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DRDO Technology News

Wed, 19 May 2021

From Iron Dome to Akash, Here are some powerful air defense systems in the world

By Anuj Tiwari

Israeli Defense Force and Hamas militants in Gaza continue to exchange rocket fire and airstrikes. Amidst all this what has attracted the world's attention is the Iron Dome System of Israel. Here's a look at some of the most powerful air missile defense systems in the world.

S-400 Triumph

The S-400 Triumph is an air defence missile system developed by Russia's Almaz Central Design Bureau.

The S-400 Triumph air defence system is capable of firing three types of missiles to create a layered defence. It integrates a multifunction radar, autonomous detection and targeting systems, anti-aircraft missile systems and command and control centre.

David's Sling

David's Sling was co-developed by Raytheon and Israel's Rafael Advanced Defense Systems. David's Sling includes an active electronically scanned array, multimission radar, which works to identify an incoming threat, target and guide the interception.

AKASH

AKASH is a Short Range Surface to Air Missile System to protect vulnerable areas and vulnerable points from air attacks. AKASH Weapon System can simultaneously engage Multiple Targets in Group Mode or Autonomous Mode. It has built-in Electronic Counter-Counter Measures (ECCM) features. The entire weapon system has been configured on mobile platforms.

S-300VM (Antey-2500) -

The S-300VM (Antey-2500) is a long-range, multi-channel anti-ballistic missile defence system designed and manufactured by Almaz-Antey, which provides warfighters with enhanced combat capabilities. The S-300VM system is designed to defeat short- and medium-range ballistic missile,

aeroballistic, cruise missiles, fixed-wing aircraft, as well as loitering ECM platforms and precision-guided munitions.

THAAD (Terminal High Altitude Area Defense)

The THAAD system is an American anti-ballistic missile defense system that is an easily transportable defensive weapon system to protect against hostile incoming threats, such as tactical and theatre ballistic missiles, at ranges of 200km and altitudes of up to 150km. THAAD system has maintained a 100% success rate over its last 16 intercept tests since the beginning of production.

MIM-104 Patriot

Patriot (MIM-104) is a long-range, all-altitude, all-weather air defence system to counter tactical ballistic missiles, cruise missiles and advanced aircraft. It is produced by Raytheon in Massachusetts and Lockheed Martin Missiles and Fire Control in Florida.

Hong Qi 9 (HQ-9)

The Hong Qi 9 or HQ-9 is a Chinese air defense missile system. It is broadly equivalent to the Russian S-300. This Chinese air defense system was reportedly adopted in 1997. The HQ-9 can intercept various aircraft, helicopters, UAVs, cruise missiles, air-to-ground missiles, guided bombs and theater ballistic missiles at medium- to long ranges.

Aster 30 SAMP/T

ASTER 30 SAMP/T is the 21st century's main, mobile anti-aircraft defence weapon for theatre protection. This missile system was developed by Eurosam, jointly owned by MBDA Missile Systems and Thales. It is part of the Aster missile family, which also comprises Aster 15. The missile is operated by various army, air force and naval forces, including the French Army, the French Air Force, the Italian Army, and the Republic of Singapore Air Force.

Medium Extended Air Defence System (MEADS)

The Medium Extended Air Defense System (MEADS) is a ground-mobile air and missile defense system intended to replace the Patriot missile system. The program is a development of the United States, Germany and Italy. With 360-degree defense capability MEADS provides ground-mobile air and missile defense with expanded coverage.

BARAK-8

The Barak-8 Surface-to-Air Missile Defence system or LRSAM provides a 360-degree defence against various airborne threats being developed jointly by the IAI and DRDO of India. Barak-8 can engage multiple targets at the same time during day and night in all weather conditions. Currently, there are three variants of the Barak-8 system. The first one is called Barak 8 AMD/LRSAM, which is a naval air defence system, originally designed for the Israeli Navy and currently used by other countries including India.

Iron Dome

Israel's Iron Dome defence system has been developed jointly by Israel Aerospace Industries and Rafael Advanced Defence Systems. Iron Dome is supposed to be a short-range ground-to-air defence system of up to 70 km. It has a Tamir interceptor and a radar. This radar helps in tracking and destroying any missile or any airborne system that will enter the airspace.

According to Rafael, The Iron Dome system has intercepted thousands of rockets so far and its success rate is over 90%. The Iron Dome is the mobile variant with all components on a single truck.

https://www.indiatimes.com/trending/social-relevance/powerful-air-defense-systems-in-the-world-540737.html?picid=2111873

COVID 19: DRDO's Contribution

THE NEW INDIAN EXPRESS

Wed, 19 May 2021

Will examine data of 2-DG drug for adding it to national COVID treatment protocol: Government

At a press conference, NITI Aayog member (health) Dr V K Paul said Drugs Controller General of India (DCGI) has granted permission for emergency use of the drug after looking at the data

New Delhi: The government will consider including India's first indigenous anti-COVID drug 2-DG in the national COVID-19 treatment protocol after examining the data of the medicine, officials said Tuesday.

Representational Image. (File Photo | PTI)

At a press conference, NITI Aayog member (health) Dr V K Paul said Drugs Controller General of India (DCGI) has granted permission for emergency use of the drug after looking at the data.

The drug 2-deoxy-D-glucose has been developed by Institute of Nuclear Medicine and Allied Sciences (INMAS), a lab of Defence Research and Development Organisation (DRDO), along with Dr Reddy's Laboratories (DRL), Hyderabad.

In response to a question, Paul said, "We will examine in COVID-19 National Task Force meeting for adding the drug in the national treatment protocol."

The first batch of the adjunct COVID therapy anti-COVID drug was released by Defence Minister Rajnath Singh and handed over to Health Minister Harsh Vardhan here on Monday.

One box each of the sachets of the drug was handed over to Delhi AIIMS Director Dr Randeep Guleria and Lt Gen Sunil Kant of Armed Forces Medical Services (AFMS).

More will be handed over to different hospitals across the country for emergency use.

Vardhan termed 2-DG an important development by DRDO and DRL that will reduce the recovery time and oxygen dependency in COVID-19 patients.

https://www.newindianexpress.com/nation/2021/may/18/will-examine-data-of-2-dg-drug-for-adding-it-to-national-covid-treatment-protocol-government-2304270.html

Wed, 19 May 2021

कोविड ट्रीटमेंट प्रोटोकॉल में कब शामिल होगी DRDO की कोरोना दवा 2-DG? डॉक्टर वीके पॉल ने बताया

DRDO के साइंटिस्ट्स के मुताबिक, 2-DG (2-deoxy-D-glucose) दवा अस्पताल में भर्ती मरीजों की तेजी से ठीक करने में मदद करती है और बाहरी या मेडिकल ऑक्सीजन पर निर्भरता को भी कम करती है।

Edited By: साकेत आनंद

सरकार कोरोना बीमारी (Coronavirus) के इलाज के लिए बनाई गई भारत की पहली स्वदेशी दवा 2-DG (2-deoxy-D-glucose) के आंकड़ों का अध्ययन करने के बाद इसे कोरोना संक्रमण के इलाज के राष्ट्रीय प्रोटोकॉल में शामिल करने पर विचार करेगी। अधिकारियों ने मंगलवार को यह जानकारी दी। नीति आयोग के सदस्य (स्वास्थ्य) डॉ. वी के पॉल ने एक प्रेस कॉन्फ्रेंस में कहा कि ड्रग कंट्रोलर जनरल ऑफ इंडिया (DCGI) ने आंकड़ों को देखने के बाद दवा के इमरजेंसी इस्तेमाल की मंजूरी दे दी है।

2-DG दवा को रक्षा अनुसंधान और विकास संगठन (DRDO) की लैब, इंस्टीट्यूट ऑफ न्यूक्लियर मेडिसिन एंड एलाइड साइंसेज (INMAS) ने हैदराबाद की डॉ. रेड्डीज लैबोरेटरीज (DRL) के साथ मिलकर तैयार किया है। पॉल ने एक सवाल के जवाब में कहा, “हम नेशनल कोविड टास्क फोर्स की बैठक में दवा को राष्ट्रीय इलाज प्रोटोकॉल में शामिल करने के बारे में विचार करेंगे।” 2-DG दवा की पहली खेप को रक्षा मंत्री राजनाथ सिंह ने सोमवार को DRDO मुख्यालय में जारी किया और स्वास्थ्य मंत्री हर्षवर्धन को सौंपा।

उम्मीद की नई किरण बनकर आई 2-DG दवा

2-DG दवा के सैशे का एक-एक डिब्बा दिल्ली AIMMS के डायरेक्टर डॉ. रणदीप गुलेरिया और सशस्त्र बल चिकित्सा सेवा (AFMS) के लेफ्टिनेंट जनरल सुनील कांत को सौंपा गया था। देशभर के अलग-अलग अस्पतालों को इमरजेंसी इस्तेमाल के लिए दवा सौंपी जाएगी। इस दवा को देश में कोरोना से लड़ाई के लिए संजीवनी और गेमचेंजर भी कहा जा रहा है। ये दवा ऐसे समय में आई है, जब कोरोना की दूसरी लहर ने कोहराम मचा रखा है और तीसरी लहर की भविष्यवाणी पूरे देश को डरा रही है, लेकिन ये देसी दवा कोरोना से भीषण जंग के बीच उम्मीद की नई किरण बनकर आई है।

2-DG दवा को लेकर किए गए ये दावे

2-DG दवा एक पाउच यानी सैशे में पाउडर के रूप में उपलब्ध है, जिसे पानी में घोलकर पीना होता है। DRDO के साइंटिस्ट्स के मुताबिक, ये दवा अस्पताल में भर्ती मरीजों की तेजी से ठीक करने में मदद करती है और बाहरी या मेडिकल ऑक्सीजन की निर्भरता को भी कम करती है। चूंकि, कोरोना की दूसरी लहर में बड़ी संख्या में कोरोना मरीजों को ऑक्सीजन की जरूरत पड़ रही है और ऑक्सीजन की कमी के चलते काफी लोगों की जान भी चली गई, ऐसे में माना जा रहा है कि ये दवा कोरोना के गंभीर मरीजों की भी जान बचा सकती है। फिलहाल ये दवा सिर्फ अस्पतालों में डॉक्टर की सलाह पर ही मरीजों को दी जाएगी।

https://www.tv9hindi.com/india/government-said-data-will-be-studied-to-include-2-dg-drug-in-covid-treatment-660585.html

TIMES NOW हिंदी

Wed, 19 May 2021

'कोरोना संक्रमण में 100 फीसदी कारगर है DRDO की 2डीजी, 3-7 दिन में ठीक होंगे मरीज'

कोरोना संक्रमण को मात देने के लिए डीआरडीओ द्वारा निर्मित 2डीजी दवा सौ फीसद कारगर बताई जा रही है।

लखनऊ: कोरोना संक्रमण को मात देने के लिए रक्षा विकास अनुसंधान संगठन (डीआरडीओ) द्वारा निर्मित 2डीजी दवा सौ फीसद कारगर बताई जा रही है। इसे बनाने वाली वैज्ञानिकों की टीम में शामिल गोरखपुर के डॉक्टर अनंत नारायण भट्ट ने खास बातचीत में बताया कि, "दवा 2 डीजी (2 डीऑक्सी डी ग्लूकोज) ट्रायल में कोरोना संक्रमण से शत प्रतिशत निजात दिलाने में कारगर रही है। उनका कहना है कि ट्रायल के दौरान सभी कोरोना मरीज 2 से 7 दिन के अंदर ठीक हुए हैं। उनको ऑक्सीजन और अन्य कोई जरूरत नहीं पड़ी। कुछ दिनों यह दवा हर आदमी की पहुंच में होगी। करीब हफ्ते भर पहले ड्रग कंट्रोलर जनरल ऑफ इंडिया से आपातकालीन इस्तेमाल की मंजूरी मिलने के बाद हैदराबाद की डॉ रेड्डीज लैब ने इसका उत्पादन शुरू कर दिया है।"

दवा आत्मनिर्भर भारत की संकल्पना पर आधारित

डॉ. भट्ट का कहना है कि यह दवा आत्मनिर्भर भारत की संकल्पना पर आधारित है। उनके मुताबिक कोविड के पहले वेव में ही डीआरडीओ ने दवा बनाने की ठान ली थी। इसके लिए एक टीम को हैदराबाद की डॉ रेड्डीज लैब में रिसर्च के लिए लगाया गया। दिल्ली में कार्यरत डॉ भट्ट को भी हैदराबाद भेजा गया। दिनरात एक कर रिसर्च टीम को आखिरकार कामयाबी मिल ही गई, इस दवा के बाबत डॉ. भट्ट का कहना है कि, "जिन मरीजों पर इसका प्रयोग किया गया उन्हें तीन दिन बाद ही अलग से ऑक्सीजन सपोर्ट पर रखने की जरूरत नहीं पड़ी। 42 प्रतिशत मरीज तीन दिन में और 75 से 80 प्रतिशत तक मरीज सात से आठ दिन में ही कोरोना संक्रमण से ठीक हो गए। 11 से 12 दिन में रिकवरी की दर शत प्रतिशत मरीजों में पाई गई है। पूरी तरह अपने ही देश में निर्मित यह दवा सैशे में पावडर के रूप में है।

पूरी तरह देश में निर्मित कोविड मेडिसिन 2-डीजी को विकसित करने वाली टीम के अहम सदस्य डीआरडीओ के वरिष्ठ वैज्ञानिक डॉ. अनंत नारायण भट्ट गोरखपुर के गगहा इलाके के कौवाडील के रहने वाले हैं। उनका कहना है कि उन्हें इस बात पर गर्व की अनुभूति होती है कि वह मुख्यमंत्री योगी आदित्यनाथ के गृह जिले के रहने वाले हैं। बकौल डॉ भट्ट, आज गोरखपुर सीएम योगी के नाते पूरे विश्व में जाना जाता है। पूरा देश उनकी कर्मठता और ईमानदारी का कायल है। खुद प्रधानमंत्री नरेंद्र मोदी उनकी कई बार तारीफ कर चुके हैं। डॉ भट्ट कहते हैं कि देश की सबसे बड़ी आबादी वाला राज्य होने के बावजूद यूपी में मुख्यमंत्री योगी आदित्यनाथ ने बेहतरीन और तारीफ के काबिल कोविड प्रबंधन किया है। यही वजह है कि उनके कोविड प्रबंधन की तारीफ डब्लूएचओ, नीति आयोग व अन्य प्लेटफॉर्म पर हुई है।

ज्ञात हो कि कोरोना संक्रमित मरीजों के लिए रक्षा अनुसंधान एवं विकास संगठन (डीआरडो) की दवा 2 डीजी की पहली खेप 10 हजार खुराक सोमवार को जारी कर दी गयी है। 2 डीजी दवा सीधे मरीज की कोशिकाओं में काम करेगी, जिससे प्रतिरक्षा प्रणाली तेजी से ठीक होगी।

https://www.timesnowhindi.com/health/article/drdos-2-dg-100-percent-effective-in-corona-infection-patients-will-cured-in-3-7-days/347071

FINANCIAL EXPRESS
Read to Lead

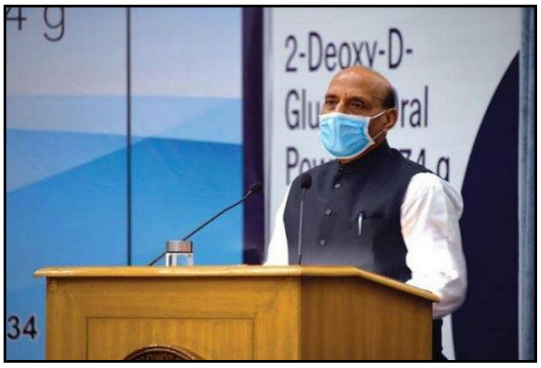
Wed, 19 May 2021

DRDO's Covid drug 2-DG expected to be in the market in June, says DRL

As has been reported earlier this anti-COVID-19 therapeutic application of the drug 2-deoxy-D-glucose (2-DG) has been jointly developed by Institute of Nuclear Medicine and Allied Sciences (INMAS), Defence Research and Development Organisation (DRDO), and Dr Reddy's Laboratories (DRL), Hyderabad

By Huma Siddiqui

On Monday, the first batch of the adjunct COVID therapy anti-COVID drug, 2-deoxy-D-glucose (2-DG), was officially released by the defence minister Rajnath Singh. As has been reported earlier this anti-COVID-19 therapeutic application of the drug 2-deoxy-D-glucose (2-DG) has been jointly developed by Institute of Nuclear Medicine and Allied Sciences (INMAS), Defence Research and Development Organisation (DRDO), and Dr Reddy's Laboratories (DRL), Hyderabad.



Responding to questions by Financial Express Online, the official spokesperson of Dr Reddy's in an email has confirmed, "2-DG is an oral drug to be administered upon prescription to hospitalised moderate to severe COVID-19 patients along with existing standard of care."

By when will it be available in the Indian pharmacies?

"We expect commercial launch of the drug in June, and expect to supply it to hospitals," the spokesperson of Dr Reddy's said.

What will be the price?

"We will share an update on the price soon. The price is being determined with a view to making it accessible and affordable to as many patients as possible."

What did the defence minister say at the launch?

This drug is expected to help the COVID patients recover faster and less dependent on oxygen.

In his address the minister described the 2-DG drug as a new ray of hope in the present challenging times. The minister expressed confidence that the medicine will play a crucial role in winning the fight against COVID-19. According to him the development and production of the drug is the best example of public-private sector partnership, to help the country in these challenging times.

He also announced that he would personally honour the scientists who played a critical role in the development of the drug as they deserve credit for this achievement.

Oxygen Supply situation in the country

The oxygen supply in the country has been substantially increased to more than 9,500 Metric Tonnes (MT) per day from around 4,700 MT, which was at the start of May.

The minister in an official statement issued by the Ministry of Defence (MoD) on May 17, 2021 has said that the situation is being monitored on a regular basis. Adding, "Effective measures have been taken to meet the requirement of oxygen supply, medicines & ICU beds in hospitals across the country. This is being done through collective efforts of the various ministries and departments."

The minister also in his address highlighted the major role played by the armed forces in dealing with the surge in the COVID cases, especially IAF and the Navy working round the clock in

transporting concentrators, oxygen tankers, containers and other critical medical equipment from within the country and overseas.

He referred to the preparedness of the Armed Forces, saying that while they are providing support to the civil administration in fighting the second COVID-19 wave, they have not let their guard down.

In the MoD statement, Chairman, DRL Kallam Satish Reddy, on the partnership with INMAS/DRDO in the development of 2-DG, termed it as a re-affirmation of his company's efforts to address COVID through a host of therapeutics and vaccines.

Who was present during the official launch?

Secretary Department of Defence R&D and Chairman DRDO Dr G Satheesh Reddy; Secretary (Health & Family Welfare) Dr Rajesh Bhushan and DG Health Services Dr Sunil Kumar attended the event. Besides Chairman, DRL, Director, Dr Rakesh Mishra of Centre for Cellular and Molecular Biology.

Defence Minister Rajnath Singh handed over to Minister for Health & Family Welfare, Science & Tech and Earth Sciences Dr Harsh Vardhan in New Delhi one box of the drug. It was also handed over to Director, All India Institute of Medical Sciences (AIIMS) Dr Randeep Guleria and Lt Gen Sunil Kant of Armed Forces Medical Services (AFMS).

And more of this drug will be shared across different hospitals across the country for emergency use.

https://www.financialexpress.com/lifestyle/health/drdos-covid-drug-2-dg-expected-to-be-in-the-market-in-june-says-drl/2253839/

Wed, 19 May 2021

Haryana to purchase DRDO's anti-COVID drug for treating coronavirus patients: Anil Vij

Haryana on Monday reported 114 COVID deaths and 7,488 fresh cases, taking the state's fatality count to 6,799 and the total infection number to 7,01,915, according to a Health Department bulletin

Haryana will purchase anti-COVID drug 2DG developed by DRDO for treatment of coronavirus patients, state Health Minister Anil Vij said. He said the drug helps in the faster recovery of patients and reduces supplemental oxygen dependence. The state has seen a surge in COVID-19 cases in the second wave of the pandemic.

"Haryana will purchase anti-Covid drug 2DG developed by DRDO for treatment of covid patients. Defence Minister Rajnath Singh and Union Health Minister Dr. Harsh Vardhan Today released the drug which helps in faster recovery of patients and reduces supplemental oxygen dependence", Vij said in a tweet.

Haryana to purchase DRDO's anti-COVID drug for treating coronavirus patients. Image Source : PTI

DRDO Chairperson Dr. G Satheesh Reddy said on Monday that the new anti-COVID drug 2-DG should work against various strains of the COVID-19 virus.

"The drug 2DG developed by us should work against the various strains of the COVID-19 virus," Reddy said.

He added that the organisation was hoping to ramp up production of the drug up to one lakh sachet per day by the first week of June.

"From the first week of June, we are hoping to ramp up the production of the drug as the process to develop it takes around one month. We are hoping to increase the number of sachets production to one lakh per day," Reddy said.

Deepak Sapra, CEO of Pharmaceutical Services and API, Dr. Reddy's Labs, said the new anti-COVID drug is an add-on and not a substitute for any of the drugs that are used to treat coronavirus patients.

https://www.indiatvnews.com/news/india/drdo-anti-covid-drug-2dg-haryana-health-minister-anil-vij-705287

Defence News

Defence Strategic: National/International

The Tribune

Wed, 19 May 2021

Indian digital clocks to replace Swiss timers in Mi-17 cockpits

By Vijay Mohan

Chandigarh: The Swiss-origin aviation clock installed in the cockpit of Russian Mi-17 V5 utility helicopters in service with the IAF are being replaced with an indigenously developed digital clock.

The project has been entrusted to No.3 Base Repair Depot (BRD) here, which is responsible for the maintenance of Mi-series helicopters.

The digital clock, at times referred to as chronometer in aviation parlance, will be developed in collaboration with public or private commercial entities while adhering to military specifications and operational requirements, IAF sources said.

The digital clock keeps track of flying time that has elapsed. It also has the option for providing specific information or a particular type of display.

The quartz aviation clock presently installed in the helicopter was developed by Revue, a Swiss luxury watch maker.

Indigenisation of aero-spares for all types of aircraft has been a major thrust area for the IAF, for which it has been making in-house efforts as well as tapping the private industry.

https://www.tribuneindia.com/news/nation/indian-digital-clocks-to-replace-swiss-timers-in-mi-17-cockpits-254856

The Tribune

Wed, 19 May 2021

Don’t overdo leasing of military equipment

When equipment is procured or leased, it is subordinate to the MoD’s overstretched budget due to shrinking outlays and large liability payments for previously acquired materiel. Hence, unbridled equipment leasing will pressure the services’ shrinking capital budgets and impact their revenue budgets which will have to bear the cost of maintaining the leased equipment

By Amit Cowshish and Rahul Bedi

Beset by a continuing financial crunch, India’s Ministry of Defence (MoD) and its armed forces have seized upon leasing an assortment of badly needed platforms and equipment from abroad to mitigate enduring operational gaps.

Indiscriminate: All three services are negotiating to lease varied platforms. PTI

Hyped as an ‘innovative’ alterative, leasing was introduced as yet another procurement category in the Defence Acquisition Procedure 2020 (DAP-2020) launched last October.

The DAP-2020 claims that leasing military equipment was ‘advantageous’ as it enabled the armed forces to swiftly acquire assets without incurring large capital expenditure and other administrative costs, besides allaying obsolescence handicaps.

Consequently, all three services had initiated a flood of inquiries and negotiations to lease varied platforms like naval utility helicopters (NUHs), mid-air refuellers, basic training aircraft, minesweepers and unmanned aerial vehicles (UAVs), among other kit.

But in their keenness to haphazardly pursue this unexplored leasing option, the MoD, military, defence analysts and media appear to have disregarded that lease rent and other associated costs have to be disbursed from the existing stressed budget outlay. Besides lease rent payable to potential lessors over pre-determined intervals, the high cost of modifying platforms or equipment to meet the military’s operational requirements and insuring them too would have to be borne by the respective services from their annually shrinking outlays. As, of course, would the eventual cost of rendering the equipment, upon its lease expiry to its original state in keeping with the accepted standard international practice.

Maintaining the equipment to standards stipulated by the lessor too would be the respective services’ responsibility, unless otherwise specified. This cost could even be higher if the equipment were to be serviced and maintained by the lessor as such an eventuality would entail stationing an upkeep crew in India for extended periods.

Principally, however, whenever equipment is procured or leased, it is subordinate to the MoD’s already overstretched budget due to shrinking outlays and large committed liability payments for previously acquired materiel.

Hence, unbridled equipment leasing by the services will not only pressure their shrinking capital budgets but also impact their revenue budgets which will have to bear the expense of maintaining the leased equipment.

In short, the leasing of materiel sounds appealing, but indiscriminate renting, given the MoD’s penurious financial milieu, would be problematic. In the fiscal year 2020-21, for instance, the MoD was allocated Rs 1,24,203 crore towards capital expenditure for all three services against the Rs 2,01,286 crore which they had demanded. Even for operating revenue expenditure, the allocation was Rs 48,298 crore less than what was claimed. This, in turn, led to the Parliamentary Defence Committee cautioning the MoD against the embarrassing possibility of it defaulting on its committed liability payments, as it could reflect on India’s solvency in the global arms bazaar.

On a lighter note, one analyst remarked that the MoD's prevailing adverse fiscal situation could end up mirroring the dilemma of an indigent, but indulgent, British aristocrat. In his unplanned and financially profligate existence, this worthy had once expansively declared that since he had no money to pay his tailor, he would simply order another suit. In all likelihood, such reasoning would find no takers in the cutthroat armament marketplace.

Meanwhile, the Indian Navy — presently operating INS Chakra, its second nuclear-powered attack submarine leased from Moscow and with a replacement boat similarly agreed upon — is the first of the three services to have fast-tracked leasing. Late last year, it had leased two non-weaponised Medium-Altitude Long-Endurance (MALE) MQ-9B Sea Guardian UAVs from the US to monitor for one year. These UAVs have been operating from INS Rajali in Tamil Nadu, but their leasing terms remain classified.

And, last month, the Navy had invited responses from overseas vendors by June 18 regarding its planned five-year lease of 24 NUHs and related support equipment to replace its fleet of legacy licence-built Chetak helicopters, inducted into service since the 1960s.

The Navy's April 15 Request for Information to original equipment manufacturers, authorised leasing firms and government-sponsored export agencies stated that five-ton rotorcraft were needed to execute search and rescue and medical evacuation missions from ships at sea and to perform communication tasks and low-intensity maritime operations by day and night. The proposed helicopters — to be delivered to the IN within two years of the contract being signed — would need to have a residual service life of 15 years at the commencement of the lease. The lessor would also be responsible for training the rotorcraft's air and technical crew in keeping with the delivery schedule.

The MoD is also in advanced negotiations with the French Government to lease one Airbus Defence and Space A330 multi-role tanker transport aircraft for the Indian Air Force (IAF) for training purposes. The proposed tanker that would be operated by the IAF, but maintained by the French Air Force, would in all likelihood be succeeded by leasing five more A330s to augment the reach and, hence, combat capability of the force's combat aircraft.

The A330s have been under consideration after these tankers, operated by the French and UAE air forces, had refuelled 21 Dassault Rafale multi-role fighters to India from France since July 2020. The IAF's remaining 15 Rafales will also be similarly refuelled by the A330s. The IAF is also considering leasing 20 basic trainer aircraft to make up for the existing shortages.

In January, the Indian Army (IA) leased four Israel Aerospace Industries MALE UAVs in response to the continuing face-off with China's People's Liberation Army that began last May. Proposals for additional equipment for the IA are anticipated.

In conclusion, while there is no argument regarding critical equipment voids in the military or about selectively filling them via leasing of equipment, opting indiscriminately for this conduit will adversely impact the MoD's already pressured kitty. Fiscal and force planning remain critical.

(Amit Cowshish, Ex-Financial Adviser, acquisition, MoD & Rahul Bedi, Senior journalist)

https://www.tribuneindia.com/news/comment/dont-overdo-leasing-of-military-equipment-255020

अमर उजाला

Wed, 19 May 2021

नौसेना को परमाणु हथियारों से लैस छह पनडुब्बियों की जरूरत, सरकार से मांगी इजाजत

सार

भारतीय नौसेना ने प्रशांत महासागर में बदलते रणनीतिक परिदृश्य को देखते हुए कैबिनेट कमेटी ऑफ सिक्योरिटी (सीसीएस) की ओर से अनुमोदित 30 वर्षीय पनडुब्बी निर्माण योजना में बदलाव करने के लिए केंद्र सरकार से इजाजत मांगी है।

विस्तार

नई दिल्ली: चीन और पाकिस्तान जैसे पड़ोसी देशों के साथ जारी तनाव के बीच देश की तीनों सेनाएं अपने-अपने मोर्चे पर मजबूती से डटी हुईं हैं। इस बीच, भारतीय नौसेना को परमाणु हथियारों से लैसे छह पनडुब्बियों की जरूरत है। भारतीय नौसेना ने प्रशांत महासागर में बदलते रणनीतिक परिदृश्य को देखते हुए कैबिनेट कमेटी ऑफ सिक्योरिटी (सीसीएस) की ओर से अनुमोदित 30 वर्षीय पनडुब्बी निर्माण योजना में बदलाव करने के लिए केंद्र सरकार से इजाजत मांगी है। नौसेना छह पारंपरिक हमले वाले जहाजों को परमाणु संचालित प्लेटफार्मों के साथ बदलना चाहती है।

प्रतीकात्मक तस्वीर - फोटो : social media

एक मीडिया रिपोर्ट के मुताबिक, जुलाई, 1999 में अटल बिहारी वाजपेयी की सरकार ने 24 डीजल हमले वाली पनडुब्बियों को शामिल करने के लिए 30 वर्षीय पनडुब्बी योजना को मंजूरी दी थी। भारतीय नौसेना के पास इस समय 12 पुरानी पारंपरिक हमलावर पनडुब्बियां और तीन नई कलवरी श्रेणी की पनडुब्बियां हैं। इनमें से पहली को दिसंबर 2017 में 23,652 करोड़ रुपये की परियोजना के हिस्से के रूप में कमीशन किया गया था। आपको बता दें कि 2005 में इसकी स्वीकृति दी गई थी।

नौसेना ने 18 पारंपरिक डीजल हमले की पनडुब्बियों की जगह नए पनडुब्बी बल को शामिल करने की अनुमति देने के लिए कैबिनेट की मंजूरी मांगी है। इनमें वायु स्वतंत्र प्रणोदन और छह परमाणु हमले वाली पनडुब्बी या एसएसएन शामिल हैं। यह परिवर्तन चीन की पीपुल्स लिबरेशन आर्मी नेवी द्वारा परमाणु पनडुब्बी शस्त्रागार की तीव्र वृद्धि को ध्यान में रखते हुए और हिंद-प्रशांत को भविष्य में विरोधी के वर्चस्व से बचाने के लिए मांगा गया है।

परियोजना को पूरा करने में लगेंगे 10 साल

राष्ट्रीय सुरक्षा योजनाकारों के अनुसार, अगर मोदी सरकार 30 साल पुरानी योजना में बदलाव को मंजूरी दे देती है तो भारतीय नौसेना संयुक्त विकास के लिए प्रमुख सहयोगियों से प्रस्तावों के लिए निविदा आमंत्रित करने से पहले आवश्यकता की स्वीकृति (एओएन) के लिए रक्षा मंत्रालय का रुख करेगी। आत्मनिर्भर भारत अभियान के तहत छह परमाणु संचालित पनडुब्बियों का निर्मा होगा। भारतीय नौसेना के अनुमान के अनुसार इस परियोजना को पूरा होने में कम से कम 10 साल लगेंगे।

https://www.amarujala.com/india-news/indian-navy-seeks-amendment-to-30-year-submarine-plan-wants-six-nuclear-boats-modi-sarkar-china-pakistan

INDIA TODAY

Wed, 19 May 2021

Chinese Army returns to exercise areas near eastern Ladakh; Indian troops keep close watch

In a fresh developmemt, China has heavily deployed troops near the training areas on Ladakh front. Indian forces, too, have stregthened their position in the zone

By Manjeet Negi

New Delhi: In a significant development, the Chinese Army troops have been deployed heavily near the Ladakh front in their training areas from where they had transgressed into Indian areas last year.

Photo for representation.

"The Chinese forces are back to their traditional training areas for an exercise near Eastern Ladakh," top sources told India Today.

The Chinese troops are there in large numbers holding exercises at different locations in their depth areas from where they can reach the Indian front in a matter of few hours, they said.

The Indian forces have also strengthened their deployment in the area as they are keeping a close watch on the Chinese activities in the adjoining sectors, the sources said.

The Chinese are also building infrastructure in their depth areas, which are about 75-100 kms from Indian forward locations at some points.

The two countries are in a stand-off position since April-May last year and are having friction points in the border area, which need to be resolved for ensuring peaceful resolution of the ongoing situation.

The sources said the recent reports suggest that the number of fighter aircraft at the Hotan and Kashgar air fields have been reduced, but the numbers keep fluctuating from time to time there, they said.

Even though the two countries have disengaged from the Pangong lake area, the deployments by both sides continue to stand.

Even during talks, the Chinese side showed reluctance in disengaging from the remaining friction points at Gogra Heights, Hot Springs, Depsang plains and CNN Junction near Demchok.

India has also made it clear that it would consider deescalation only if there is disengagement by the Chinese from the friction points.

The Indian Army and other security forces have also started returning to the summer deployments in the Ladakh sector abd other mountainous areas along the line of Actual Control. The Indian and Chinese armies both have many troops deployed at the border since last year. The deployment of formations and troops in the Sugar sector, Central sector and the north-eastern borders have also been strengthened.

https://www.indiatoday.in/india/story/chinese-army-returns-to-exercise-areas-near-eastern-ladakh-indian-troops-keep-close-watch-1804123-2021-05-18

Press Information Bureau
Government of India

Ministry of Science & Technology

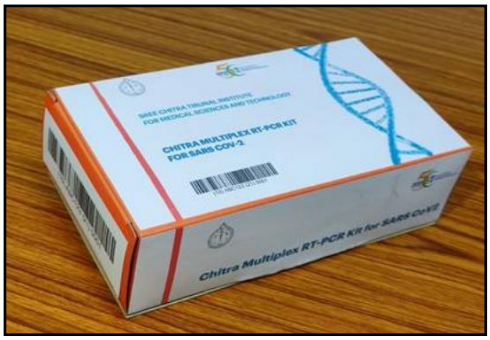
Tue, 18 May 2021 5:21PM

DST institute develops new multiplex RT-PCR kit with novel gene targets to facilitate detection across various mutant strains of COVID 19

This unique RT-PCR kit will be a significant weapon in our fight against COVID-19 by a facile detection of SARS-CoV-2 mutations: Secretary, DST, Prof Ashutosh Sharma

A newly developed multiplex RT-PCR kit has a higher accuracy of detecting covid19 across the various mutant strains of the virus responsible for the global pandemic.

As the pandemic is going through a second wave with multiple variants, the selection of target genes in multiplex RT-PCR assay is becoming critical for accurate detection of the virus.



Even though coronaviruses make far fewer errors than other RNA viruses, the mutations in S, R, and N genes often interfere with RT-PCR assay. For example, the "variant of concern" B1.1.7 (also known as the UK variant) has a 69-70del, due to deletion of 6 bases in the RNA, which resulted in S gene drop out from RT-PCR assay.

The new multiplex RT-PCR kit developed Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), an Institute of National Importance under the Department of Science and Technology, Government of India targets two SARS CoV2 genes: RdRp and ORFb-nsp14, and the human RNAse P gene as the internal control to help detect a range of mutant strains.

Various studies have shown that RdRp and ORF1b-nsp14 genes are more sensitive in detecting Covid19. In order to target the multiple variants in the second wave, using two highly accurate confirmatory genes like RdRp and ORF-nsp14, can give precise results. The ORFb-nsp14 is one of the least mutated genes in Covid19 and currently, there are no kits in the market with ORF-nsp14 as the target.

The new kit is based on multiplex Taqman chemistry, amplifying all three genes in a single reaction. The amplification time for the assay is 45 minutes, apart from the time required for the RNA isolation from nasopharyngeal swab samples. Multiplexing two confirmatory genes will help shortlist possible new variants if one of the genes fails to amplify and can be marked for sequence analysis.

ICMR has validated this kit at the National Institute of Virology, Pune, and found that it has 97.3% sensitivity and 100% specificity in covid19 detection.

SCTIMST has signed a non-exclusive license MoU with Huwel Lifesciences, Hyderabad, on 14th May 2021 to commercialize the kit.

"This unique RT-PCR kit will be a significant weapon in our fight against COVID-19 by a facile detection of SARS-CoV-2 mutations which are becoming increasingly important," said Secretary, DST, Prof Ashutosh Sharma.

https://pib.gov.in/PressReleasePage.aspx?PRID=1719628

Press Information Bureau
Government of India

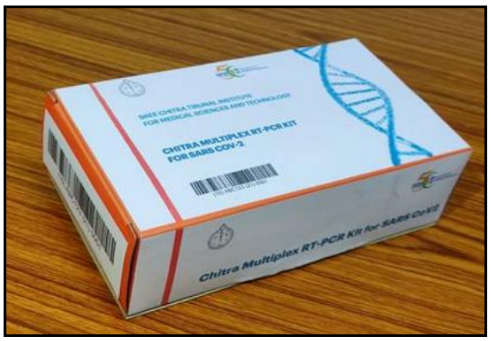
विज्ञान एवं प्रौद्योगिकी मंत्रालय

Tue, 18 May 2021 5:21PM

डीएसटी इंस्टीट्यूट ने कोविड-19 के विभिन्न म्युटेंट स्ट्रेंस का पता लगाने की सुविधा प्रदान करने के लिए नॉवल जीन लक्ष्य के साथ नई मल्टीप्लेक्स आरटी-पीसीआर किट विकसित की

यह विशेष आरटी-पीसीआर किट एसएआरसी-सीओवी-2 म्यूटेशन का आसानी से पता लगाकर कोविड-19 के खिलाफ हमारी लड़ाई में एक महत्वपूर्ण हथियार बनेगा: प्रो आशुतोष शर्मा, सचिव, डीएसटी

वैश्विक महामारी के लिए ज़िम्मेदार कोविड-19 वायरस के विभिन्न म्युटेंट स्ट्रेंस की पहचान करने के मामले में हाल ही में विकसित की गई मल्टीप्लेक्स आरटी-पीसीआर किट काफी ज़्यादा कारगर और सटीक है।



हम जानते हैं कि महामारी की दूसरी लहर कई अलग-अलग म्युटेंट्स के साथ हमें प्रभावित कर रही है, ऐसे में वायरस की सटीकता के साथ पहचान करने के लिए मल्टीप्लेक्स आरटी-पीसीआर जाँच में लक्षित जीन का चयन करना महत्वपूर्ण होता जा रहा है।

वैसे तो कोरोना वायरस अन्य आरएनए वायरस की तुलना में कम त्रुटियां करता है, मगर एस, आर और एन जीन में म्युटेशंस अक्सर आरटी-पीसीआर जाँच में हस्तक्षेप करते हैं। उदाहरण के तौर पर, आरएनए में 6 बेसिस को को हटाने की वजह से "वेरिएंट ऑफ कंसर्न" बी1.1.7 (यूके वेरिएंट के नाम से भी जाना जाता है) में 69-70डेल हैं।

भारत सरकार के विज्ञान एवं प्रौद्योगिकी विभाग के अंतर्गत राष्ट्रीय महत्व के एक संस्थान श्री चित्रा तिरुनल इंस्टीट्यूट फॉर मेडिकल साइंस एंड टेक्नॉलॉजी (एससीटीआईएमएसटी) द्वारा विकसित ये नई मल्टीप्लेक्स आरटी-पीसीआर किट म्युटेंट स्ट्रेंस की एक श्रंखला की पहचान करने के लिए आंतरिक नियंत्रण के तौर पर एसएआसएस सीओवी2 के दो अलग-अलग जीन को टार्गेट करती हैः आरडीआरपी एंड ओआरएफबी-एनएसपी14 और ह्युमन आरएनएसई पी जीन।

कई अध्ययनों से पता चला है कि आरडीआरपी और ओआरएफ1बी-एनएसपी14 जीन कोविड-19 का पता लगाने में अधिक कारगर होते हैं। कोविड की दूसरी लहर में कई वेरिएंट पर निशाना साधने के लिए, आरडीआरपी और ओआरएफ-एनएसपी14 जैसे दो अधिक सटीक जीन का उपयोग करके ज़्यादा सटीक परिणाम दिए जा सकते हैं। ओआरएफबी-एनएसपी14 कोविड-19 में सबसे कम म्युटेटेड जीन में से एक है और वर्तमान में, ओआरएफ-एनएसपी14 की मदद से कोविड का पता लगाने के लिए बाजार में कोई किट उपलब्ध नहीं है।

नई किट मल्टीप्लेक्स टैकमैन केमिस्ट्री पर आधारित है, जो सिंगल रिएक्शन में तीनों जीन को बढ़ाती है। नैसॉफैरिन्जियल स्वैब नमूनों से आरएनए अलगाव के लिए आवश्यक समय के अलावा, जाँच के लिए एम्प्लिफिकेशन समय 45 मिनट है। दो पुष्टिकारक जीन की मल्टीप्लेक्सिंग से संभावित नए वेरिएंट की

पहचान करने में मदद मिलेगी। यदि दो जीन में से कोई एक बढ़ने में विफल हो जाता है तो भी उसे अनुक्रम विश्लेषण के लिए चिन्हित किया जा सकता है।

आईसीएमआर ने इस किट को पुणे स्थित नेशनल इंस्टीट्यूट ऑफ वायरोलॉजी में मान्यता दिलाई है, और जांच के दौरान पाया गया है कि इस किट में कोविड-19 का पता लगाने के मामले में 97.3% संवेदनशीलता और 100% विशिष्टता है।

एससीटीआईएमएसटी ने इस किट के व्यावसायिक इस्तेमाल के लिए 14 मई, 2021 को ह्यूवेल लाइफसाइंसेज, हैदराबाद के साथ एक नॉन-एक्सक्लुसिव लाइसेंस समझौता ज्ञापन पर हस्ताक्षर किए हैं।

विज्ञान एवं प्रौद्योगिकी विभाग के सचिव प्रो आशुतोष शर्मा ने कहा कि "यह विशेष आरटी-पीसीआर किट एसएआरसी-सीओवी-2 म्यूटेशन का आसानी से पता लगाकर कोविड-19 के खिलाफ हमारी लड़ाई में एक महत्वपूर्ण हथियार बनेगा।"

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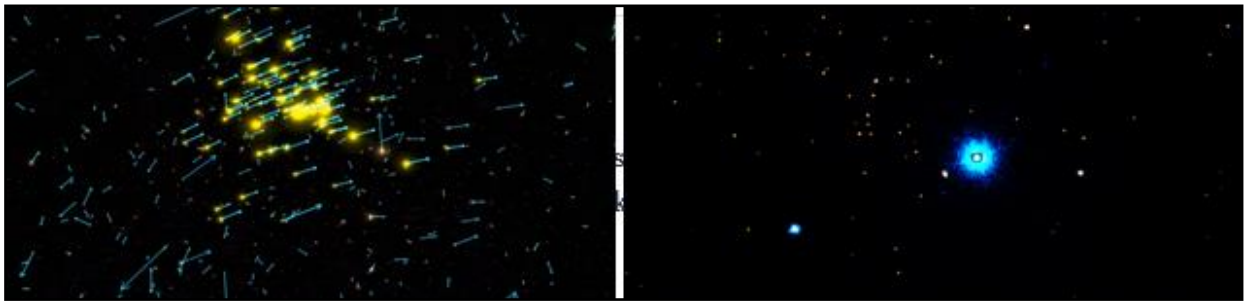
Ministry of Science & Technology

Tue, 18 May 2021 5:51PM

Machine learning helps pick out stars in a crowd

The new Artificial Intelligence based algorithm is very promising in automating and greatly speeding this process and may also find uses in other areas of analysis of patterns in biology and materials science: Secretary, DST, Prof Ashutosh Sharma

Indian Astronomers have developed a new method based on Machine Learning that can identify cluster stars-- assembly of stars physically related through common origin, with much greater certainty. The method can be used on clusters of all ages, distances, and densities. The method has been used to identify hundreds of additional stars for six different clusters up to 18000 light-years away and uncover peculiar stars.



Studying stars and how they evolve is the cornerstone of astronomy. But understanding them is difficult since they are observed at different ages. A star cluster is, therefore, a great place to study stars. All stars in a star cluster have approximately the same age and chemistry, so any differences seen can be attributed to the peculiarities in individual stars with certainty. As the clusters are part of the Milky Way, there are many stars between us and the cluster, so it isn't easy to identify and select the stars of a particular cluster.

A team of Astronomers from Indian Institute of Astrophysics (IIA), an autonomous institute of the Department of Science & Technology, Government of India used European Space Agency (ESA)'s recently released Gaia Early Data Release 3 (EDR3) which gives very accurate information about the brightness, parallax, and proper motion of more than a billion stars with an accuracy of 1 milli-arc-second (equivalent to seeing a person standing on the moon) to pick out the stars that are cluster members.

IIA team identified the crucial measurements for this task and understood the complex relationship between these parameters, using a machine learning technique called Probabilistic Random Forest. This uses a combination of parallax, proper motion, temperature, brightness and other parameters to classify each star as a cluster member or a non-member. The IIA team trained their algorithm using the most likely members from a model called the Gaussian Mixture Model, which can identify clumps of co-moving stars. The Probabilistic Random Forest algorithm then learns how to identify a typical cluster member star and efficiently takes out stars that share only similar proper motions or only similar velocities as the cluster itself. They used 10 parameters to identify members, after performing a trade study of all available parameters in the catalogue.

IIA team used the catalogue of members to identify the hottest stars in the six clusters using ultraviolet images from Ultra-Violet Imaging Telescope (UVIT) on the Indian space observatory 'AstroSat'. This work has been published in the scientific journal 'Monthly Notices of the Royal Astronomical Society'. Their work has already resulted in discovering hot subdwarf-B type stars (compact stars that are very rare) in open cluster King 2. A research paper on the same has been accepted for publication in the *'Journal of Astrophysics and Astronomy'*. The tool helped confirm that these stars are indeed part of the cluster, though showing unexpected properties.

The newly developed method can now identify cluster stars with much greater certainty and pinpoint individual stars that behave differently from their siblings. The team will apply the algorithms to more clusters in the future.

"Manual identification of stars belonging to a star-cluster is a daunting task owing to an armload of data to be analyzed. The new Artificial Intelligence based algorithm is very promising in automating and greatly speeding this process and may also find uses in other areas of analysis of patterns in biology and materials science," said Prof Ashutosh Sharma, Secretary, DST.

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विज्ञान एवं प्रौद्योगिकी मंत्रालय

Tue, 18 May 2021 5:51PM

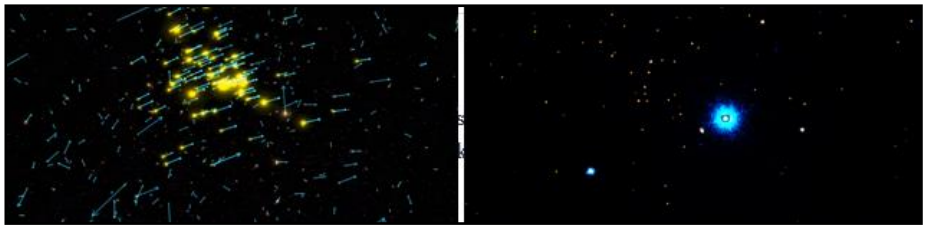
मशीन लर्निंग समूह में भी तारों को चुनने में सहायता कर सकती है

नई आर्टिफिसियल इंटेलीजेंस आधारित एल्गोरिद्म से इस प्रक्रिया की ऑटोमेटिंग होने तथा इसमें तेजी आने की बहुत संभावना है और इसका जीवविज्ञान तथा मैटेरियल्स साईंस में पैटर्न के विश्लेषण के अन्य क्षेत्रों में भी उपयोग हो सकता है: डीएसटी सचिव प्रो. आशुतोष शर्मा

भारतीय खगोल वैज्ञानिकों ने मशीन लर्निंग पर आधारित एक नई पद्धति का विकास किया है जो समूह तारों अर्थात तारों का जमाव जो बहुत अधिक निश्चिंतता के साथ समान उत्पति के जरिये संबंधित हो, की पहचान कर सकती है। इस पद्धति का उपयोग सभी उम्रों, दूरियों और घनत्वों के क्लस्टरों पर किया जा सकता है। इस पद्धति का उपयोग 18000 प्रकाश वर्ष दूर तक के छह विभिन्न क्लस्टरों के लिए सैकड़ों अतिरिक्त तारों की पहचान के लिए तथा अनोखे तारों का पता लगाने के लिए किया गया है।

तारों और किस प्रकार उनका उद्भव हुआ, का अध्ययन करना खगोल विज्ञान की आधारशिला है। लेकिन उन्हें समझना कठिन है क्योंकि उन्हें विभिन्न कालों में देखा जाता है। इसलिए, तारों का अध्ययन करने के लिए तारों का समूह (स्टार क्लस्टर) एक शानदार जगह है। स्टार क्लस्टर के सभी तारों की लगभग समान उम्र और कैमिस्ट्री होती है, इसलिए देखी गई किसी भी विभिन्नता को निश्चिंतता के साथ अलग अलग तारों की विशेषता के लिए जिम्मेदार ठहराया जा सकता है। चूंकि क्लस्टर आकाश गंगा के हिस्से होते हैं,

क्लस्टर और हमारे बीच कई तारे हैं और इसलिए किसी विशेष क्लस्टर के तारों की पहचान करना तथा उन्हें चुनना आसान नहीं है।



भारत सरकार के विज्ञान एवं प्रौद्योगिकी विभाग के एक स्वायत्तशासी संस्थान इंडियन इंस्टीच्यूट ऑफ एस्ट्रोफिजिक्स (आईआईए) के खगोल वैज्ञानिकों की एक टीम ने यूरोपियन स्पेस एजेंसी (ईएसए) की हाल ही में जारी गाईआ अर्ली डाटा रिलीज 3 (ईडीआर 3) का उपयोग किया जो ऐसे तारों को चुनने के लिए जो क्लस्टर मेंबर हैं, 1 मिली-आर्क--सेकेंड (चांद पर खड़े किसी व्यक्ति को देखने के समतुल्य) की सटीकता के साथ एक बिलियन से अधिक तारों की चमक, पैरालैक्स तथा समुचित गति के बारे में बहुत सटीक जानकारी देती है।

आईआईए टीम ने इस कार्य के लिए महत्वपूर्ण मापों की पहचान की और प्रोबैबिलिस्टक रैंडम फॉरेस्ट नामक एक मशीन लर्निंग टेक्निक का उपयोग करते हुए इन मानकों के बीच जटिल संबंध को समझा। यह एक क्लस्टर मेंबर या एक गैर मेंबर के रूप में प्रत्येक तारे को वर्गीकृत करने के लिए पैरालैक्स, समुचित गति, तापमान, चमक तथा अन्य मानकों के संयोजन का उपयोग करता है। आईआईए टीम ने गौसियन मिक्स्चर मॉडल, जो को-मूविंग स्टार्स के क्लंप्स की पहचान कर सकता है, नामक एक मॉडल के सबसे अधिक संभावित मेंबरों का उपयोग करते हुए अपने एल्गोरिद्म को प्रशिक्षित किया। इसके बाद, प्रोबैबिलिस्टक रैंडम फॉरेस्ट एल्गोरिद्म सीखता है कि किस प्रकार एक विशिष्ट क्लस्टर मेंटर तारे की पहचान की जाए और प्रभावी तरीके से उन तारों को अलग किया जाए जो केवल समान उचित गति या खुद क्लस्टर की ही तरह समान वेगों को साझा करते हैं। उन्होंने सूचीपत्र में सभी उपलब्ध मानकों का एक ट्रेड स्टडी करने के बाद मेंबरों की पहचान के लिए 10 मानकों का उपयोग किया।

आईआईए टीम ने भारतीय अंतरिक्ष वेधशाला 'एस्ट्रोसैट' पर अल्ट्रा-वायलेट इमेजिंग टेलीस्कोप (यूवीआईटी) से अल्ट्रावायलेट इमेज का उपयोग करते हुए छह क्लस्टर में सबसे गर्म तारे की पहचान करने के लिए मेंबरों की सूचीपत्र का उपयोग किया। यह शोधपत्र वैज्ञानिक जर्नल 'मंथली नोटिसेज ऑफ द रायल एस्ट्रोनोमिकल सोसाइटी' में प्रकाशित किया गया है। उनके कार्य का परिणाम पहले ही ओपेन क्लस्टर किंग 2 में सबड्वार्फ-बी प्रकार के तारों (कांपैक्ट तारे जो बहुत दुर्लभ होते हैं) की खोज के रूप में सामने आ चुका है। इसी पर एक शोध पत्र को 'जर्नल ऑफ एस्ट्रोफिजिक्स एंड एस्ट्रोनोमी' में प्रकाशन के लिए स्वीकृत किया गया है। इस टूल ने इसकी पुष्टि में सहायता की कि ये तारे वास्तव में क्लस्टर के हिस्से हैं, हालांकि अनपेक्षित गुणधर्म प्रदर्शित करते हैं।

इस नई विकसित पद्धति अब अधिक विश्वसनीयता के साथ क्लस्टर तारों की पहचान कर सकती है और उस विशिष्ट तारे को ठीक तरीके से निर्धारित कर सकती है जो अपने सहोदरों (सिबलिंग्स) से अलग बर्ताव करती है। यह टीम भविष्य में और अधिक क्लस्टरों पर एल्गोरिद्म को लागू करेगी।

डीएसटी के सचिव प्रो. आशुतोष शर्मा ने कहा कि, 'किसी स्टार-क्लस्टर से संबंधित तारों की मैनुअल पहचान करना, खासकर यह देखते हुए कि कितने अधिक डेटा का विश्लेषण किया जाना है, एक दुष्कर कार्य है। नई आर्टिफिसियल इंटेलीजेंस आधारित एल्गोरिद्म से इस प्रक्रिया की ऑटोमेटिंग होने तथा इसमें तेजी आने की बहुत संभावना है और इसका जीव विज्ञान तथा मैटेरियल्स साईंस में पैटर्न के विश्लेषण के अन्य क्षेत्रों में भी उपयोग हो सकता है। '

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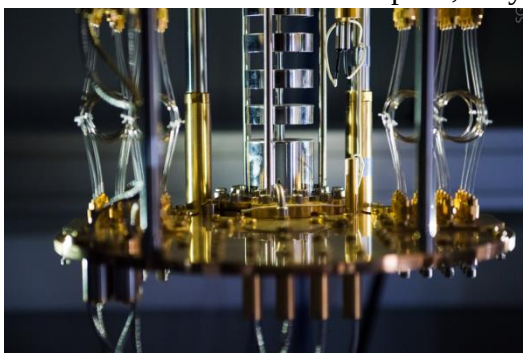
Wed, 19 May 2021

Scientists get photons to interact, taking a step towards long-living quantum memory

Scientists believe that individual light particles, or photons, are ideally suited for sending quantum information. Encoded with quantum data, they could literally transfer information at the speed of light. However, while photons would make for great carriers because of their speed, they don't like to interact with each other, making it difficult to achieve quantum entanglement.



Quantum computer. Credit: Sergey Gnuskov/NUST MISIS

An international research team from NUST MISIS, Russian Quantum Center, the Ioffe Institute St. Petersburg and Karlsruhe Institute of Technology has obtained experimental evidence for effective interaction between microwave photons via superconductive qubits for the first time. The study, published in *npj Quantum Materials*, may be a step toward the implementation of a long-living quantum memory and the development of commercial quantum devices.

In their experiments, the researchers used photons with the frequency of a few GHz and the wavelength of a few centimeters.

"We used superconducting cubits, which are basically artificial atoms, because they have been proven to strongly interact with light. Interaction between natural atoms and natural light is weak due to the small size of natural atoms. Superconducting cubits are man-built; their size can reach up to 0.1 mm, which makes it possible to significantly increase their dipole moment and polarity, engineering strong interaction between light and matter," said Prof. Alexey Ustinov, head of the Laboratory for Superconducting Metamaterials at NUST MISIS and Group Head at Russian Quantum Center, who co-authored the study.

Superconducting qubits represent a leading qubit modality that is currently being pursued by industry and academia for quantum computing applications. However, they require milli-Kelvin (mK) temperatures to operate. The most powerful of the existing superconducting quantum devices contains under 100 qubits. As you add qubits, the number of operations a quantum computer can perform grows exponentially, but the maximum number of qubits that can be integrated in a quantum computer is limited by the size of refrigerators used to cool them down to operational temperatures. Taking this into account, the efforts of the scientific community have been recently focused on increasing the processing power of a quantum computer by transmitting quantum signals from one refrigerator to another. To engineer this transmission, the scientists coupled an array of eight superconducting transmon qubits to a common waveguide—a structure that guides waves, e.g., light waves.

"By employing dedicated flux-bias lines for each qubit, we establish control over their transition frequencies. It was derived and experimentally verified that multiple qubits obtain an infinite range photon mediated effective interaction, which can be tuned with the inter-qubit distance," says Alexey Ustinov.

The circuit of this work extends experiments with one and two qubits toward a full-blown quantum metamaterial, thus paving the way for large-scale applications in superconducting waveguide quantum electrodynamics.

More information: Jan David Brehm et al. Waveguide bandgap engineering with an array of superconducting qubits, *npj Quantum Materials* (2021). DOI: 10.1038/s41535-021-00310-z

https://phys.org/news/2021-05-scientists-photons-interact-long-living-quantum.html

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Wed, 19 May 2021

'Cohesion researchers' unravel the mystery of hydrogen effects on materials

Hydrogen is considered an important energy carrier with the potential to reshape the energy landscape in the future. Distributing large amounts of hydrogen requires safe steel pipelines. Steel pipelines can become brittle due to hydrogen and can therefore break. Fascinated by this urgent problem, Carey Walters (MTT), Othon Moultos (P&E) and Poulumi Dey (MSE) joined forces and turned to the cohesion programme to work on this together.

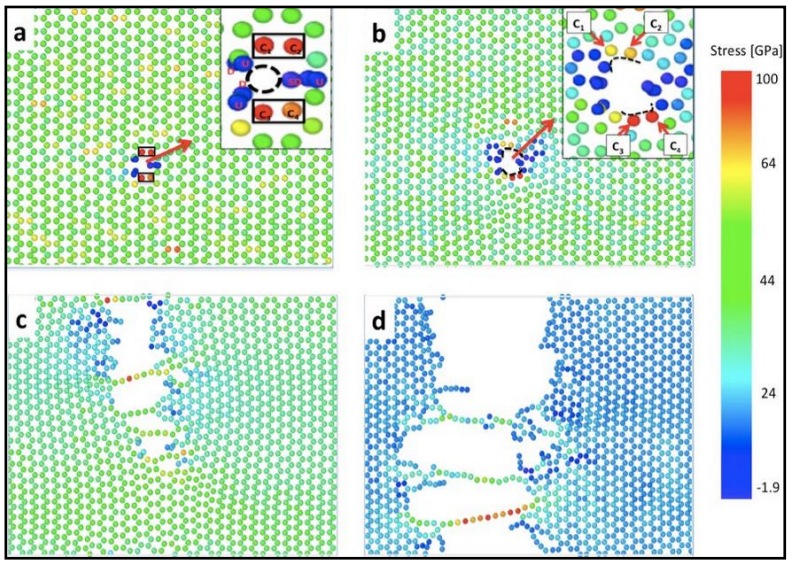

Fig. 2. Molecular Dynamics simulation snapshots of stress concentration, bond breaking, crack nucleation and growth at 300 K in a single vacancy containing graphene sheet with the vacancy edge functionalized with six hydrogen atoms. Carbon and Hydrogen atoms are colored according to the corresponding atomic stresses. (a) Stress distribution in the hydrogenated graphene sheet prior to bond breaking. The orientations of the hydrogen atoms are denoted by "U" for up, "D" for down and "SD" for slightly down. (b) Breaking of the sp2-hybridized C–C bonds near the hydrogenated vacancy. (c) Crack growth along the y-direction originating from the hydrogenated vacancy. (d) Successive debonding of sp2-hybridized C–C bonds along the armchair direction leading to the fracture of the graphene sheet. Credit: Delft University of Technology

They collaborated with Abdelrahman Hussein and Gagus Ketut to investigate the cause of the brittleness, and obtain new insights into the complex underlying physical phenomena. Their results aim to improve the storage, distribution and usability of hydrogen. The results are recently published open-access in *Acta Materialia* and the *International Journal of Hydrogen Energy*.

Othon Moultos, assistant professor engineering thermodynamics, says, "Poulumi, Carey and I have been working on the hydrogen storage and distribution issue for some time, albeit at different scales. Bringing together our expertise from the different fields of maritime technology, materials science and process technology seemed a logical move. As a result, we were able to investigate hydrogen and its distribution at a multi-scale level, ranging from the atomistic up to the macroscale. We gained useful knowledge about the efficient storage and resistance of high-strength steels to hydrogen embrittlement. Our research has also motivated the preparation of a new NWO proposal which is supported from important industrial stakeholders in hydrogen distribution. This cohesion project is certainly laying the foundation for a more extensive and enduring partnership."

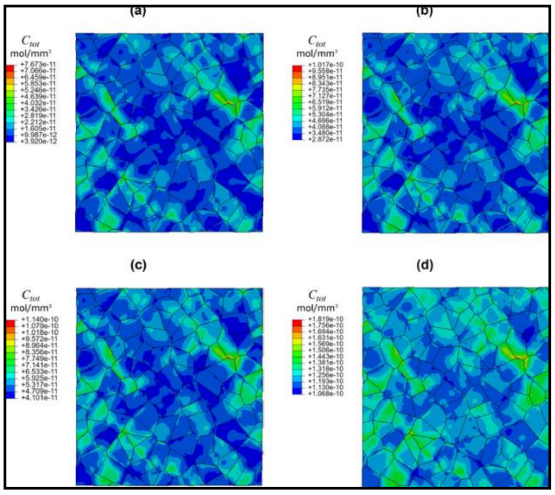

Fig. 1. Total hydrogen distribution in steel after 3% tensile strain loading corresponding to hydrogen pressure of (a) 1 bar, (b) 100 bar, (c) 200 bar and (d) 1000 bar. Credit: Delft University of Technology

Abdelrahman Hussein, postdoc in ship and offshore structures, says, "We used RVE and crystal plasticity to show how micromechanical stresses accumulate hydrogen at grain boundaries. We also show how increasing yield strength results in higher localization of hydrogen, increasing the susceptibility to damage. This virtual framework can increase our understanding of hydrogen embrittlement and speed up developing hydrogen resistant alloys."

More information: Gagus Ketut Sunnardianto et al. Efficient hydrogen storage in defective graphene and its mechanical stability: A combined density functional theory and molecular dynamics simulation study, *International Journal of Hydrogen Energy* (2020). DOI: 10.1016/j.ijhydene.2020.11.068

Abdelrahman Hussein et al. The effect of hydrogen content and yield strength on the distribution of hydrogen in steel: a diffusion coupled micromechanical FEM study, *Acta Materialia* (2021). DOI: 10.1016/j.actamat.2021.116799

Journal information: *International Journal of Hydrogen Energy*

https://phys.org/news/2021-05-cohesion-unravel-mystery-hydrogen-effects.html

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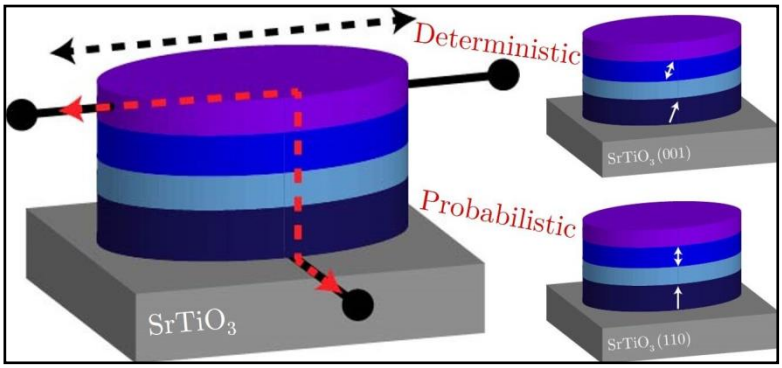
New material could create 'neurons' and 'synapses' for new computers

Classic computers use binary values (0/1) to perform. By contrast, our brain cells can use more values to operate, making them more energy-efficient than computers. This is why scientists are interested in neuromorphic (brain-like) computing. Physicists from the University of Groningen (the Netherlands) have used a complex oxide to create elements comparable to the neurons and synapses in the brain using spins, a magnetic property of electrons. Their results were published on 18 May in the journal *Frontiers in Nanotechnology*.

Although computers can do straightforward calculations much faster than humans, our brains outperform silicon machines in tasks like object recognition. Furthermore, our brain uses less energy than computers. Part of this can be explained by the way our brain operates: whereas a computer uses a binary system (with values 0 or 1), brain cells can provide more analogue signals with a range of values.



Schematic of the proposed device structure for neuromorphic spintronic memristors. The write path is between the terminals through the top layer (black dotted line), the read path goes through the device stack (red dotted line). The right side of the figure indicates how the choice of substrate dictates whether the device will show deterministic or probabilistic behaviour. Credit: Banerjee group, University of Groningen

Thin films

The operation of our brains can be simulated in computers, but the basic architecture still relies on a binary system. That is why scientist look for ways to expand this, creating hardware that is more brain-like, but will also interface with normal computers. "One idea is to create magnetic bits that can have intermediate states," says Tamalika Banerjee, Professor of Spintronics of Functional Materials at the Zernike Institute for Advanced Materials, University of Groningen. She works on spintronics, which uses a magnetic property of electrons called 'spin' to transport, manipulate and store information.

In this study, her Ph.D. student Anouk Goossens, first author of the paper, created thin films of a ferromagnetic metal (strontium-ruthenate oxide, SRO) grown on a substrate of strontium titanate oxide. The resulting thin film contained magnetic domains that were perpendicular to the plane of

the film. "These can be switched more efficiently than in-plane magnetic domains," explains Goossens. By adapting the growth conditions, it is possible to control the crystal orientation in the SRO. Previously, out-of-plane magnetic domains have been made using other techniques, but these typically require complex layer structures.

Magnetic anisotropy

The magnetic domains can be switched using a current through a platinum electrode on top of the SRO. Goossens: "When the magnetic domains are oriented perfectly perpendicular to the film, this switching is deterministic: the entire domain will switch." However, when the magnetic domains are slightly tilted, the response is probabilistic: not all the domains are the same, and intermediate values occur when only part of the crystals in the domain have switched.

By choosing variants of the substrate on which the SRO is grown, the scientists can control its magnetic anisotropy. This allows them to produce two different spintronic devices. "This magnetic anisotropy is exactly what we wanted," says Goossens. "Probabilistic switching compares to how neurons function, while the deterministic switching is more like a synapse."

The scientists expect that in the future, brain-like computer hardware can be created by combining these different domains in a spintronic device that can be connected to standard silicon-based circuits. Furthermore, probabilistic switching would also allow for stochastic computing, a promising technology which represents continuous values by streams of random bits. Banerjee: "We have found a way to control intermediate states, not just for memory but also for computing."

More information: A. S. Goossens et al, Anisotropy and Current Control of Magnetization in $SrRuO_3/SrTiO_3$ Heterostructures for Spin-Memristors, *Frontiers in Nanotechnology* (2021). DOI: 10.3389/fnano.2021.680468

https://phys.org/news/2021-05-material-neurons-synapses.html

PURDUE UNIVERSITY

Wed, 19 May 2021

The COVID-19 virus may not insert genetic material into human DNA, research shows

WEST LAFAYETTE, Ind. — The virus that causes COVID-19, which scientists refer to as SARS-CoV-2, likely does not integrate its genetic material into the genes of humans, according to a study published in the Journal of Virology.

A separate study recently reported the virus's genetic material was found to have integrated into human DNA in cells in petri dishes. But the scientists conducting the newer research now say that result was most likely caused by genetic artifacts in the testing.

Majid Kazemian, a Purdue University assistant professor of biochemistry and computer science and one of the three co-lead authors on the research study, said that this finding has two important implications.

The virus that caused COVID-19 likely does not integrate its genetic material into the human genome, research says. Although throughout human history there have been viruses capable of integrating their genetic material into human genes, this new study found that the COVID-19 virus, which is known to scientists as SARS-CoV-2, lacks the molecular machinery to integrate its RNA into human DNA. "Our work does not support the claim that SARS-CoV-2 fuses or integrates into human genomes," says Purdue scientist and co-lead author Majid Kazemian, pictured here. (Purdue University photo/Rebecca McElhoe)

"Relatively little is known about why some individuals persistently test positive for the virus even long after clearing the infection. This is important because it's not clear whether such individuals have been re-infected or whether they continue to be infectious to others. So-called 'human genome invasion' by SARS-CoV-2 has been suggested as an explanation for this observation, but our data do not support this case.

"If the virus was able to integrate its genetic material into the human genome, that could have meant that any other mRNA could do the same. But because we have shown that this is not supported by current data, this should allay any concerns about the safety of mRNA vaccines, he said."

It is possible for the genetic material of some viruses to be incorporated into the DNA of humans and other animals, resulting in what scientists call "chimeric events." Human DNA contains approximately 100,000 pieces of DNA from viruses that our species have accumulated over millions of years of evolution. In total, this lost-and-found DNA from viruses makes up a bit less than 10% of the genetic material in our cells.

Recent scientific journal articles have claimed that the SARS-CoV-2 virus can also cause these chimeric events. Even before this new research team conducted experiments showing this was not the case, the researchers suspected it was unlikely, said Dr. Ben Afzali, an Earl Stadtman Investigator of the National Institutes of Health's National Institute of Diabetes and Digestive and Kidney Diseases and a co-lead author on the study.

"While an earlier study suggested that, in cells infected with SARS-CoV-2, genetic material from the virus copied and pasted itself into human DNA, our group thought this seemed unlikely," Afzali said. "SARS-CoV-2, like HIV, has its genetic material in the form of RNA but, unlike HIV,

does not have the machinery to convert the RNA into DNA. SARS-CoV-2 is unlikely to paste itself into the genome and coronaviruses, in general, does not go near human DNA. As our study shows, we find it highly improbable that SARS-CoV-2 could integrate into the human genome."

Christiane Wobus, associate professor of microbiology and immunology at the University of Michigan Medical School, also a co-lead author on the study, said that although the collective understanding of RNA viruses is that integration of SARS-CoV-2 into the human genome would be very unlikely, it was important to examine the question.

"Unexpected findings in science — when confirmed independently — lead to paradigm shifts and propel fields forward. Therefore, it is good to be open-minded and examine unexpected results carefully, which I believe we did in our study," she said. "However, we did not find conclusive evidence for SARS-CoV-2 integration, but instead showed that during the RNA sequencing methodology, chimeras are produced at a very low level as an artifact of the laboratory technique."

To examine the proposed integration event, the researchers developed a novel technique in which they extracted the genetic material from infected cells and then amplified or reproduced the genetic material 30-fold. If there were chimeric events in the host cell DNA, these bits of genetic material from SARS-CoV-2 should also increase 30 times. The data did not show this.

"We found the frequency of host-virus chimeric events was, in fact, not greater than background noise," Kazemian said. "When we enriched the SARS-CoV-2 sequences from the bulk RNA of infected cells, we found that the chimeric events are, in all likelihood, artifacts. Our work does not support the claim that SARS-CoV-2 fuses or integrates into human genomes."

This research was supported by the National Institute of General Medical Sciences of the National Institutes of Health (NIH) grant R35GM138283 and in part by the National Institute of Diabetes and Digestive and Kidney Diseases, project number ZIA/DK075149, and the National Institute of Allergy and Infectious Diseases, project number ZIA/AI001175.

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https://www.purdue.edu/newsroom/releases/2021/Q2/the-covid-19-virus-may-not-insert-genetic-material-into-human-dna,-research-shows.html