

# CSIR IN MEDIA



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*The Innovation Engine of India*

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## Successful Teacher Training Workshop on "Nano Quest - A journey of exploration through nanoworld" at CSIR-CSIO, Chandigarh in association with KAMP and CBSE

CSIR-CSIO, NIScPR

20<sup>th</sup> November , 2023



A specialized Teacher Training Workshop convened at CSIR-CSIO in Chandigarh on November 20th, 2023 marked a significant milestone in the realm of science education. The workshop, organized as part of Knowledge and Awareness Mapping Platform (KAMP)'s third Continuous Professional Development (CPD) program for educators in collaboration with the CSIR – Central Scientific Instruments Organization (CSIO) and Central Board of Secondary Education (CBSE), brought together over 40 enthusiastic teachers from diverse schools.

The central theme of the workshop, "Nano Quest – A Journey of Exploration through Nanoworld," underscored the commitment of educators to enhance their knowledge and teaching skills in the field of science education. The diverse training modules covered various facets of science education, providing a unique opportunity for educators to learn from esteemed scientists and experts associated with CSIR-CSIO, Chandigarh.

Dr. Sachin Tyagi, Principal Scientist at CSIR-CSIO, delivered an enlightening technical session on “माइक्रोवेव अवशोषण अनप्रयोग - “माइक्रोवेव अवशोषण अनुप्रयोग - चुभंकीय सामग्री आधारित त समिश्रण” which translates to "Microwave Absorption Applications –



Magnetic Material Based Composites." The workshop also featured a session by Dr. Abhay Sachdev, Senior Scientist at CSIR-CSIO, exploring the "Prospects and Applications of Nanomedicines." In a practical turn, Dr. B. Sreekanth and Dr. Inderpreet Kaur, scientists from CSIR-CSIO, guided teachers on Environmental Monitoring, providing insights into skill development in a scientific context.

Mr. Dhiraj Singh Rajput, Regional Head of KAMP and Mr. Kaushal Payal, Regional Manager of KAMP captivated the audience with an in-depth presentation on the KAMP, an initiative of CSIR-NIScPR and NCPL. Stressing the importance of science education beyond textbooks and classrooms. Mr. Dheeraj emphasized the need for a dynamic and immersive experience that encourages students to question, explore, and innovate.

The workshop served as a platform for educators and administrators to gain fresh perspectives on science education, exchange ideas on effective teaching strategies, and align with the latest developments in the field. The collective knowledge and experience shared by the scientists promise to leave a lasting impact on the future of science education.

Continuous Professional Development programs of this nature play a vital role in equipping teachers with the latest tools and knowledge to enrich the learning experiences of their students. Beyond enhancing educators' understanding of scientific concepts, these initiatives aim to spark a profound enthusiasm for scientific exploration in students.

#### About CSIR-CSIO:

CSIR-Central Scientific Instruments Organisation (CSIO) is a premier national laboratory dedicated to the research, design, and development of scientific and industrial instruments. As a multi-disciplinary and multi-dimensional apex industrial research & development organization, CSIO stimulates the growth of the Instrument Industry in India.

#### About CBSE (Training/Capacity Building Programmes):

CBSE is committed to addressing quality concerns in school education, prioritizing the



development of teachers and principals. The Board provides various training programs to enhance their understanding of curriculum, delivery mechanisms, and other professional qualities.

#### About KAMP:

KAMP is an Initiative and Knowledge Alliance of CSIR-National Institute of Science Communication and Policy Research (NIScPR) and industrial partner M/S Nysa Communications Pvt. Ltd. (NCPL). It aims to develop creativity, meaningful learning, critical reading, and thinking skills, bringing out the inherent abilities of students.



## Marine life faces threat as Arabian Sea heats up, intensifies cyclones, says NIO

CSIR-NIO

20<sup>th</sup> November , 2023

In a recent revelation by experts at the CSIR-National Institute of Oceanography (NIO) concerning trends in the Arabian Sea, a dramatic rise in sea surface temperatures has been detected across key regions. The primary factors contributing to this trend are attributed to a decrease in wind speed and the influx of 'spicy' waters from the Red Sea and the Persian Gulf. Senior scientist Kukkapalli Maneesha, who led the research, unveiled findings



highlighting a marked increase in the heat content of the 50m surface layer.

This upsurge in temperature and salinity levels has stirred significant concerns regarding its impact on marine life and ecosystems. The influx of 'spicy' waters has introduced a disruption in the delicate balance of the marine environment.

The altered temperature and salinity conditions have led to the emergence of a phenomenon known as 'salt fingering'. This occurrence influences substantial vertical variations in the heat and salt flux and thereby significantly impacts the ocean's composition.

“The introduction of warm and saltier 'spicy' waters can disrupt the temperature and salinity profiles of the Arabian Sea, potentially inducing thermal stress on coral reefs, leading to coral bleaching,” said Maneesha. Moreover, the altered temperature and salinity conditions can influence the distribution and migration patterns of marine species.

“Some commercially-valuable fish species may become more abundant due to favourable



conditions, while others may decline. This can disrupt traditional fishing patterns and affect the livelihoods of fishing communities,” she said. “Spicy waters can lead to shifts in the abundance and composition of planktonic species, which form the base of the marine food web. These changes can have cascading effects on higher trophic levels, including fish and other marine organisms.

Highlighting broader implications, Maneesha shed light on the climatological impact of these intrusive waters.

“Spicy waters, characterised by higher temperatures and salinity, can significantly affect weather patterns, ocean circulation, marine ecosystems, and local climate dynamics,” she said, adding that the increased thermal anomaly in the northern Arabian Sea may potentially amplify the frequency and strength of cyclone formation.

In essence, the intrusion of ‘spicy’ waters into the Arabian Sea poses multifaceted challenges, threatening marine ecosystems, fisheries, coastal communities, and even local weather patterns.



## INCOIS 'SAM' study to understand fair weather patterns on seas for maritime activities

CSIR-NIO

19<sup>th</sup> November , 2023

Indian National Centre for Ocean Information Services (INCOIS), under the Ministry of Earth Sciences (MoES), has discovered that the Southern Annular Mode (SAM), an important climate pattern, plays a pivotal role in shaping the sea conditions across the Indian Ocean. Scientists, who have been studying the SAM climate pattern and trying to understand how it shapes the wave patterns over extended time frames, state that it could help the country in better coastal planning, resource management and also in disaster preparedness.



Their study's findings can also contribute to advancing the accuracy of wave predictions and can help identifying fair weather windows, thus benefitting the fisherfolk community and blue economy stake holders such as shipping, maritime boards and oil industry for their multi-million dollars worth operations at sea.

INCOIS scientists said that it is important to study ocean surface waves as they play a crucial role in shaping the coastal processes, and influencing numerous aspects of society, including shoreline erosion, sediment transport, coastal engineering and recreational activities.

### Positive and Negative SAM

The scientific team used the 40-year data (1979 to 2018) from the European Centre for Medium-Range Weather Forecast to analyse seven parameters such as wave height, wave period and wind speed for the study.



They found that during a positive SAM phase, a cyclic pattern of warm sea surface temperature anomalies was seen, and strong winds caused increased wave activity in Indian Ocean. They also found a new swell generation region along the east African coast, which caused an increase in wave height in the Arabian Sea.

On the other hand, during a negative SAM phase, the eastern tropical southern Indian Ocean becomes the main region for generating swells, resulting in reduced wave heights in the Arabian Sea.

“Generally, inland vessel operations and oil exploration activities have a blanket ban during the monsoon season. By predicting the SAM phases in Ocean forecasting System, we can identify ‘Fair Sea state windows’ in monsoons. These fair windows can be utilised by oil and shipping industries for their operations, thus making a huge impact in the blue economy activities in the Indian coast,” said INCOIS group director and co-author of the paper T. M. Balakrishnan Nair.

His collaborating scientific colleagues have been Meenakshi Sreejith, P. G. Remya, B. Praveen Kumar and CSIR-National Institute of Oceanography’s G. Srinivas. The paper titled ‘Impact of southern annular mode on the Indian Ocean surface waves’ was published last month in the ‘International Journal of Climatology’.



## Queen of Tadoba' found dead, may have died of natural causes

CSIR-CCMB

19<sup>th</sup> November , 2023

Maya tigress, known as the 'Queen of Tadoba' and one of the most popular tigresses in India, has been found dead in the Tadoba Andhari Tiger Reserve (TATR) in Maharashtra. She may have died of natural causes, said Maharashtra Forest Department officials.

Officially known as T-12, Maya was one of the star tourist attractions of the TATR. She had been missing since August 25, and tiger reserve authorities had launched large-scale search operations to ascertain her whereabouts.

Dr. Jitendra Ramgaonkar, Conservator of Forest and Field Director of TATR, said, "The skeleton of a tiger skeleton was found in compartment number 82 of the tiger reserve on Saturday morning. The body parts were in a very advanced stage of decomposition and not fit for autopsy."

The remains of the skeleton, which were scattered over a 100m radius, were collected and will be sent for DNA analysis to National Centre for Biological Sciences (NCBS), Bengaluru and Centre for Cellular and Molecular Biology (CCMB), Hyderabad. They will be matched with DNA samples of T-12 collected during an ongoing scientific study. The reports are expected to arrive by November 30. A final statement regarding the status of T 12 shall be made on receipt of DNA analysis report, Ramgaonkar added.

According to TATR authorities, Maya was a dominant tigress of Pandharpawani area of core area of the tiger reserve. She was born in December 2010 to a tigress known as Leela and a male tiger known as Hiltop tiger.

Since June 2014, Maya gave birth five times (2015, 2017, 2020, and 2022) and contributed 13 cubs in total, most of which, except for four cubs from the second and third litters, did not



survive to breeding age for various natural reasons. She has been continuously captured in systematic camera trap exercises since 2014 and was last captured on camera traps during the phase IV exercise from March to May 2023.

Maya's last direct sighting was in August by TATR patrolling staff in the Panchdhara area near Tadoba Lake. In order to ascertain her presence, large-scale intensive monitoring operations were launched in her known territory from October 7 with the help of camera traps and regular patrolling.

The entire area of Tadoba and Kolara ranges, known to be her territory and movement area, was covered during this exercise. In the process, 10 different tigers (6 females and 7 males), were captured in her territory since October 7, 2023. However, Maya was not captured in the area, giving rise to the possibility of her absence in the area.

As a last resort, an intensive foot patrolling cum combing operation was carried out from November 16 to 18 with the help of all the frontline staff of TATR core area, Special Tiger Protection Force units and protection camp patrolling staff. A total of 150 staff members took part in the combing operations.



## CIMFR celebrates 77th foundation day

CSIR-CIMFR

18<sup>th</sup> November , 2023

Central Institute of Mining and Fuel Research, a premier research institute of CSIR, celebrated its 77th foundation day on Friday. Chief guest DG of Geological Survey of India Janardan Prasad lauded the role of CIMFR in the field of coal analysis and its several achievements and emphasized the necessity of continued R&D efforts in alliance with GSI for further advancements.

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## UP govt signs MoUs with CSIR, DRDO to promote research in medical sector

CSIR

17<sup>th</sup> November , 2023

The Yogi government in Uttar Pradesh is focusing on connecting the proposed Bulk Drugs Park in Lalitpur with technology along with research and innovation to provide high-quality and affordable medicines and medical devices.

For this, the government has linked big institutions of the Government of India like the Council of Scientific and Industrial Research (CSIR) and Defense Research and Development Organization (DRDO) with the Bulk Drug Park and made them its knowledge partners, according to the release.

It is noteworthy that as per the intention of CM Yogi, Bulk Drugs Park is being prepared as per international standards so that not only India but 196 countries worldwide can benefit from it and have access to affordable medicines and medical devices.

Moreover, the Yogi government has organized an Investors Connect webinar and signed an MOU with around 1,500 stakeholders to make the state a hub for the medical sector with the latest technology.

Research and innovation will get a boost in Lalitpur Bulk Drugs Park, CSIR and DRDO to become knowledge partners Yogi govt will provide medicines and medical devices to the country and worldwide at high quality and affordable cost.

In order to make Lalitpur's Bulk Drugs Park high-tech, the Yogi government has made the country's renowned research institutions, CSIR and DRDO, knowledge partners, which will also enhance research and innovation in the medical sector. It will further enable the development of innovative devices through new technology, allowing for quick diagnosis of serious illnesses and ensuring proper treatment.



Under this, the state government has signed MoUs with 43 labs of CSIR and 46 labs of DRDO, where research work will be done to manufacture affordable medicines. Discussions are also underway with the Biotechnology Department for knowledge tie-ups. Additionally, Adani Gas has been chosen as the PNG supply partner to create a nature-friendly zone for Bulk Drugs Park, while THDC has been selected as the solar power partner.

Moreover, CONCOR has been made the logistics partner, playing a crucial role in distributing medicines and medical devices nationally and internationally. Along with this, STPI will support Industry 4.0 to establish global recognition for the medical units in the park. Furthermore, Invest UP has been given the responsibility for policy support so that everyone can get the benefits of the new pharma policy of the Yogi government.

Yogi govt also organizes stakeholder meets to provide world-class facilities to entrepreneurs in Bulk Drugs Park.

The Yogi government organized stakeholder meetings with about 150 stakeholders from India and abroad to provide world-class facilities to entrepreneurs in Bulk Drugs Park. These meets took place in Hyderabad, Mumbai, Japan, and America.

In these meetings, approximately 1505 stakeholders have signed MoUs to share their technology. Additionally, the Yogi government has decided to establish a Software Technology Park to strengthen the backbone of the medical sector's IT infrastructure.



## Fern proteins fight crop pests, could usher in potent new insecticides

CSIR-NBRI

17<sup>th</sup> November , 2023

The pretty ferns that adorn windowsills and gardens have some surprising powers. Biologists have long known that this ancient group of plants wards off hungry insects better than other flora, and now they're homing in on why. They've discovered fern proteins that kill and deter pests, including, most recently, one that shows promise against bugs resistant to widely used natural pesticides.

The new protein, described last month in the Proceedings of the National Academy of Sciences (PNAS), adds to a growing arsenal that could one day provide a fresh alternative to chemical insecticides. "These proteins have great potential and may represent a new mode of pesticide action," says Juan Luis Jurat-Fuentes, an entomologist at the University of Tennessee, Knoxville. They are exciting, says Kristina Sepčić, a biochemist at the University of Ljubljana, because they "have proven to be active against insect [populations] resistant to certain bacterial toxins." Since the late 1930s, proteins isolated from a soil bacterium called *Bacillus thuringensis* (Bt) have become a mainstay of natural pest control. They were first used as an insecticidal spray, but more recently scientists engineered genes for these proteins into crops. Farmers around the world planted more than 100 million hectares of these transgenic plants in 2019.

Transgenic corn and cotton alone saved growers more than \$50 billion in lost crops in the first 2 decades of their use, according to Corteva Agriscience. Bt pest control also brought environmental benefits, reducing the use of organophosphate insecticides and other toxic chemicals. But it may not be working as well as it used to. When Bruce Tabashnik, an entomologist at the University of Arizona, reviewed 25 years of data on corn, sugarcane, cotton, soybeans, and other Bt crops from seven countries, he found signs that populations of 11 pest species have evolved substantial resistance to the proteins. Cases of resistance jumped from three in 2005 to 26 in 2020, he and his colleagues reported in April in the Journal of



Economic Entomology. That trend is continuing, Jurat-Fuentes says. Tabashnik has found 17 additional instances where pests were becoming resistant. “This is of great concern,” says Marilyn Anderson, a biochemist at La Trobe University. “We do not want to return to heavy use of chemical insecticides.” She is among a small group of scientists eyeing fern proteins as an alternative. In the wild, these ancient plants, which evolved long before the plants now used as crops, often seem unaffected by insects. In the 1990s, researchers sprayed crops with fern extracts, with mixed results. Otherwise, ferns and other non–seed producing plants got little attention as possible insect killers. Then, in 2016, researchers from India inserted a gene from a halberd fern (genus *Tectaria*) into cotton, hoping to fight sap-sucking whiteflies. Because no other natural insecticides had ever worked against this pest, says P.K. Singh, a plant biotechnologist at the CSIR-National Botanical Research Institute, “We thought to explore nonobvious and unrelated sources for insecticidal activity.”

The halberd fern gene protected the cotton from whiteflies and other sucking pests, and Singh has now isolated other fern compounds that deter chewing insects, such as caterpillars. He says his team has engineered the corresponding genes into cotton and seen very “interesting” and “promising” results in field studies. Evidence that ferns might harbor useful insecticides also emerged from a collaboration between Corteva and Anderson’s company, Hexima. Starting 8 years ago, Anderson’s team examined 10,000 Australian plants, testing extracts against pest insects in the lab and exposing them to digestive enzymes to determine whether they’d likely break down in the human gut and therefore be safe to use on crops. Corteva, meanwhile, screened plants from North America and elsewhere. Both teams looked for proteins with a novel mechanism that could replace Bt, Anderson says.

In 2019, Corteva reported that genes for proteins found in maidenhair ferns could protect soybeans from soybean looper and velvetbean caterpillars, and since then both groups have sharpened their focus on ferns. “We have since discovered several families of insecticidal proteins from these plants,” Corteva said in a statement. They don’t yet know exactly how these proteins work. In the recent PNAS paper, a team including Anderson and the Corteva scientists report the latest potential weapon against pests: a protein from *Pteris cretica* cv.



Albolineata, sometimes called Cretan brake fern, ribbon fern, or table fern, which is a common houseplant native to Europe, Asia, and Africa. In the lab, extracts of the fern stunted the growth of soybean looper and corn earworm. Distant relatives of the fern have variants of this protein, the researchers discovered, indicating it arose early in fern evolution, about 300 million years ago. They dubbed this group of proteins IPD113. Co-author Megan Maher, a structural biologist at the University of Melbourne, and colleagues solved the structure of one variant. They found that it resembles the Bt proteins used as insecticides, except it has just two major active parts, whereas Bt proteins have three. Bt proteins work by puncturing the insect gut. The researchers think the fern proteins do, too, but because the active part missing in fern proteins is the one Bt proteins use to bind receptors on the cell membranes, the fern proteins may bind different receptors. “The hope is the new fern proteins can be Goldilocks insecticides—similar enough to Bt to be safe and effective yet different enough to kill insects that evolved resistance to Bt,” Tabashnik says.

When the Corteva team transferred the genes for the most effective IPD113 versions into maize, leaf damage from key pests such as fall armyworm and corn earworm fell to at most 30% compared with more than 50% in unmodified maize. The fern proteins also worked against insect strains resistant to Bt proteins. The paper “is an excellent advance and establishes ferns as a repertoire of new molecules,” Singh says. These successes will likely attract interest from other research groups, says Georg Jander, a chemical ecologist at the Boyce Thompson Institute. And he thinks other companies are quietly casting an even wider net for new insecticidal proteins. Jander and Boyce Thompson fern biologist Fay-Wei Li, for example, are looking into defense compounds of primitive plants called liverworts. And Sepčić is evaluating mushroom-derived compounds that kill insects by a different mechanism. Instead of binding protein-based receptors on the cell membrane as the fern proteins do, they bind the lipids the membranes are made of. Because these lipids are conserved across the tree of life, Sepčić thinks insects will not easily evolve resistance. If such compounds prove effective against Bt-resistant pests, proteins from some of the earliest land organisms may help ensure the future of food security.

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## Jammu gets first-ever lavender farm on 40 kanals of govt land

CSIR-IIIM

17<sup>th</sup> November, 2023

The Agriculture Department in Jammu in a significant move has established a first-of-its-kind lavender farm, spread over 40 kanals of government land. It is expected to push the lavender sector and the cultivation. Chief Agriculture Officer, Kathua, Sanjeev Rai said they have established the first-of-its-kind lavender farm in Jammu province at Challah village in the area of Bani. The farm, spread over 40 kanals of land, is owned by the Department of Agriculture Production and Farmers' Welfare Kathua.

The CAO expressed gratitude to the Director of Agriculture Kashmir for supporting the establishment of the lavender farm with 30,000 lavender saplings (cuttings).

“We have planted the 30,000 cuttings on 30 kanals of land. The lavender farm will not only increase the income of local farmers but become a famous tourist attraction,” he said.

The officer said the government's ownership of a lavender farm aims to increase awareness of lavender cultivation within the local farming community. This initiative serves as a model for an alternative income source, contributing to the upliftment of the regional economy, he said.

The CAO said they often face issues in bringing the lavender sapling which they often take from Kashmir and Doda. He said the establishment of the farm would become a valuable source of quality planting material for farmers in the adjoining Bani and Duggan Blocks, with the potential to supply saplings to other areas in the Union Territory of Jammu & Kashmir.

Sanjeev said they are working for the further promotion of lavender in the region by organising training and awareness programmes to encourage cultivation. “We encourage farmers to turn the wasteland into lavender cultivation. From next year farmers will be given the plant cuttings from the farm only,” he said, adding, “We started last year only. The first project was done under Aroma Mission on 25 hectares of land that belonged to farmers.”



The CAO said there is a good market for the lavender and farmers can take this opportunity to turn wasteland into a source of livelihood.

The agricultural officer said they are planning to prepare a detailed project report under which they would suggest further development and upgradation in the infrastructure at the new farm. “In future, the lavender would get a further boost,” he said.

The CSIR-Aroma Mission is a flagship project of CSIR under which Lavender cultivation is being promoted in the temperate regions of J&K. The aim of the project is to increase the income of small and marginal farmers and develop agriculture-based Startups.

Agriculture officials said the variety of lavender is highly suitable for cultivation in the rainfed temperate regions of India. Under the CSIR-Aroma Mission, CSIR-IIIM introduced Lavender and provided more than 30 lakh free Lavender plants to the farmers of different districts of J&K.

Notably, earlier this year, the Jammu and Kashmir government approved two projects on floriculture and their implementation is expected to bring a major change in the floriculture sector and provide a significant boost.



## With help of AI, scientists tap into underwater fish chorus symphony

CSIR-NIO

16<sup>th</sup> November, 2023

Scientists at the Goa-based CSIR-National Institute of Oceanography (NIO) have, for the first time, recorded the captivating sounds of marine life with the help of AI. Recent passive acoustic recordings by the NIO have uncovered a veritable "symphony" of sounds produced by fish, shedding light on their complex underwater communication.

"The application of passive acoustic techniques has become increasingly vital for investigating variations in ocean ambient sound characteristics," principal scientist V P Mahale told TOI. According to his research, the data collected through passive acoustic recording is crucial for monitoring coral reef ecosystems, especially in shallow water regions like coral reef areas. Such studies, while relatively new in India, are vital for understanding and safeguarding marine environments.

The research, primarily conducted in the Grande Island area using advanced AI and machine learning techniques, has achieved an impressive classification success rate of 89.8%, offering a promising avenue for real-time classification and enhanced marine research.

Within the study's findings, distinct fish species were identified, including Sciaenidae (croakers), Terapontheraps (tiger perch) and planktivorous species. Temporal and spectral parameters, extracted from 60-second oscillogram data, played a vital role in identifying these species and are essential for soundscape analyses. Among the primary sources of biological sounds in marine environments are marine mammals, soniferous (sound-producing) fish, and invertebrates.

"Soniferous fish constitute a remarkable group of vocal vertebrates that heavily rely on acoustic signals during various social interactions. This group boasts a high degree of diversity in species' life histories," Mahale said. It has been reported that approximately 989



fish species across 133 families and 33 orders are capable of producing intentional, active sounds. Many species utilise vocal signalling as a fundamental aspect of their activities, generating sounds through sonic muscles that either vibrate the swim bladder or create sound through the rubbing of bony elements – a process known as stridulation.

“Our research is centred around understanding the behaviour of individual fish and fish species, with a particular focus on identifying and analysing individual fish sounds,” he said. However, challenges persist in validating the acquired fish sound data using onsite fish photographic data.

“The deployment of divers is a common practice but has limitations, including depth restrictions and fish avoidance of divers. Longterm installation of underwater cameras has proven unsuitable, as fish may avoid strobe lights, and capturing photos in locations distant from reefs poses challenges.

Turbid water can further hinder photo capture. Additionally, using laboratory-based tank facilities for fish sound data acquisition is subject to concerns related to resonance and propagation effects,” Mahale said. While this study presents ground-breaking insights, challenges remain in validating fish sound data with onsite fish photographic data. Nevertheless, the promise of AI-driven marine research holds the potential to unlock the mysteries of the deep and enhance our understanding of marine ecosystems in unprecedented ways.



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