

## In the News

# Hon'ble President of India Confers Rashtriya Vigyan Puraskar-2024 to three CSIR Scientists



The President of India, Smt. Droupadi Murmu presented the Rashtriya Vigyan Puraskar-2024 at an award ceremony held at Gantantra Mandap, Rashtrapati Bhavan, on 22 August 2024. In the first edition of the Rashtriya Vigyan Puraskar, 33 awards were presented to distinguished scientists in four categories – Vigyan Ratna, Vigyan Shri, Vigyan Yuva, and Vigyan Team.

In a proud moment, three scientists from CSIR were also conferred the prestigious award, including Dr Anandharamakrishnan,

Director, CSIR-National Institute for Interdisciplinary Science and Technology (CSIR-NIIST), Thiruvananthapuram, Prof. Syed Wajih Ahmad Naqvi, National Science Chair, CSIR-National Botanical Research Institute (CSIR-NBRI), Lucknow, and Dr Abhilash, Senior Principal Scientist, CSIR-National Metallurgical Laboratory (CSIR-NML), Jamshedpur.

Dr Anandharamakrishnan has significantly contributed to the field of food processing and has improved the



understanding of innovative food processing technologies, nutrient delivery systems, 3-D food printing, food structure & digestion, and their applications towards achieving sustainable food systems

Prof. Syed Wajih Ahmad Naqvi is an outstanding Biogeochemical Oceanographer with national and international recognition. His pioneering research work had an enduring disruptive impact on the field of oceanography.

Dr Abhilash has contributed significantly to the development of interdisciplinary indigenous processes for the extraction of critical/strategic metals from secondary resources like mine and process wastes, etc., as well as contributed exemplarily in leveraging technologies for mining, metallurgical and waste recycling industries.

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Adapted from PIB

*Hon'ble Union Minister for S&T, Dr Jitendra Singh, stressed on the India's ability to lead global health sector research.*

## Hon'ble Union Minister Dr Jitendra Singh receives the prestigious Distinguished Mentor Award

The Hon'ble Union Minister of Science and Technology and Vice President of CSIR, Dr Jitendra Singh, has received the prestigious award "Distinguished Mentor of the Year" from the American College of Physicians (ACP) at the 9<sup>th</sup> Annual Conference of IM-ACP India Chapter on 16 August 2024 at Lucknow.

During his address, Dr Singh stressed India's ability to lead global health sector research. He also emphasised the significance of collaboration between public and private sectors in advanced medical sciences.

The American College of Physicians aims to bring internists from around the world together to help and inspire each other through educational engagements and mutually beneficial associations with other organisations on various programmes.



# CSIR and Laghu Udyog Bharati sign MoU for transfer of CSIR technologies to Micro and Small Entrepreneurs

CSIR and Laghu Udyog Bharati (LUB) entered into an MoU on 21 August 2024 at CSIR Headquarters for the transfer of selected CSIR technologies to Micro and Small Entrepreneurs in the presence of the Director General, CSIR, All India Secretary of LUB and President LUB. Laghu Udyog Bharati has been a registered all-India organisation of micro and small industries since 1994. It is a Section 8 company with a presence in more than 575 districts in 27 states of India and more than 51000 members.

The specific objectives of the MoU include the transfer of 100 know-how/Technology/Products of CSIR within 100 days to the identified MSMEs under LUB. It also comprises providing suggestions/ideas/problems to CSIR for developing new technologies in any suggested areas of interest by MSMEs within the scope of CSIR for technology advancement, meeting regulatory norms, increasing market reach and export promotion/import substitution.

The programme was presided over by Dr N Kalaiselvi, Secretary DSIR & Director General, CSIR; Dr RP Singh, Head, IMD; Dr Vibha Malhotra Sawhney, Head, TMD; Dr Debashis Bandyopadhyay; Dr Mahesh Kumar and Ms Deepti



Sharma Dullu and other dignitaries from CSIR. From LUB, Sh Ghanshyam Ojha, Sh Om Prakash Gupta, Sh Diwan Chand, and Ms Arti Sehgal attended the meeting along with other organisation members.

During this MoU signing, 15 technologies were transferred to the companies from six CSIR labs – CSIR-CSIO, CSIR-IMMT, CSIR-NAL, CSIR-NBRI, CSIR-CSMCRI and CSIR-CFTRI.

The transferred technologies covered various sectors, including Pesticide Detection Kits, Multi-copter Drones, Air Quality Monitoring Systems, Potash enriched Biochar from Waste Biomass, Gluten biscuits, etc.

For CSIR, the MoU shall greatly extend the market reach for CSIR technologies, including export promotion and import

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substitution, while meeting all necessary regulatory norms. For LUB, the deployment of low-cost CSIR technologies shall bring

efficiency in the operations of LUB Units/MSMEs at economic costs, besides bringing awareness about the societal contribution of CSIR.

## One Week One Theme – Aerospace, Electronics, Instrumentation and Strategic Sector (AEISS)

The inauguration of the AEISS theme under the One Week One Theme campaign was held from 2-4 August 2024 at CSIR-NPL, New Delhi, with participating laboratories – CSIR-CSIO, CSIR-CEERI, CSIR-NPL and CSIR-IIP, bringing out the achievements of the theme in the areas of electronics and instrumentation.

The second event under the theme was conducted at CSIR-IMMT, Bhubaneswar, from 12-13 August 2024 with participating laboratories – CSIR-NAL, CSIR-NML, CSIR-AMPRI, CSIR-CGCRI and CSIR-CMERI, focusing on the aerospace technologies based on materials and mechanical systems for aircraft.

The third and final event was concluded at CSIR-NAL with participation from CSIR-NAL, CSIR-4PI, CSIR-NIIST, CSIR-NCL, CSIR-NML, CSIR-CEERI and IIMT.

### At CSIR-NPL

CSIR-NPL organised a three-day programme on the AEISS theme, during which Prof. Venugopal Achanta, Director, CSIR-NPL, extended a warm welcome to everyone.

In his keynote address, Dr Abhay Anant Pashilkar, Director, CSIR-NAL and AEISS Theme Director, elaborated on the theme, outlining its pivotal role in achieving Atmanirbhar Bharat, Swasth Bharat, and Make in India initiatives. He also discussed the projected targets associated with the theme. Dr PC Panchariya, Director, CSIR-CEERI, highlighted the crucial role of the theme in driving industrial growth and elaborated on the significance of a single-window system for smooth and straightforward technology transfer.

Dr SK Dubey, the workshop convener, outlined the three-day agenda. This included a student-scientist interaction session, a Startup/MSME/Industry meet,



*Dr Abhay Anant Pashilkar, Director, CSIR-NAL, outlined a pivotal role of theme in achieving Atmanirbhar Bharat, Swasth Bharat, and Make in India initiatives.*



and a focus on women in AEISS. He concluded by proposing a vote of thanks. Over 60 students participated in the student-scientist interaction programme. They explored the exhibition and engaged with scientists during the second session. A science quiz based on the exhibition concluded the first day of the event.

The inaugural was followed by an exhibition, during which, as part of the jigyasa programme, school students visited the exhibition that showcased the latest technologies and innovations in science. The exhibition's main focus at the CSIR-NPL museum was the product demonstration of cutting-edge technologies.

The second day was focused on industry collaborations, highlighting technologies developed and sold to industries by CSIR. Industries were provided a platform for panel discussions where they could showcase their technologies and interact with leading experts. The day also featured various talks from renowned scientists, providing insights into their work's significance and enlightening us about new research and technologies. The networking sessions helped to foster collaboration and knowledge-sharing.

The third day was devoted to celebrating the contributions and achievements of women in science and technology. It featured talks on new and interesting research by women scientists. These sessions aimed to motivate and inspire young girls to pursue careers in S&T.

#### At CSIR-IMMT

In the inaugural, Dr Kota Harinarayana, Padma Shri Awardee, was the Chief Guest and delivered the keynote address and the Guest of Honour Dr Naresh Chandra Murmu, Director CMERI and CGCRI. The Director-in-Charge of CSIR-IMMT, Dr LD Besra, welcomed the gathering with his address. The programme was attended by scientists, teachers, scholars and external participants.

During the first technical session after the inaugural ceremony, Dr A Udayakumar from CSIR-NAL delivered his talk on Continuous Fibre Reinforced Ceramic Matrix composites for application in aircraft brake discs. He demonstrated C/SiC disc-shaped composites fabricated via the CVI +LSI process, which exhibited superior specific strength at higher temperatures and a delayed fracture due to multiple energy dissipating

*The second day was focused on industry collaborations, highlighting technologies developed and sold to industries by CSIR.*



events within the system. This was followed by an insightful talk on stealth technology by Dr Balamati Choudhury from CSIR-NAL, which necessitated the need for indigenously developed lightweight multilayer stealth coating to bring self-reliance to the defence sector.

The session proceeded with a talk by Dr Murugan Thangadurai, CSIR-CMERI, on mechanical systems for aircraft applications, wherein he discussed the problems caused during the launch of a missile after opening the cavity doors. The session concluded with a talk by Dr Atiar Rahaman Molla from CSIR-CGCRI on developing strong transparent glass-ceramic material and laminated armour for combat aircraft and vehicle applications.

In the exhibition, stalls with posters, models, components, materials and live demonstrations were organised at the CRTDH complex of IMMT. All participants visited the exhibits and interacted with scientists and scholars. Stalls were from all participating CSIR labs. In addition to this, HAL also displayed some aerospace components. One stall was allotted to a startup company.

On the second day, i-SMART connects – a panel discussion was conducted, bringing the stakeholders from various sectors connected to the objective and theme of the event – Industry, Startup, MSME, Academia, Research and Technology (i-SMART) connect. The programme was attended by about 200 participants representing all sectors and included very fruitful and constructive discussions/interactions. Dr Niladri Roy, Additional Director, DRDO, Chandipur, chaired the panel discussion. The programme successfully connected the dots and paved the way for new collaborations.

Next, a technical session started with a talk by Dr Soma Hansda on advanced ceramics for aerospace applications, elaborating on the development of Cf-SiC ball bearings for brake discs. For efficient braking, the fabricated disc brakes exhibited high water and corrosion resistance, superior thermal shock resistance, and exceptional strength at higher temperatures.

Dr Shailesh Jha delivered the next talk on the electrodeposition of binary and ternary Zn-alloy as a replacement for toxic Cd

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coatings. This was followed by an insight into smart material-based actuators by Dr Hari Bhargaw, who used wire-shaped memory alloys (SMA) as the core material. Owing to their modular design and facile processing methods, these actuators are used in various fields like automotive, prosthetics, and soft-gripper applications. The next talk by Dr DP Das shed light on indigenous instrumentation for mineral industries, highlighting in-house instruments such as eye-on-pellet, EIT-based slurry density monitoring, and battery health monitoring.

Dr Abhishek Pandey briefly introduced various Additive Manufacturing (AM) techniques with a special focus on the laser powder bed AM facility for 3D printing at CSIR-AMPRI. This was followed by discussions by Dr Venkat ANCh on developing Al-based hybrid composite closed cell foams for defence applications. His talk covered the development of a core sandwich Kevlar-Al composite foam that demonstrated exceptional performance for deformation behaviour under low impact compared to conventional foam. Mr Shubhra Bajpai highlighted the importance of developing efficient thermal barrier coatings for defence applications. Dr Manju Unnikrishnan presented a quick insight into the emerging high-temperature magnetic refrigeration technology. The session concluded with a presentation on stealth materials by Dr Mamata Mahapatra.

There was a transfer of technology on Stealth Materials developed by CSIR-IMMT and



CSIR-NAL. About 350 school students were invited and participated in the OWOT programme. Guided lab visit programmes were conducted in the first half for the school students, and in the afternoon, they all visited the exhibits and interacted with exhibitors.

Dr Santosh Kumar Behera, Convener of OWOT function, delivered the vote of thanks.

#### **At CSIR-NAL**

Initiating the programme, Dr Abhay A Pashilkar, Director, CSIR-NAL, delivered the keynote lecture and highlighted the vision and mission of various participating laboratories in the theme and their salient achievements in aerospace-related technologies. Dr Pashilkar also provided glimpses of R&D focus areas catering to the needs of aircraft programmes in the country.

In her opening remarks, Dr Sridevi Jade, Director, CSIR-4PI, summarised various verticals her laboratory is pursuing and CSIR-4PI's contributions in data science products across all themes of CSIR. She emphasised the need for AI-enabled technologies and systems in various sectors, including aerospace.

The Director, CSIO, made a virtual presentation and

*Shri Jitendra J Jadhav, Director, ADA, and Programme Director, Combat Aircraft, touched upon policy support by the government for private players in these large aircraft programmes.*

highlighted CSIO's contributions to head-up display and instrumentation for strategic and manufacturing sectors in the country.

Shri Jitendra J Jadhav, Director, ADA, and Programme Director, Combat Aircraft, was the Chief Guest of the inaugural session and presented in detail various ongoing aircraft programmes in the country, including defence and civil sectors. He also presented future aircraft programmes such as AMCA and RTA. He explained how close to 380 private industries in the country contributed to the success of the LCA programme and presented other enabling technologies, namely, Additive Manufacturing and Industry 4.0, which need to be implemented in aircraft manufacturing. He invited the industries for the success of various national aircraft programmes and also touched upon policy support by the government for private players in these large aircraft programmes.

The Guest of Honour, Shri Subramanya Ullal, Member Board of Directors, SASMOS HET Technologies Ltd, highlighted the contributions of SASMOS in the aviation sector and also brought out the challenges faced by the small and medium-scale

industries while participating in national aerospace programmes. In particular, he highlighted the need for quality control and assurance in the technologies being developed by private players in India for the aerospace sector.

Following the inaugural session, the exhibition of various technologies developed by CSIR-NAL and other participating CSIR laboratories was inaugurated by the Chief Guest at the Golden Jubilee Aircraft Hangar, CSIR-NAL Belur Campus. A student visit was organised in the afternoon session, followed by a quiz contest in the JIGYASA programme. Around 80 school students participated in this event.

On the second day, Dr Ashish Lele, Director, CSIR-NCL, was the Chief Guest for the inauguration of the technical sessions. In his address, he appreciated the various major aircraft programmes being undertaken by CSIR-NAL and assured that NCL and other national laboratories will contribute to these programmes' success. Following this, there were six presentations on aerial vehicles by programme directors of HAPS, SARAS-MkII, HANSA-NG, and drones for solid waste management. Dr CM Ananda, Programme Director, Civil Aviation

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Director,  
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Programme, presented a detailed overview of various past, present and future aircraft activities of CSIR-NAL. A large number of industries participated in this session.

In the next session, the project leaders from CSIR-NAL briefly summarised various indigenously developed deep technologies; this was followed by another session on aerospace materials technologies, which are being developed to support the aircraft programmes of CSIR-NAL. The afternoon session was dedicated to the contributions of other CSIR laboratories, such as CSIR-4PI, CSIR-IMMT, CSIR-CEERI & CSIR-NML in AI-enabled technologies and systems and technologies for advanced devices.

On the third day, the cluster chairpersons of various clusters of CSIR-NAL, namely systems, materials, aerothermal, structural and aircraft clusters, made brief presentations on CSIR-NAL capabilities, facilities, and services under various clusters. The idea of this session was to facilitate modalities for the mode of engagement with the industry to utilise the competencies,

facilities, and services offered by CSIR-NAL and other participating labs. This session was followed by another interesting session on the aircraft development eco-system in the country by experts from various private and public sector aerospace giants such as Adani Defence & Aero and HAL.

An NDA was signed with M/s Tata Elxsi Limited, Bengaluru, to explore collaborations in Urban Air Mobility (UAM), Test Infrastructure & Test Expertise.

The third session was focused on Industry 4.0. Speakers from Central Manufacturing Technology Institute (CMTI), Bengaluru, and Siemens, Bengaluru, elaborated on this interesting topic and presented case studies of Industry 4.0 implemented at CMTI and Siemens.

The last session was attended by subject experts from software giants Siemens, Dassault, ANSYS, and Altair, who discussed Digital Twin and Model-Based Systems Engineering (MBSE). All the experienced speakers from these four software companies shared their experience in Digital Twins and showcased how the

innovative solutions offered by their firms are helping the Aerospace community.

The success of CSIR-NAL's OWOT event is evident from the participation of more than 1000 engineering college students from different parts of the country, 400 school students, close to 400 individuals and a record of 50 plus industries. The event was also represented by CSIR-NAL's

sister laboratories: NCL, CMERI, NIIST, 4PI, NML, IMMT and CEERI. Further, there was a great mix of interaction between various CSIR laboratories and public and defence sector PSUs involved in the aviation sector.

The industry participants exhibited keen interest in collaborating and requested that CSIR-NAL consider them partners in all major programmes.

## CSIR-NPL Organises a Brainstorming Meeting on BNDs with Stakeholders

CSIR-National Physical Laboratory (CSIR-NPL), New Delhi, organised a one-day Brainstorming Meeting on "Enhancing global competence in quality by providing SI traceable measurements through Bharatiya Nirdeshak Dravyas (BNDs) [Certified Indian Reference Materials]" on 9 August 2024. Shri Rajesh Kumar Singh, Secretary of DPIIT (Govt of India); Dr Vaidya Rajesh Kotecha, Secretary (AYUSH); Dr N Kalaiselvi, Secretary DSIR & DG, CSIR; Dr Parveen Malik, CEO (Agrinnovate, India Ltd); Dr Venugopal Achanta, Director, CSIR-NPL and Dr SP Singh, Head, BND Division, CSIR-NPL, inaugurated the event.

Welcoming the guests, Dr Venugopal Achanta highlighted the significance of BNDs and the progress made so far by the efforts of CSIR-NPL. Dr N Kalaiselvi informed the house about strengthening the CSIR labs in the endeavour and

appealed to the directors and scientists to work together to establish the mechanism for fulfilling the requirement of BNDs and making them not only acceptable but also competing in the global market. Dr Vaidya Rajesh Kotecha emphasised the need for reference material in herbal drugs and AYUSH products in his address. Dr Praveen Malik highlighted the need for standard reference material in agriculture, drugs & vaccines and proposed an elaborate roadmap for establishing the BNDs globally.

In his inaugural address, the Chief Guest, Sh RK Singh, complimented CSIR NPL's efforts on this great initiative. He emphasised the requirement for all stakeholders to join hands to make the dream of the Hon'ble Prime Minister of India for "Aatmanirbhar Bharat" a reality.

The directors of different CSIR laboratories like CSIR-NPL, CSIR-

*Dr N Kalaiselvi, DG, CSIR, informed the house about strengthening the CSIR labs in the endeavour and appealed to the directors and scientists to work together.*

AMPRI, CSIR-IHBT, CSIR-CBRI, CSIR-CEERI, CSIR-IIP, as well as the Director Generals and Director representatives of CFSL, NDTL, FSSAI, IPFT, IPC, CWC, JJM, BIS, NTH, accreditation bodies, industry representatives and other scientific institutions attended the meeting.

The major focus of the discussion was on the development and SI traceability of Indigenous-certified materials, i.e., BNDs, for use by various segments of Indian industries towards better quality

control of locally produced products. They deliberated on the current challenges and opportunities in developing and utilising such Indian-made CRMs/BNDs in India. Success stories of BNDs in water and cement were detailed to explain the benefits to the users. Issues and conflicts associated with related accreditation and proper regulatory audits of different testing laboratories and the possible way forward were also discussed.

## R&D

# CSIR-NAL develops a paint coating for thermal insulation applications in aircraft

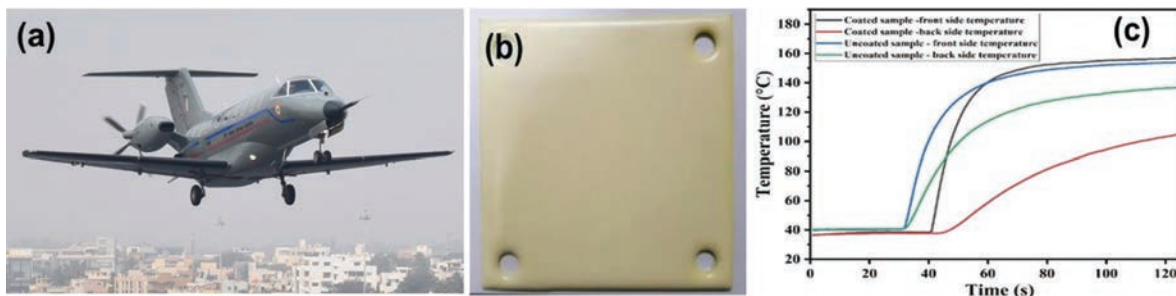
**E**nergy conservation is one of the most important aspects of efficient energy generation and use. Improving thermal insulation is a practical approach to energy conservation. On the other hand, there are also applications where thermal insulation is needed to protect the underlying substrate from degradation. This, particularly in aircraft, is a commonly faced issue. High temperatures caused by hot plume impingement from engine ducts are detrimental to the aircraft's structure, whether aluminium alloy or carbon composite, irrespective of the material.

CSIR-National Aerospace Laboratories (CSIR-NAL), Bengaluru developed a paint coating technology to provide

thermal insulation for aircraft surfaces. The technology aims to mitigate the heating issue noticed in CSIR-NAL designed and developed SARAS PT1N aircraft, wherein engine exhaust plume, at a mass flow rate of 1.1 kg/s per stub of temperature  $\sim 150^{\circ}\text{C}$ , was impinging the rear fuselage and adjoining areas.

The coating provides a temperature drop of  $\sim 25^{\circ}\text{C}$  when exposed to temperatures of  $150^{\circ}\text{C}$  compared to an uncoated surface. The coating has excellent adhesion and is suitable for metals and composites. The method adopted is a simple room temperature process with low coating density ( $\sim 0.85 \text{ g cm}^{-3}$ ) and therefore less weight penalty. It is easily scalable and feasible on complex structures

*The development of a novel indigenous paint certified by CEMILAC will augment the ongoing SARAS MK II programme of CSIR-NAL that in turn, upholds the national slogan of Make in India.*



(a) SARAS PT1N aircraft (b) Thermal insulation coated flat aluminium plate surface and (c) test data of coated surface against the uncoated panel

and supports onsite repairs. The paint coating is compatible with epoxy and polyurethane paint on aircraft surfaces.

The paint coating has qualified several stringent environmental and mechanical tests such as artificial weathering, sand, dust, driving rain, flammability, CATH, salt fog, contamination by fluids (aviation fuel, engine oil, hydraulic oil), pull-off adhesion, vibration, thermal shock, thermal stability up to 200°C, thermal cycles, etc. as per relevant ASTM, Military and RTCA standards.

The paint has been accorded with Pre-Production Clearance by RCMA(F&F), CEMILAC, vide letter ref: RCMA(F&F)/323/2023/pc-10 dated 17/08/2023.

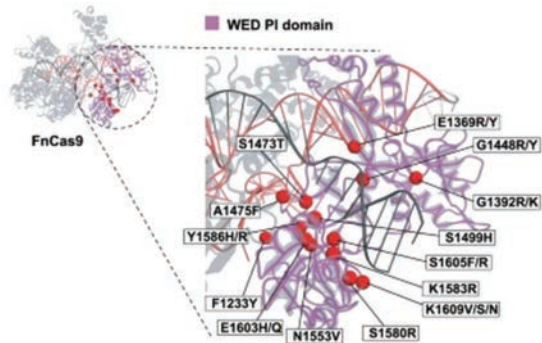
CSIR-NAL is now interacting with industries for possible technology transfer and continuing the activity for temperatures >300°C. The development of a novel indigenous paint certified by CEMILAC will augment the ongoing SARAS MK II programme of CSIR-NAL that in turn, upholds the national slogan of Make in India.

*CSIR-IGIB's study has produced variants of FnCas9 that offer superior performance, addressing key limitations of existing genome editing tools.*

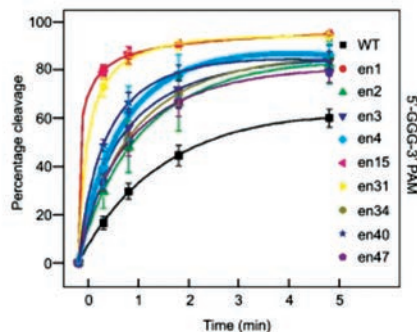
## CSIR-IGIB's New Gene editor

Recent advancements in genome editing have pushed the boundaries of possibilities in therapeutics and diagnostics. At the forefront of this innovation is developing novel CRISPR-Cas9 variants engineered to achieve enhanced precision and range of targets within the genome. While *Streptococcus pyogenes* Cas9 (SpCas9) has been instrumental in genome editing, its superior cleavage activity comes at the cost of limited cellular targeting efficiency due to strict PAM requirements and many off-targets.

A recent article published by Dr Debojyoti Chakraborty's lab at CSIR-IGIB in *Nature Communications*, titled "PAM-flexible Engineered FnCas9 Variants for Robust and Ultra-Precise Genome Editing and Diagnostics," showcases pioneering research focused on enhancing the capabilities of the *Francisella novicida* Cas9 (FnCas9) protein. This study has produced variants of FnCas9 that offer superior performance, addressing key limitations of existing genome editing tools while maintaining the high specificity necessary for clinical applications.



**FnCas9 crystal structure in complex with sgRNA-DNA (PDB: 5B2O) in ribbon model**



**Comparison of in vitro cleavage efficiency of nine enFnCas9 variants**

Rational engineering of FnCas9 by modifying its WED-PI domain and phosphate-lock loop (PLL), led to the creation of 49 different variants with single amino acid substitutions, all of which were tested for DNA cleavage activities. Among these, three kinetically enhanced, PAM-flexible enFnCas9 variants – en1, en15, and en31 – were identified and characterised. These variants demonstrated significantly higher cleavage rates than wild-type FnCas9 and maintained the intrinsic DNA interrogation specificity of the original protein.

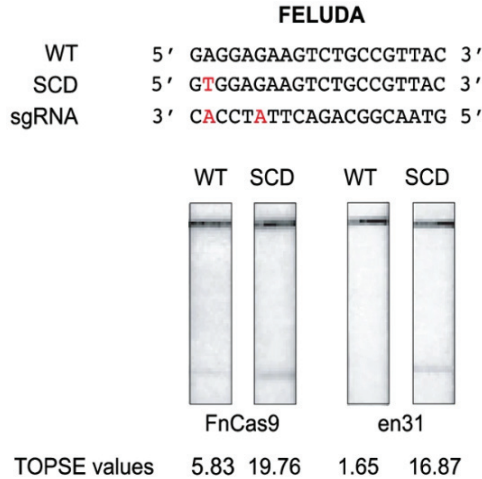
The engineered FnCas9 variants (enFnCas9) proved PAM-flexible and highly specific, expanding their utility in genome editing and diagnostics. These variants exhibited increased flexibility in recognising non-canonical PAMs while preserving high specificity, effectively expanding the PAM recognition landscape from 5'-NGG-3' to 5'-NRG/NGR-3'. This expansion increased the accessibility across the human genome by approximately 3.5 times, marking a significant advancement in genome editing technology.

In the context of CRISPR diagnostics (CRISPRDx), the enFnCas9 variants were tested on platforms like FELUDA and RAY, demonstrating a two-fold increase in the coverage of Mendelian SNVs across the human genome. Furthermore, these variants exhibited improved specificity and signal discrimination in diagnostic assays for diseases such as Sickle Cell Anemia and the SARS-CoV-2 Alpha variant.

The en1 variant, in particular, showed higher editing rates than SpCas9-HF1 and eSpCas9, with no detectable off-target effects. This variant demonstrated robust editing at non-canonical PAM sites in therapeutically relevant loci, including those associated with Sickle Cell Anemia. Additionally, the engineered variants outperformed SpCas9 in Homology-directed Repair (HDR)-mediated knock-in assays, highlighting their potential for therapeutic genome editing.

The en31 variant showcased its ability to perform precise base editing at specific loci in the human genome. This was further validated in a proof-of-concept experiment for therapeutic base editing using

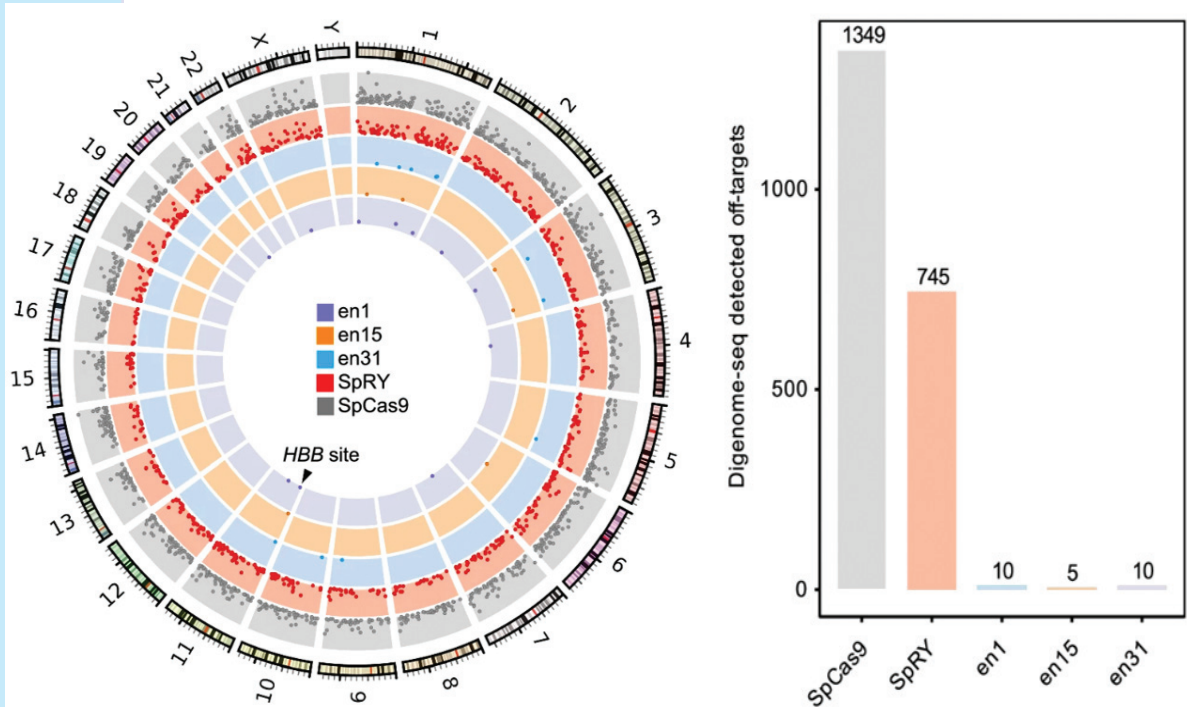
*Overall, the engineered FnCas9 variants represent a significant leap forward in genome editing, offering enhanced precision, flexibility, and potential for therapeutic applications.*



**Representative image showing the outcome of lateral flow assay (LFA) for Sickle cell disease (SCD)-associated point mutation detection by FELUDA using FnCas9 and en31**

demonstrating the restoration of full-length protein expression in patient-specific iPSC-derived retinal pigmented epithelium using the en31-ABEmax8.17d variant, successfully correcting a point mutation in the RPE65 gene.

Overall, the engineered FnCas9 variants represent a significant leap forward in genome editing, offering enhanced precision, flexibility, and potential for therapeutic applications. With a growing need to address genetic disorders affecting millions across India, these enhanced



**Comparative off-targeting profile of SpCas9, SpRY, en1, en15, and en31 at HBB locus in HEK293T cells as captured by Digenome-seq**

en31-ABEmax8.17d in patient-specific induced Pluripotent Stem Cells (iPSCs) derived from a Leber Congenital Amaurosis (LCA2) patient. The study concluded by

gene editors could revolutionise treatment approaches, offering highly precise and efficient methods for editing disease-causing genes.

## CSIR-CLRI demonstrates sustainable leather manufacturing technologies in the Kanpur leather sector

Leather manufacturing is associated with environmental challenges, particularly water pollution and resource consumption. The traditional processes followed in tanneries often result in the discharge of wastewater containing hazardous chemicals such as sulphides and chromium, which can pose significant risks to the environment and public health.

Recognising these challenges, CSIR-Central Leather Research Institute (CSIR-CLRI), Chennai, has been at the forefront of promoting cleaner technologies that mitigate

these risks and enhance the overall efficiency of leather production. CSIR-CLRI's initiatives aim to create a more resilient and environmentally responsible leather sector by reducing water consumption and minimising pollution to enhance resource efficiency. By collaborating with industry stakeholders, governmental organisations and international bodies, CLRI strives to ensure that the leather industry can thrive in a way that is both economically viable and environmentally sustainable.

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Demonstration of Cleaner Technologies in one of the leather unit, Kanpur

In line with this commitment, CLRI recently successfully demonstrated cutting-edge cleaner technology solutions in the Jajmau Leather Cluster, Kanpur, from 12 to 17 August 2024. This initiative, funded by the World Wide Fund (WWF-India), marks a significant milestone in CLRI's efforts to reduce the environmental impact of leather production and promote sustainable practices across the industry.

The key technologies showcased are enzyme-based unhairing process, reuse of liming wastewater and Direct Chrome Liquor Recycling (DCLR). Through these measures (a) sulphide can be eliminated, (b) liming wastewater is not discharged, and (c) chromium in the wastewater is repurposed.

The enzyme-assisted unhairing process is a cleaner approach that replaces the conventional use of toxic chemicals with natural enzymes. Traditional unhairing methods typically rely on sulphides, which can lead to the generation of toxic waste, H<sub>2</sub>S emission and increased environmental pollution. In contrast, the enzymatic method significantly reduces the presence of sulphides in the wastewater, thereby minimising the environmental footprint of the leather manufacturing process. This method is not only safer for the environment but also improves the quality of the leather, making it a more desirable option for manufacturers and consumers alike.

DCLR is another sustainable, cleaner measure that was

demonstrated. Chromium salts, used in the tanning process, are essential for producing high-quality leather but are also a major source of pollution when not properly managed. The DCLR process enables the reuse of chromium from the tanning liquor, completely averting the chromium discharged into the environment. This recycling approach curbs pollution and conserves valuable resources in the wastewater, making it a cost-effective and sustainable solution for the leather industry.

One of the most significant benefits of these cleaner technologies is their potential to reduce the water footprint of leather manufacturing. The traditional tanning process is notoriously water-intensive, with large volumes of water required for various stages of production. The bio-based enzymatic unhairing process can lead to substantial water savings by eliminating the need for high water consumption associated with chemical unhairing. Similarly, the DCLR technology reduces the need for fresh water in the chrome tanning process by enabling the reuse of chrome liquor, further conserving water resources.

The demonstration was attended by the team from WWF-India, as well as the tanners of the cluster. Dr Sundarapandiyan, Senior Scientist, CSIR-CLRI, along with the team from RC-Kanpur of CSIR-CLRI, conducted the demonstration.

The demonstration showcased the innovative technologies and

*The demonstration reinforced the importance of continuous innovation and partnership in driving sustainability in the leather industry.*

fostered a deeper understanding among industry participants of the significant environmental and economic benefits these technologies can offer. The local tanners and industry representatives were highly engaged, expressing enthusiasm about the potential of the bio-based enzymatic unhairing process and DCLR to transform their operations.

The tanners noted the impressive reduction in pollutants and water usage, recognising how these innovations could lead to cost savings and compliance

with increasingly stringent environmental regulations. The positive feedback from the industry was a clear indication of the readiness and willingness to adopt these sustainable practices.

Moreover, the industry stakeholders appreciated the collaborative approach of CLRI, which provided them with the necessary technical support and expertise to implement these technologies. The demonstration reinforced the importance of continuous innovation and partnership in driving sustainability in the leather industry.

## CSIR-CSIO – Indo Swiss Training Centre (CSIO-ISTC) 59<sup>th</sup> Convocation Ceremony

The 59<sup>th</sup> Convocation of the Central Scientific Instruments Organisation-Indo Swiss Training Centre (CSIO-ISTC) was celebrated on 8 August 2024, honouring the achievements of its graduating students. The event was graced by the esteemed presence of Prof. Shantanu Bhattacharya, Director of CSIR-Central Scientific Instruments Organisation (CSIR-CSIO), Chandigarh. The ceremony featured Sh Yathiraj Kansal, General Manager and Business Head of Wipro 3D, as the Chief Guest and Dr Shailendra Singh, Executive Vice President at Maruti Suzuki India Ltd, as the Guest of Honour.

During the ceremony, Sh Yathiraj Kansal delivered an inspiring address, emphasising

innovation and adaptability in today's fast-paced technological landscape. He encouraged graduates to embrace challenges as opportunities for growth, urging them to stay curious and pursue lifelong learning. Kansal also highlighted the importance of collaboration, advising students to work with diverse teams to foster creativity and innovation.

Following Kansal's address, Dr Shailendra Singh shared insights on the practical application of education, stressing that success lies in applying theoretical knowledge to real-world problems. He urged graduates to uphold integrity and dedication in their careers, reminding them that hard work and sincerity lead to lasting success.

*Sh Yathiraj Kansal, GM, Wipro 3D, emphasised on the innovation and adaptability in today's fast-paced technological landscape.*



A total of 101 students received diplomas across four programmes: Electronics Engineering (41), Mechanical Engineering (36), Mechatronics & Industrial Automation (12), and Die & Mould Making (12). Outstanding academic achievements were honoured, with Sameer Khatri and Anuj Kumar earning Director's Gold Medals and Satyam Dixit and Saurabh receiving Principal's Silver Medals.

In the 3-Year Diploma in Mechanical Engineering (Tool and Die), Nagaansh Vashisht earned the Director's Gold Medal, while Pritam Koley received the Principal's Silver Medal. Gurkirat Singh and Sudeep Verma were similarly honoured in Electronics Engineering. The ceremony highlighted CSIO-ISTC's dedication to educational excellence and empowering graduates to drive industry innovation.

In collaboration with the Swiss Foundation for Technical Assistance, CSIO Indo Swiss Training Centre (CSIO ISTC) was inaugurated on 18 December 1963 by India's first Prime Minister. Over the years, ISTC has grown significantly, impacting regional and national levels. The Centre offers interdisciplinary programmes aligned with global trends in technical education, focusing on a practice-oriented approach – learning by doing. CSIO ISTC emphasises precision, innovation, and leadership, fostering well-rounded individuals through sports, NCC, and other activities. Proud of its alumni who excel globally, CSIO ISTC is committed to advancing as a model for quality technical education, shaping future world-class engineers.

## CSIR-CRRI Celebrates 73<sup>rd</sup> Foundation Day

CSIR-Central Road Research Institute (CSIR-CRRI), New Delhi, celebrated its 73<sup>rd</sup> Foundation Day on 16 July 2024. The event had the distinguished presence of Dr N Kalaiselvi, DG, CSIR and Secretary, DSIR, where she inaugurated the newly

constructed 'AcSIR PhD scholar lab'. Prof. Manoj Kumar Dhar, Director, AcSIR, was also present.

Following that, she briefly interacted with AcSIR students about the prospective scenario of scientific research in India, where all the chief scientists and



admin members of CRRI were also present. She highlighted the role of students in achieving the Viksit Bharat Mission 2047. A board was put up in the AcSIR PhD Scholar Lab for Dr N Kalaiselvi to serve as a souvenir for students. It has wishes written for the future of PhD scholars and students by Dr N Kalaiselvi. Later, she also interacted with CRRI staff and students and graced the exhibition with posters of PhD scholars and various divisions of CRRI.

A poster presentation competition was also organised for internship and dissertation students of CSIR-CRRI entitled “Vividus 2024”.

On this day, Prof. Prateek Sharma, Vice Chancellor, Delhi Technological University,

New Delhi, dignified the occasion as the Chief Guest and delivered the foundation day lecture on “Engineering Solution for Sustainable Development Challenges’. Later, an MoU was signed between CSIR-CRRI and Delhi Technological University for collaboration in R&D areas of mutual interest.

The foundation day was also declared ‘Open Day’, during which students visited the lab under the Jigyasa programme. During the day, students also visited the various labs in the divisions. Over 200 students from over 18 Kendriya Vidyalaya and other schools attended the event.

Dr Vinod Karar, Chief Scientist & Acting HoD, ILT, concluded the event with a vote of thanks.

*An MoU was signed between CSIR-CRRI and Delhi Technological University for collaboration in R&D areas of mutual interest.*

### Workshops/Conferences/Seminars

## CSIR-NIScPR organised Vigyan Kavi Sammelan in collaboration with co-organisers

In a significant move to promote scientific knowledge and understanding in the Hindi language, CSIR-AMPRI in collaboration with Vijnana Bharati Madhya Bharat Province; the Madhya Pradesh Council of Science and Technology, Bhopal; Madhya Pradesh Bhoj (Open) University,

Bhopal; CSIR-NIScPR and Atal Bihari Vajpayee Hindi University, Bhopal, organised the Rashtriya Hindi Vigyan Sammelan 2024 in Bhopal from 30-31 July 2024, to connect the masses with science through their native tongue.

Chief Minister of Madhya Pradesh, Dr Mohan Yadav,



inaugurated the event and emphasised Hindi's importance in scientific advancement. Six sessions were held on diverse topics, including Ayurveda, engineering, and science communication.

A key highlight of the conference was the "Vigyan Kavi Sammelan", organised by CSIR-NIScPR, New Delhi. This unique initiative aimed to make science accessible to the general public through creative expression. Renowned poets from across India showcased their works, blending literature with scientific concepts.

The conference also witnessed the release of a science poetry book, "Vigyan Kavya Pravah," which compiled the work of

participating poets. The event was a platform for researchers, poets, and science communicators to share their knowledge and ideas in Hindi.

Dr Santosh Chaubey, Chancellor of Rabindranath Tagore University, Bhopal, emphasised the significance of Hindi in science dissemination. He also released a three-volume set of books, "Vigyan Kavita Kosh," as a valuable resource for poets and researchers.

The Rashtriya Hindi Vigyan Sammelan 2024 proved to be a successful initiative in promoting Hindi language in science and technology. It inspired the scientific community and made science more accessible to the general public.

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