्यास दोनों देशों के बीच बढ़ते सैन्य सहयोग में एक और कदम है।

इस अभ्यास का उद्देश्य दो सेनाओं के बीच समझ, सहयोग और अंतर-संचालन को बढ़ाना है। संयुक्त अभ्यास ठंडी जलवायु वाली परिस्थितियों में संयुक्त हथियार युद्धाभ्यास पर ध्यान केंद्रित करेगा और इसका मुख्य उद्देश्य सामरिक स्तर के अभ्यासों को साझा करना तथा एक दूसरे से अभ्यास की सर्वश्रेष्ठ परिपाटियां सीखना है। यह अभ्यास 48 घंटे के लंबे सत्यापन के बाद समाप्त होगा।



<https://pib.gov.in/PressReleasePage.aspx?PRID=1764043>

## Roadmap being put in place for synergy among Armed Forces: General Bipin Rawat

*General Bipin Rawat said that a roadmap is being put in place to enhance integration and synergy amongst the Indian armed forces with "time-bound milestones"*

New Delhi: India is in the process of reorganising and right-sizing its armed forces into a leaner and agile military driven by new age technologies in the areas of cyberspace, electronic warfare and artificial intelligence, Chief of Defence Staff Gen Bipin Rawat said on Thursday.

In an address at an event, he also said that a roadmap is being put in place to enhance integration and synergy amongst the Indian armed forces with "time-bound milestones".

The chief of defence staff said India is focusing on becoming self-reliant in defence manufacturing as its aspirations to emerge as a regional power can no longer be held hostage to arms imports.

"Warfare is changing and so are the threats, especially for India. There are collusive threats from our neighbouring nations, border intrusions across terrestrial borders and the new phenomenon of multi-front warfare spanning borders," he said. Gen Rawat said the armed forces of the nation must be prepared for future challenges with 'changing' security dynamics given the uncertain environment around India.

Emphasising the need for acquiring new age technologies, he said nations are aware that control over technology defines economic, political and military power.

"We are in the process of reorganisation and right-sizing the armed forces into a leaner and agile force driven by technology in the fields of space, cyber, electronic warfare and special forces," Gen Rawat said.

"Leveraging Artificial Intelligence for our defence preparedness is being given due importance," he said at the Def-Tech India conference.

The chief of defence staff said the pursuit of disruptive technologies like artificial intelligence, robotics, nanotechnology, big data analytics, drone technology, unmanned systems and militarisation of space along with "manipulation of social media" are leading to the emergence of new threats.

"While these technologies are constantly reshaping the contours of the threat, they provide us an opportunity to acquire new enabling military capabilities for strategic advantage," he said.

Gen Rawat said growth of Indian defence manufacturing is likely to accelerate with rising concerns over national security.

"The Indian industry today is on the cusp of entering into a new era where it will assume greater responsibility in making the nation self-reliant in defence production. The resurgence of India's manufacturing sector has been remarkable," he said.

"The sector not only saw an increase in profits but also saw increased footprints in foreign countries with many Indian firms becoming transnational companies," he said.

The chief of defence staff said India is fast developing into a manufacturing hub for world corporations which are wanting to leverage the sector's proven skills in product design, customisation with creativity, assured quality and value addition.

<https://www.ndtv.com/india-news/roadmap-being-put-in-place-for-synergy-among-armed-forces-general-bipin-rawat-2575886>



General Rawat said the armed forces must be prepared for future challenges. (FILE)

## Malabar exercise: India, U.S. Navy Chiefs embark on American aircraft carrier

*This is the 25th edition of Exercise Malabar*

*By Dinakar Peri*

New Delhi: Chief of Naval Staff, Indian Navy, Admiral Karambir Singh and Chief of Naval Operations (CNO), U.S. Navy, Admiral Michael Gilday embarked on the aircraft carrier USS Carl Vinson during the ongoing second phase of Malabar exercise in the Bay of Bengal. This is the 25th edition of the naval exercise, which began as a bilateral exercise between India and the U.S. in 1992.

“This visit to Carl Vinson during Malabar was an important opportunity to see first-hand the integration between our two navies at-sea,” Adm Gilday said in a statement issued by the U.S. Navy. “By our navies continuing to exercise together, as we are doing right now alongside Japanese and Australian naval forces, there is no doubt our partnership will only continue to grow. Cooperation, when applied with naval power, promotes freedom and peace, and prevents coercion, intimidation and aggression.”



While Phase-I of Malabar exercise was held in August and hosted by the U.S. Navy near Guam, Phase-II is being held from October 12-15 in the Bay of Bengal off Visakhapatnam. | Photo Credit: Special Arrangement

The U.S. Navy said a team of 12 senior Indian Navy officers was hosted aboard the carrier.

“Exercise Malabar is a showcase example of defense collaboration between our four partnering countries, demonstrating what we can accomplish when we work together to advance our common interests in the Indo-Pacific,” she said Chargé d’Affaires Patricia Lacina, who was also part of the visit.

In 2015, Japan joined Malabar as a permanent member, while Australia was included in 2020.

While Phase-I of Malabar was held in August and hosted by the U.S. Navy near Guam, Phase-II is being held from October 12-15 in the Bay of Bengal off Visakhapatnam.

The Navy has stated that the second phase would build upon the synergy, coordination and inter-operability developed during the first phase of the exercise and would focus on “advanced surface and anti-submarine warfare exercises, seamanship evolutions and weapon firings.”

The Indian Navy has deployed two frontline warships, a P8I long-range maritime patrol aircraft and a Submarine for the exercise.

<https://www.thehindu.com/news/national/malabar-exercise-india-us-navy-chiefs-embark-american-aircraft-carrier/article36999752.ece>

# The 4 Submarines competing for the Indian Navy's P-75I Program

*The Indian Navy's P-75I submarines will be larger and much more potent than the Kalvari Class now entering service. They will be the bedrock of India's submarine fleet at a time when the strategic focus is leaning towards China as well as the traditional adversary, Pakistan. There are 4 contenders*

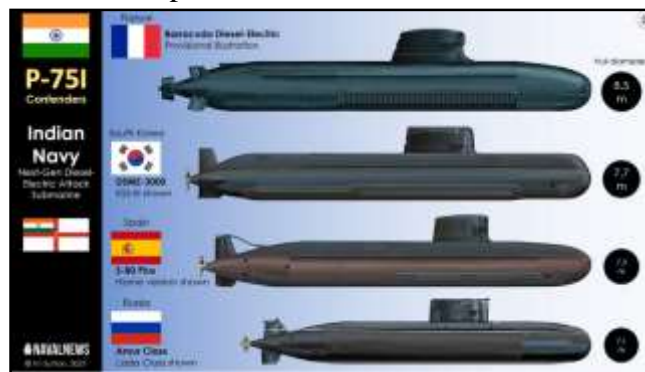
*By H I Sutton*

There are four contenders for the Indian navy's next-generation P75I submarine. They are currently submitting design proposals to the Indian Government. Whatever the outcome the boats are expected to all be built in India. So the deal will factor in political and industrial considerations as well as naval requirements.

The four contenders are the Barracuda from France, the S-80-Plus from Spain, DSME-3000 from South Korea and Amur design from Russia. Germany had also been a contender but recently said that they dropped out.

All of the contenders have their merits and it is likely to be a tough choice for the Indian Navy. Below we outline the different designs.

The Indian Navy's detailed requirements have not been shared. Based on reports and analysis of their current capabilities, investments and threat focuses, two things seem sure. The first is that P75I will have AIP (air independent power). The second is that they would prefer a VLS to launch Brahmos anti-ship missiles. Taken together, the P75I will have to be much larger than previous Indian navy conventional submarines.



The 4 P-75I submarine designs are from France, South Korea, Spain and Russia. Challenges are likely to include the Indian Navy's requirements for AIP (Air Independent Power). And possibly a vertical launch system (VLS) for Brahmos missiles.

Both the AIP and VLS will present challenges and difficult decisions. Like all major submarine projects, trade-offs will have to get made. India has developed its own fuel cell AIP which it is planning to fit to the current French-designed Kalvari Class (Scorpene type). This is a logical choice for the P75I also, particularly from the perspective of indigenous industry. However the Indian Navy is likely to be very interested in the AIP already available with the designs. Incorporating the local AIP would increase development risks, and close off opportunities to access better AIP systems.

The VLS will be a challenge because all the contenders are relatively small boats. It is unclear how dependent the contract will be on a VLS, or whether alternative missile options will be considered.

## 1. Barracuda Class Submarine

France's Naval Group is believed to be offering a diesel-electric version of their Barracuda nuclear submarine. The nuclear version is already in service with the French Navy (Marine Nationale) as the Suffren Class. Being from the same lineage as the Kalvari Class currently being built in India, it can be seen as a strong contender.

The diesel-electric version could have some design features from the SMX-3.0 design. This was exhibited at DEFEXPO in India in 2020. This may include the sail-mounted hydroplanes (as opposed to hull mounted on Suffren) and AIP. The French AIP system uses fuel-cells with a diesel reformer to eliminate the need for onboard hydrogen storage. It has been shore tested for years.

Perhaps the largest design advantage of the Barracuda is simply its size. The hull diameter of around 8.5 meters is the largest of the competitors. This should make it comparatively less challenging to fit a VLS, even with the massive Brahmos missile. The related SMX Ocean concept already has a VLS, and the baseline Barracuda class can anyway launch MdcN land-attack cruise missiles.

Other noteworthy features of the French design are likely to include X-form rudders and a pump-jet. This latter feature may also be of interest in India's nuclear submarine projects.

We can speculate that French nuclear submarine technologies and/or access to extra-large uncrewed underwater vehicle (XLUUV) technologies, may also be a factor. Naval Group recently revealed that they have had an XLUUV demonstrator in the water since last year.

## **2. DSME-3000, South Korea's Missile Submarine**

South Korea has recently spread its wings and entered the submarine export game, selling boats to Indonesia. They are understood to be proposing an export version of their home-grown KSS-III design. This is a relatively large non-nuclear boat, likely second only to the Barracuda.

The type comes with German based fuel-cell AIP. The layout, with a hull section essentially dedicated to AIP, suggests that it would not be too challenging to swap it for the Indian alternative.

And South Korea is ahead of most countries in the race to fit lithium-base battery technology to submarines. This promises to extend the endurance of submarines when running on batterie. Naturally this may be attractive to the Indian Navy, even potentially diminishing the importance of AIP. Its differentiating feature is that it already comes with a six or ten round VLS. In South Korean service this is expected to carry the Hyunmoo 4-4 missile, which is roughly equivalent to India's K-15 Sagarika but without a nuclear option. While exact dimensions and weights are not available, this at least implies that it could accommodate the similarly sized Brahmos.

Carrying a VLS in such a small submarine likely needs some trade-offs, like fewer weapons slots in the regular torpedo room. But overall the South Korean design seems balanced and highly capable.

## **3. Spain's New Entrant: S-80 Plus**

Another new country to submarine exports, Spain's Navantia is offering a variant of their latest S-80 plus design. This is a larger boat than the Scorpene design (per India's Kalvari Class), but smaller than the South Korean or French options.

The AIP is a fuel-cell system with bio-ethanol reformer. So like the French system there is no need for hydrogen storage. Currently Spain's S-80 Plus boats are not running with AIP, but the system is being tested and should go to sea in the next few years.

It is unclear whether Navantia is proposing a VLS. The design was always intended to be compatible with land-attack cruise missiles shot from the torpedo tubes.

## **4. The Russian Option: Amur**

Essentially the export versions of the Lada Class, the Amur family of submarines has been offered for several years. Russia already has strong ties with the Indian Navy and some related Kilo Class submarines are still in their service. The Amur shares some lineage to the Kilo but features a single-hull configuration. Despite having the smallest hull diameter of the contenders (1.5 meters less than the Barracuda), design models have frequently shown a VLS. This seems to have been for smaller Kalibr sized weapons rather than the Brahmos however.

Another challenge for the Amur designs could be AIP. Russia has yet to develop an AIP system for its Lada Class. Possibly the Indian AIP system is key to the proposal.

Like France, Russia may be seen as having a 'home advantage' because of the strong historic relationship. There have been reports that Russia views this as an opportunity to joint-develop the next generation of non-nuclear submarine. How this sits with other reports of the same thing with China remains unclear.

<https://www.navalnews.com/naval-news/2021/10/the-4-submarines-competing-for-the-indian-navys-p-75i-program/>

## Exotic magnetic states in miniature dimensions

We are all used to the idea that simpler units in nature interact to form complex structures. Take, for example, the hierarchy of life, where atoms combine to form molecules, molecules combine to form cells, cells combine to form tissues, and so on, ultimately leading to the formation of complex organisms such as humans. In the quantum world, however, this process may play in reverse, where interactions between two complex objects lead to the emergence of simpler species.

All elementary particles have a "spin," a fundamental property that governs their interaction with magnetic fields. Spins are quantized, which means they can only assume discrete values. Electrons have the smallest possible spin that can take two discrete values, while the next simplest systems are those whose spin takes three discrete values—these are dubbed spin  $\frac{1}{2}$  and spin 1, respectively. In the 1980s, it was predicted that a one-dimensional chain of interacting spin 1 units should be 'fractionalized,' such that the terminal units of the chain behave, counterintuitively, like spin  $\frac{1}{2}$  objects. Therefore, much like magicians who seem to saw a person in two halves and pull them apart, quantum correlations in the chain divide a spin 1 in two spin  $\frac{1}{2}$  entities.



Artistic rendering of a triangulene quantum spin chain adsorbed on a gold surface and probed with the sharp tip of a scanning tunneling microscope. While each triangulene unit has a total spin of 1, quantum correlations in the chain lead to spin fractionalization, such that the terminal triangulene units exhibit a spin of one-half. Credit: Empa

### One-dimensional magnetic chains assembled from molecules

Testing this prediction in a laboratory has been challenging for various reasons, chief among them being that conventional materials are not one-dimensional. While indirect evidence of spin fractionalization has been seen in crystals of organometallic chains containing transition metal ions, a direct observation of the phenomenon has remained elusive.

Now, an international team of researchers has found a remarkable route to accomplish this feat. Combining organic chemistry and ultra-high vacuum surface science, the team fabricated chains of a triangular polycyclic aromatic hydrocarbon with spin 1, known as triangulene. Using a scanning tunneling microscope the team then probed magnetic excitations of these spin chains on a gold surface. They found that beyond a certain length, the terminal triangulene units of the chains exhibited Kondo resonances—which are a characteristic spectroscopic fingerprint of spin  $\frac{1}{2}$  quantum objects in contact with a metal surface.

The researchers believe that easily and directly accessible molecular spin systems exhibiting strongly correlated behavior of electrons will become a fertile playground for developing and testing new theoretical concepts. In addition to exploring linear spin chains, the scientists are also focusing on two-dimensional networks of quantum magnets. Such spin networks are a promising material platform for quantum computation.

**More information:** Shantanu Mishra et al, Observation of fractional edge excitations in nanographene spin chains, *Nature* (2021). DOI: [10.1038/s41586-021-03842-3](https://doi.org/10.1038/s41586-021-03842-3)

**Journal information:** *Nature*

<https://phys.org/news/2021-10-exotic-magnetic-states-miniature-dimensions.html>



# A new twist on 2D materials may lead to improved electronic, optical devices

By Jamie Oberdick

A new generation of electronics and optoelectronics may soon be possible by controlling twist angles in a particular type of bilayer 2D material used in these devices, strengthening the intrinsic electric charge that exists between the two layers, according to researchers from Penn State, Harvard University, Massachusetts Institute of Technology and Rutgers University.

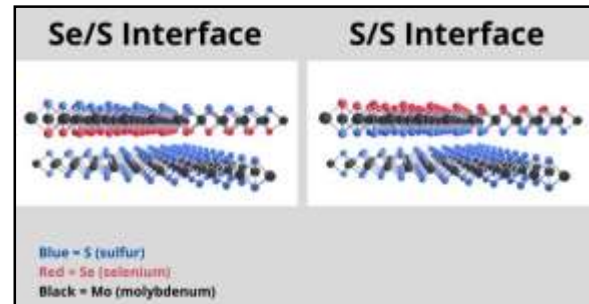
The researchers worked with regular transition metal dichalcogenides (TMD) 2D materials and Janus TMDs, a class of 2D materials named after the Roman god of duality, Janus. These bilayer 2D materials have an interaction between layers known as a van der Waals interlayer coupling that leads to a charge transfer, a process important to the functionality of electronic devices. The charge transfer for both sides of conventional TMDs is the same due to each side having the same type of atoms. In the case of Janus TMD materials, the atoms on each side of the material are different types, leading to varied charge transfer when each side is in contact with other 2D materials.

"In our study, the two types of atoms on each side of the Janus TMD material were sulfur and selenium," said Shengxi Huang, assistant professor of electrical engineering and biomedical engineering at Penn State and co-author of the study recently published in *ACS Nano*. "Because they are different, there can be a charge separation or charge imbalance for the top and bottom side. It creates a vertically directed intrinsic electric field that is very different from conventional 2D materials."

In previous research, Huang and the other researchers worked to understand whether this intrinsic electric field would impact adjacent 2D materials when they are layered. They found that the coupling is stronger in the Janus 2D materials than traditional 2D materials, due to the asymmetric charge caused by the different types of atoms on each side.

For the current work, they manually stacked two types of material layers, Janus TMD and regular 2D materials, which caused random angles depending on how they were stacked. But when they tuned the angles of how each layer was stacked to specific degrees, they made an interesting finding. If the triangle-shaped materials are twisted to stack at a zero-degree angle, when they are perfectly aligned, or at a 60-degree angle, when they are the exact opposite of perfect alignment, they found the couplings to be much stronger than at random angles. In addition, they also found the interlayer coupling is stronger when the Janus TMD is layered on the conventional TMD with the same type of element.

"The main finding was that for this same sulfur/sulfur interface, the interlayer coupling is much stronger than the sulfur/selenium interface," Huang said. "And this is because of the charge distribution related to the dipole direction in these atoms. This means there can be an effective charge transfer between the two layers. Based on our calculation, the separation, meaning the distance between the interlayers, is much smaller, so that shows there's a stronger coupling."



The two types of interfaces between layers of transition metal dichalcogenides (TMD) 2D materials where the top layer is a Janus TMD with two types of atoms (selenium and sulfur) and the bottom layer is a regular TMD with one type of atom (sulfur). The S/S interface is much stronger than the Se/S interface due to the charge distribution from the imbalance in S atoms. Credit: Penn State Materials Research Institute

To discover this, Huang and the team used low-frequency Raman spectroscopy. They shone light onto the two layers of 2D materials, which caused the materials' atoms to vibrate. If the vibration is faster and at higher frequency, that indicates the interlayer coupling is strong.

"You can imagine this using a spring connecting two balls," Huang said. "If the spring is vibrating really fast, that means this spring is strong."

The other method that the team used during its research was photoluminescence spectroscopy. When two layers of 2D material exchange charges between each other, the light emission intensity in one of the materials will drop. This is because there are some charges that transfer to the other layer, and there's not enough charge for the photoluminescence to happen in the "sending" layer.

"We used this as a measure of the degree of charge transfer between the two layers," said Kunyan Zhang, doctoral candidate in electrical engineering at Penn State and co-lead author in the study. "This results we got from the light emission are consistent with our low-frequency Raman spectroscopy. Where we see a stronger coupling from the atomic vibration, we also see a larger drop in the light emission."

These findings are important for the advancement of electronics and optoelectronics. Controlling the interlayer coupling and inducing different optical and/or electronic behaviors has great importance for the performance of many optoelectronic and electronic devices.

"These new material abilities can affect lots of applications, ranging from optoelectronics to electronic devices to catalytic abilities in electrochemical devices such as batteries," Huang said. "These devices are all over in our everyday lives, such as lighting, electronics, appliances and batteries."

Continued work in this research realm will include how the interlayer coupling affects other types of materials. In addition, their findings may be of use to other researchers in the future.

"People outside our field could benefit from our study," Zhang said. "Tuning this kind of interior coupling using the interface with twist angles was not studied before. Those findings may be striking for others in the 2D field whose work does not involve Janus TMDs."

**More information:** Kunyan Zhang et al, Spectroscopic Signatures of Interlayer Coupling in Janus MoSSe/MoS<sub>2</sub> Heterostructures, *ACS Nano* (2021). DOI: [10.1021/acsnano.1c03779](https://doi.org/10.1021/acsnano.1c03779)

**Journal information:** [ACS Nano](https://phys.org/news/2021-10-2d-materials-electronic-optical-devices.html)  
<https://phys.org/news/2021-10-2d-materials-electronic-optical-devices.html>

# New theories and materials aid the transition to clean energy

By Richard Harth

With each passing day, the dark side of our addiction to fossil fuels becomes more apparent. In addition to slashing emissions of carbon dioxide, society must find sustainable alternatives to power the modern world.

In a new study, Gary Moore and his research group explore different approaches to catalysis, a chemical process that plays an essential role in biological reactions, as well as many industrial applications.

Catalysts are substances that speed up the rates of chemical reactions, without being consumed during the reaction process. Enzyme catalysts are so important in nature that life would be impossible without them, as conditions within living cells are not conducive to many vital chemical processes. Chemical reactions that would otherwise require hours or even days to occur can unfold in under a second with the help of enzyme catalysts.

Chemical catalysts have been used in a variety of human applications, ranging from pharmaceutical development to biodegradable plastics and environmentally safe fertilizers. They may also advance the development of green energy solutions to address the climate crisis, an area Moore's group has actively pursued.

Moore is a researcher in the Biodesign Center for Applied Structural Discovery (CASD) and an associate professor in ASU's School of Molecular Sciences (SMS). He is joined by Daiki Nishiori, a graduate student in SMS and lead author of the new study, as well as Brian Wadsworth, a former graduate student in SMS who is now employed at Intel Corporation.

The study findings appear in the current issue of the journal *Chem Catalysis*.

## Catalysts up close

The new study draws on investigations into the behavior of catalysts by Moore and his ASU colleagues as well as other researchers in the field. The current perspective article describes three forms of catalysis—enzymatic, electrocatalytic and photoelectrosynthetic—outlining progress to date and highlighting some of the remaining challenges faced by scientists seeking a comprehensive understanding of these important phenomena.

While a great deal has been learned through the study of enzyme catalysis in living organisms, researchers hope to develop synthetic alternatives that can improve on nature's designs. "It's challenging to mimic biological enzymes for catalysis," Nishiori says. "Biological enzymes have complex, three-dimensional protein structures," and operate under quite different conditions than most human-engineered catalysts.

Instead, researchers hope to produce a new range of synthetic catalysts to drive chemical reactions with high efficiency. Successful results could greatly improve the industrial production of many products of benefit to society. These include new types of carbon-neutral or carbon-free fuels.

"We cover a fair amount of material space in this article, including traditional chemical catalysis by enzymes, as well as electrocatalytic processes mediated by biological and/or synthetic

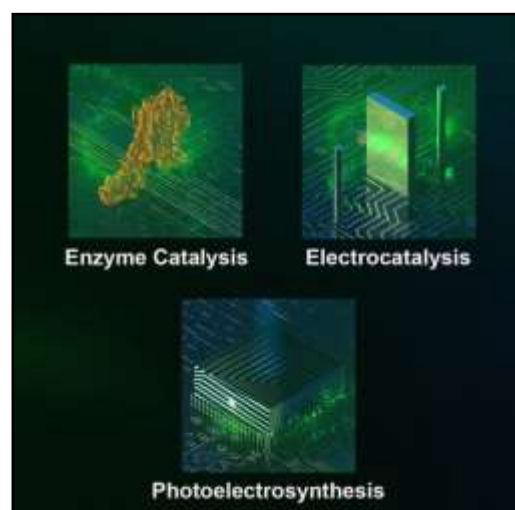


Illustration highlighting the three forms of catalysis described in the new study. Credit: Jason Drees / The Biodesign Institute at Arizona State University

complexes," Moore says. The study then moves on to describe hybrid systems that capture radiant light energy and use it to drive charge transfer reactions. The obvious parallel in nature is with photosynthetic processes carried out by plants.

But artificial photosynthetic technologies can't simply replicate nature's blueprint. In addition to a limited understanding of the structure-function relationships governing their performance, photosynthetic plants convert and store barely 1% of the incident sunlight gathered by their leaves in the form of chemical bonds. These bonds ultimately make up the foods we eat, and on longer-geological time scales, the carbon-based fossil fuels our modern societies rely on. This is all a healthy plant needs to develop and reproduce but is insufficient for human applications.

### **Illuminating research**

Designing new photoelectrosynthetic devices involves using light-gathering technology, similar to current photovoltaic cells, and coupling it to a thin layer of catalytic material. In this scheme, charge carriers are transferred from a semiconductor surface to catalytic sites. Once a catalyst has accumulated enough charge carriers, it enters a so-called activated state, allowing catalysis to proceed. The process can be used to produce hydrogen from water or to produce reduced forms of CO<sub>2</sub> including methane, carbon monoxide, liquid fuels, and other industrially useful products.

"In the case of a more traditional solar cell, your ultimate target is converting sunlight into electrical power. The systems we're developing use solar energy to power energetically uphill chemical transformations," Moore says. Instead of producing electricity, the impinging sunlight leads to catalyzed chemical reactions, ultimately generating fuels.

"Here, the fuels we are describing are not tied to fossil carbon sources. We can develop chemistry that's either carbon free, including the transformation of water into hydrogen gas, which could serve as a fuel, or we can use CO<sub>2</sub> from the atmosphere to generate carbon-containing fuels," Moore says. "In this latter example, although the resulting fuels are carbon-based, no new sources of CO<sub>2</sub> are liberated into the atmosphere." The process is a form of carbon recycling.

Moore refers to such technologies as photoelectrosynthetic. While they hold significant promise for producing clean energy and cleaner generation of useful industrial products, understanding the chemistry at both a theoretical and practical level is challenging. The photons of light and charge carriers used to jumpstart catalysis are quantum entities, with particularly subtle properties that researchers are still struggling to accurately model.

Producing effective technologies to address future energy challenges will require a more thorough mathematical understanding of light harvesting dynamics as well as catalytic processes and charge movement. The current study provides a tentative step in this direction.

Alongside these advances, researchers in materials science will need to design materials better able to exploit these processes, fabricated from durable and affordable materials.

### **New paths through the energy labyrinth**

In addition to the purely scientific hurdles to be addressed, Moore states that changes in public policy will be critical drivers if greener energy technologies are to succeed. "It's daunting to compete with an existing technology that involves simply drilling a hole in the ground to extract a source of energy that's already there," Moore says. A scientifically educated public, able to make informed voting choices that impact how society invests in future infrastructure will also be vital. "Do we want to choose to make investments in technologies that minimize the impact of climate change, or do we continue making use of an energy infrastructure with components and processes that are over a hundred years old?"

Moore is hopeful that advances in enzymatic, electrocatalytic and photoelectrosynthetic technologies will play important roles in a more sustainable, less destructive energy future.

**More information:** Daiki Nishiori et al, Parallels between enzyme catalysis, electrocatalysis, and photoelectrosynthesis, *Chem Catalysis* (2021). DOI: [10.1016/j.cheecat.2021.09.008](https://doi.org/10.1016/j.cheecat.2021.09.008)  
<https://phys.org/news/2021-10-theories-materials-aid-transition-energy.html>

## People taking statins less likely to die from Covid, study suggests

*Experts warn findings do not prove cholesterol-lowering drugs can reduce death rates*

Millions of people who take statins may be less likely to die from Covid, research suggests.

The cholesterol-lowering drugs are one of the world's most popular medications. They can also reduce inflammation in blood vessels, which has prompted questions over whether they could help with outcomes in coronavirus patients.

Now a large study published in PLOS Medicine suggests statins are associated with a slightly lower risk of dying from Covid-19. However, experts urged caution over the results and stressed that the findings did not prove that statins can reduce death rates.

The research looked at the relationship between the drugs and Covid mortality. Using data from Swedish registers, the Karolinska Institutet followed 963,876 residents of Stockholm over the age of 45 between March and November 2020.

The results were based on analyses of data on the participants' prescribed medication and healthcare and from the cause of death register. The information was analysed with respect to such factors as diagnosed medical conditions.

The co-first author Viktor Ahlqvist, of the Department of Global Public Health at the Karolinska Institutet, said: "All in all, our findings support the continued use of statins for conditions such as cardiovascular disease and high levels of blood lipids in line with current recommendations during the Covid-19 pandemic." The researchers cautioned that randomised studies would be needed to ascertain whether there is a causal relationship. Limitations of the study include the use of prescription data without the possibility of checking individual drug use, and not being able to control for risk factors such as smoking and high BMI.

Tim Chico, a professor of cardiovascular medicine and honorary consultant cardiologist at the University of Sheffield, who was not involved in the study, said it was not yet clear why statins may help Covid patients.

"Covid-19 can cause very severe lung infections but it also causes inflammation of the blood vessels," he said. "Because statins reduce inflammation in blood vessels, there has been a lot of debate as to whether they might improve outcome in Covid-19."

"This study does not prove that statins reduce death in Covid-19, but does provide some supportive clues. It observes that people prescribed statins were less likely to die than similar people. However, this does not prove the statins caused the reduced death rates; to do so needs a randomised controlled trial."

Chico also urged caution after other drugs that had initially shown promise in helping Covid patients did not turn out to be beneficial.

"It's important to learn from this and to be suitably measured in how we describe these results," he said. "These results do not in any way justify using statins to treat Covid-19. We already have effective ways to lower risk of death in Covid-19 – social distancing, hand washing, mask wearing and vaccination in the population, and use of techniques and drugs with a good evidence base (like dexamethasone) in people with severe Covid-19 infections."

<https://www.theguardian.com/society/2021/oct/14/people-taking-statin-less-likely-to-die-from-covid-study-suggests>

