IGSTC

INDO-GERMAN SCIENCE AND TECHNOLOGY CENTRE

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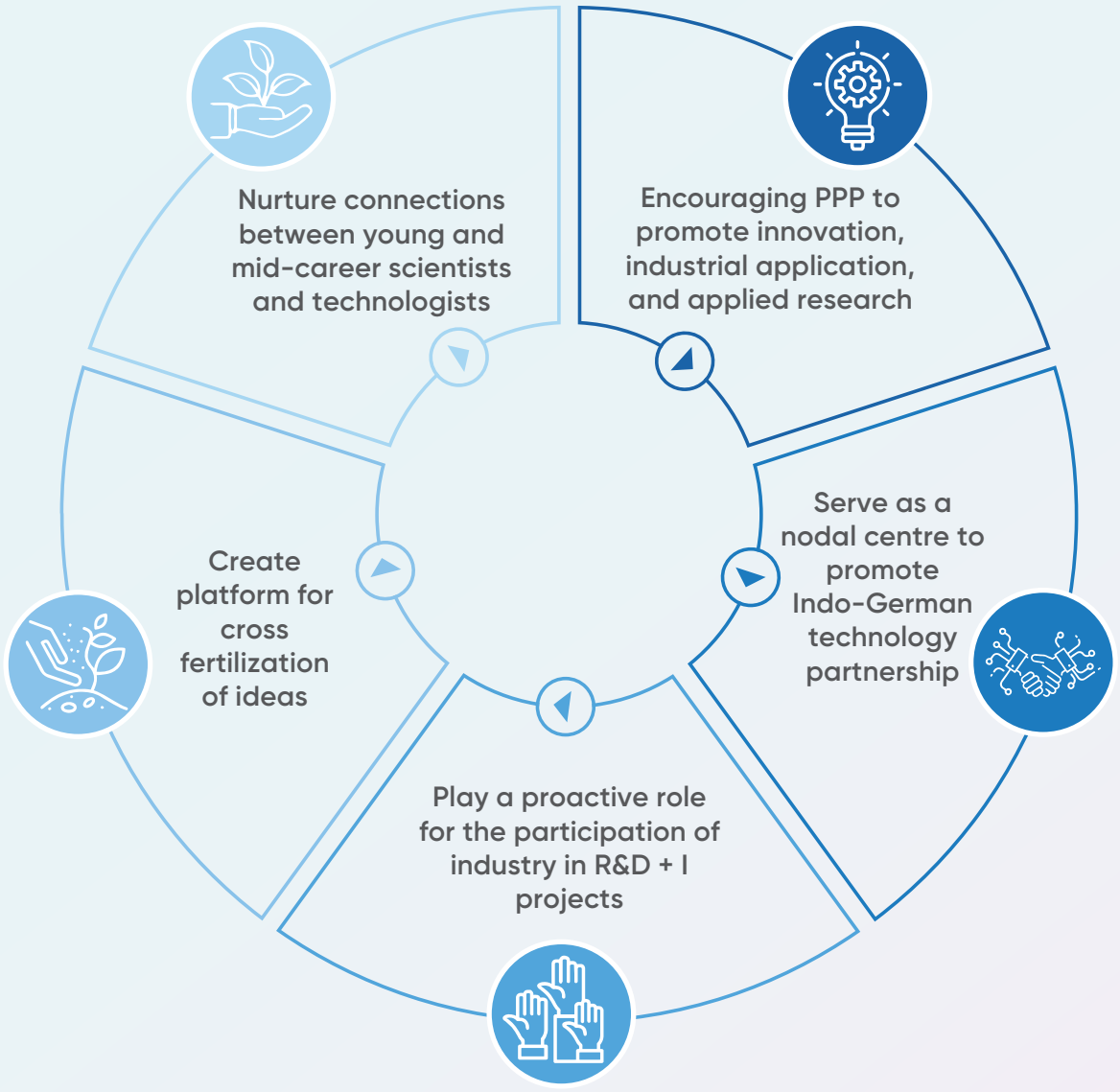
TO CATALYSE INDO-GERMAN
STRATEGIC R&D PARTNERSHIPS

About IGSTC

The Indo-German Science & Technology Centre (IGSTC), a joint initiative by the Department of Science & Technology (DST), Government of India and the Federal Ministry of Education and Research (BMBF), Government of Germany was established to facilitate Indo-German R&D networking through substantive interactions among government, academia/research system and industries, thus fostering innovation for overall economic and societal developments in both the countries. Through its various funding programmes, IGSTC intends to catalyse innovation centric R&D projects by synergising the strength of research/academic institutions and public/private industries from India and Germany.



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19th Governing Body Meeting

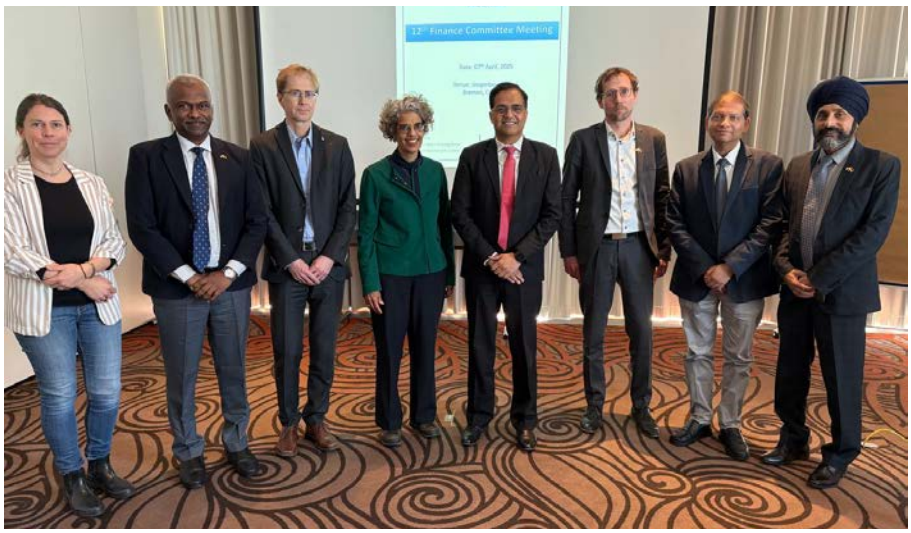
The Indo-German Science & Technology Centre (IGSTC) convened its 19th Governing Body (GB) Meeting on the 9th of April 2025, at the Steigenberger Hotel in Bremen, Germany. This significant gathering was graced by the presence of twenty-one distinguished participants, comprising the Co-Chairs of the Governing Body, GB members, Member Secretaries, a Special Invitee, and representatives from both the IGSTC Secretariat and the German Project Office, DLR-PT, based in Bonn. The proceedings were jointly presided over by Dr. Praveen Kumar S, representing the Department of Science and Technology (DST), Government of India, and Ms. Kathrin Meyer from the Federal Ministry of Education and Research (BMBF), Federal Republic of Germany. The meeting was convened by Mr. R. Madhan, Director, IGSTC.

During the session, the Governing Body undertook a comprehensive review and deliberation on the Centre's ongoing activities and programmes. Particular attention was given to updates and progress under the flagship "2 + 2" collaborative research projects, workshops, and the various networking and fellowship initiatives designed to foster Indo-German academic and industrial cooperation.

A moment of special recognition was accorded to Mr. R. Madhan for his exemplary leadership and commendable service during his tenure as Director of IGSTC.

The meeting concluded on a note of mutual gratitude and camaraderie, with the Co-Chairs extending their heartfelt thanks to all Governing Body members for their invaluable insights and active engagement.

12th Finance Committee Meeting



The 12th Finance Committee Meeting of Indo-German Science and Technology Centre (IGSTC) was held on 7th April 2025 at Bremen, Germany. The Finance Committee comprises of Dr. Renata Ch. Feldmann (BMBF & German Co-Chair), Mr. Chetan Prakash Jain (DST & Indian Co-Chair), Dr. Martin Goller (BMBF) and Dr. Arindam Bhattacharyya (DST). Mr R Madhan (Director, IGSTC), Mr. Hans Westphal (DLR-PT / IGSTC), Mr Inderjit Singh (Chief Administrative Officer, IGSTC) and Ms. Alexandra Stinner (DLR-PT / IGSTC). The FC undertook a financial review of IGSTC and deliberated on the Centre's provisional expenditure statement for the FY 2024-25 (up to February 2025). The committee also took a note of forecast presented in last FC vs Provisional Expenditure Statement for FY 2024-25 (up to February 2025).

Partner's Meet

The Indo-German Science & Technology Centre (IGSTC) successfully organised the Partner's Meet 2025 on 8th April 2025 at the Schnoor Eleven, Bremen, Germany. Held on the eve of the IGSTC Governing Body (GB) meeting, the event served as a vibrant platform to bring together project partners, scientists, and researchers involved in the six bilateral projects supported under the 2+2 Call 2023, which focuses on the thematic areas of "Waste to Wealth" and "Sustainable Packaging." The meet was inaugurated by Ms. Soumya Gupta, Consul General of India in Hamburg, who emphasized the growing importance of Indo-German collaboration in addressing global challenges through science and technology. In her address, she highlighted the relevance of the 2+2 programmes in translating research into scalable, sustainable solutions for further strengthening the Indo-German cooperation.

A total of 55 participants including project partners from all six funded projects were in attendance. Each project team delivered detailed presentations, outlining their

ongoing research activities, and future directions. The sessions allowed for an in-depth exchange of ideas, challenges, and innovative approaches being explored under the mentioned thematic areas. The event was graced by the presence of Dr. Leif Steuernagel from TU Clausthal, a member of the Scientific Committee for Call 2023, who keenly observed the scientific progress of the projects. In addition, the Co-Chairs and members of the IGSTC Governing Body attended the session, underscoring the Centre's commitment to supporting high-quality bilateral research initiatives. Beyond technical discussions, the Partner's Meet fostered a spirit of community and collaboration through informal interactions. The event concluded with a networking dinner, providing an excellent opportunity for participants & stakeholders to connect in an informal setting, exchange insights, and explore avenues for future cooperation.

Overall, the Partner's Meet 2025 marked a significant milestone in strengthening Indo-German research partnerships and advancing innovation-driven solutions to sustainability challenges.

2+2 Projects

BETTERyRec

MAMM-WAAM

Add-bite

BETTERyRec

IGSTC 2+2 project Integrated bio and hydrometallurgical techniques for the recovery of metals from spent battery waste and recycling wastewater (BETTERyRec) had the first in-person meeting on 20th January 2025 at CSIR-IMMT, Bhubaneswar, India. Teams from German academic partner- Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Helmholtz Institute Freiberg for Resource Technology (HIF), and German industrial partner-- MEAB Chemie Technik, GmbH visited their counterparts in India. This gathering marked the beginning of a collaborative effort between partners from both academia and industry, focused on leveraging the strengths of each organization.

During the meeting held at CSIR-IMMT, Bhubaneswar, each partner showcased their domain expertise, outlined their planned contributions, and presented preliminary findings. The discussions sparked valuable insights into the novel approaches shaping the project's future direction. CSIR-IMMT also provided an impressive tour of its state-of-the-art laboratories and advanced research facilities, which are poised to play a pivotal role in driving the project's R&D initiatives. Dr. Nilotpala Pradhan introduced key members of the CSIR-IMMT team, who will bring their expertise and commitment to the collaborative effort. Adding further depth to the engagement, Dr. Martin Rudolph, Project Coordinator from HZDR, and Dr. Katrin Pollmann delivered lectures to students and research staff, offering meaningful perspectives and a deeper understanding of the cutting-edge research underway at HIF-HZDR.

At the site of the industrial partner, M/s Himadri Specialty Chemicals Ltd. (HSCL) in Kolkata, the collaborators had the opportunity to explore the company's newly established facilities at New Energy Materials division, which focuses on battery production and recycling. Dr. Debashish Das, Principal Investigator from HSCL, presented the company's impressive product portfolio along with its progressive approach to manufacturing, innovation, and recycling. The visit offered valuable insights into how HSCL's capabilities align with the objectives of the project.

The visit proved to be a resounding success—both through the depth of discussions and in highlighting the complementary strengths each partner brings to the collaboration.

The rich blend of academic and industrial expertise forms a well-rounded, high-performing team, with synergies emerging that reach well beyond the project's immediate objectives. The potential for cross-departmental collaboration is considerable, setting the stage for broader innovation and long-term partnerships.

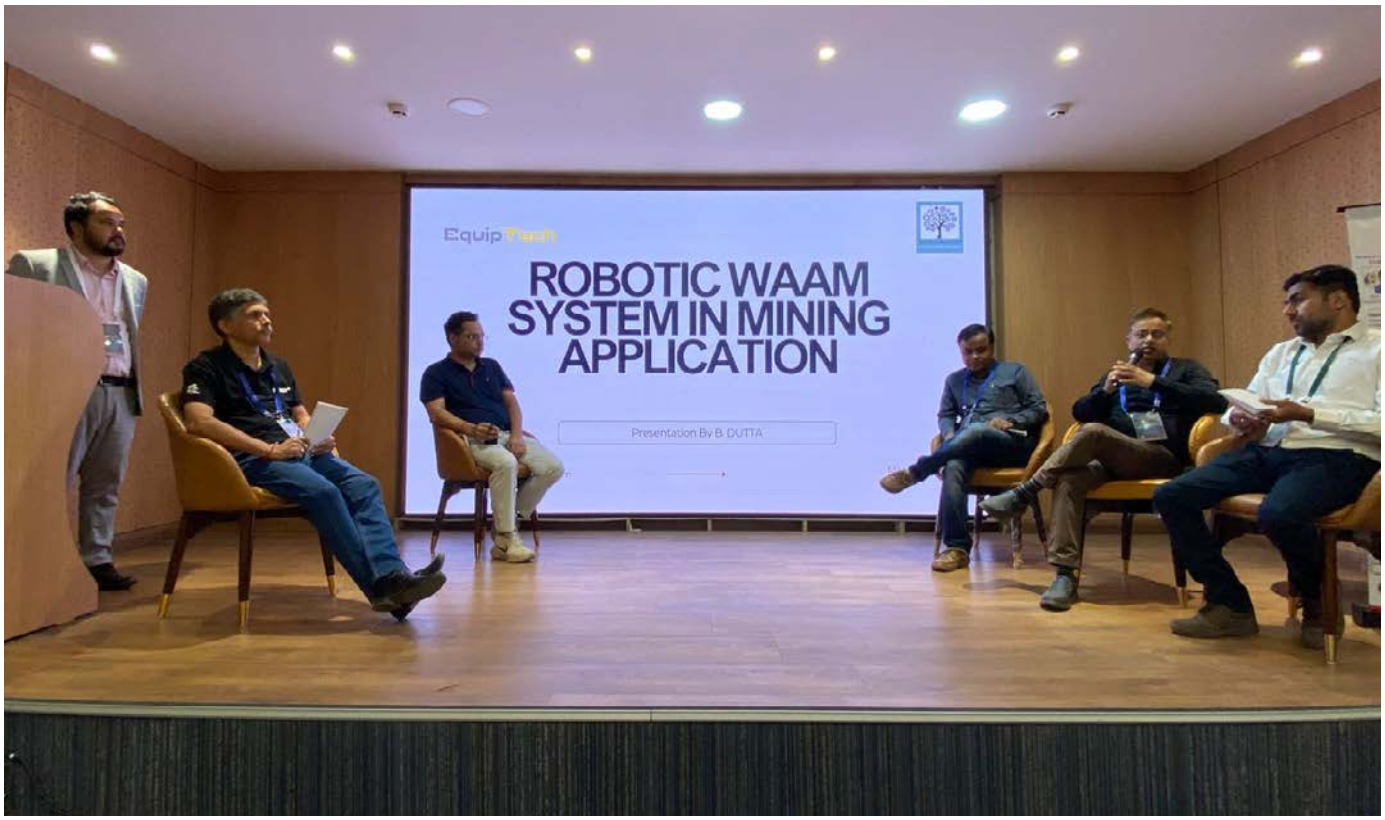
With a strong foundation now in place, the partners are excited to embark on this collaborative journey, confident in their collective ability to make significant strides in the project's goals.

MAMM-WAAM

The Multi-Axis Multi-Material Wire Arc Additive Manufacturing (MAMM-WAAM) team, under the Indo-German Science & Technology Centre (IGSTC) initiative, successfully organized an Indo-German Industry-Academia Symposium on Multi-Material Additive Manufacturing During March 22–23, 2025, at the IIT Kanpur Outreach Center, Noida.

This two-day symposium brought together over 100 participants, including representatives from more than 15 industries, 15 academic institutions, and numerous online additive manufacturing (AM) enthusiasts. The collaborative platform served as a nexus for innovation, knowledge exchange, and strategic planning across sectors such as aerospace, oil & gas, underwater systems, mining, deep ocean applications, and construction.

The MAMM-WAAM team, comprising researchers from IIT Guwahati, IIT Kanpur, Ace Designers Ltd. Bangalore, RWTH Aachen, and ModuleWorks Aachen, represented groundbreaking achievements in multi-material deposition technologies. Key highlights included significant cost and lead-time reductions in manufacturing components such as clamps, diffusers, propellers, and rocket tanks, as evidenced through successful case studies.



Strategic applications of the MAMM-WAAM system, especially in multi-material deposition for dies and deep-sea housings, were discussed in depth. Industry partners explored certification frameworks, material performance challenges, and return-on-investment (ROI) considerations for dedicated WAAM facilities. Academic contributions focused on advanced process integration, including Computer-Aided Manufacturing (CAM), thermal modelling, and adaptive toolpath generation.

A recurring theme was the critical need for cross-disciplinary plugins, collision-free robotic programming, and the adoption of sustainable feedstocks. Case studies from the marine and mining sectors illustrated MAMM-WAAM's potential for heavy industrial repair and refurbishment, further underlining its industrial relevance.

The event concluded with a resounding call for structured industry-academia partnerships to validate proofs of concept, streamline standards and certification protocols, and co-develop India-specific WAAM solutions tailored to strategic infrastructure needs.

Encouraged by the system's potential, several industrial partners expressed strong interest in collaborating with the MAMM-WAAM team, particularly in the areas of repair and maintenance of metallic objects and the development of functionally graded materials.

This symposium reaffirmed the Indo-German commitment to fostering technological innovation and industrial transformation through joint research and collaborative platforms.

Add-bite

IGSTC supported workshop on "Additively Manufactured Patient-Specific Implants" was successfully organised by the Indian Institute of Technology Delhi (IITD), India, on February 3, 2025. This one-day event served as the official dissemination platform for the Indo-German collaborative research project titled "add-bite: Development of patient specific additively manufactured mandibular implants with biotechnology inspired functional lattice structures" which aims to advance the way medical implants are designed and fabricated, with a particular focus on using additive manufacturing (AM) technologies to create patient-specific solutions.

The workshop brought together key researchers and collaborators from the project's core partner institutions, which include IIT Delhi, All India Institute of Medical Sciences (AIIMS), the Institute of Production Science at Karlsruhe Institute of Technology (wbk/KIT), Tata Steel, and OTEC. These institutions represent a unique blend of expertise across engineering, clinical sciences, and industrial manufacturing, making this consortium ideally suited to address the multifaceted challenges of patient-specific implant development.

In addition to the main project partners, the workshop was attended by researchers from several other esteemed academic institutions such as Indian Institute of Technology Mandi, Indian Institute of Engineering Science and Technology (IIEST), Shibpur, Indian Institute of Technology Mumbai, Indian Institute of Technology Patna, and the University of Sheffield, UK.

This broad academic participation provided a platform for exchanging ideas and learning from ongoing national and international research in the area of medical device innovation.

Industry leaders and domain experts from Stryker India, Orthotech India Pvt Ltd, and Osteoskill Pvt Ltd also took part in the discussions, offering practical insights into the clinical translation, regulatory considerations, and market implications of additive manufacturing for implants. Their involvement emphasised the critical role that industry plays in taking research from laboratory benches to operating rooms.

The presence of Dr. Rupak Bhattacharya, a senior representative from IGSTC, further elevated the significance of the event. His address underscored the importance of Indo-German cooperation in driving cutting-edge scientific innovation and highlighted how joint funding schemes like IGSTC's 2+2 model serve as catalysts for impactful bilateral research.

Throughout the workshop, participants engaged in a series of technical presentations, and interactive sessions. Topics ranged from the biomechanics of customised implants to the latest trends in 3D printing materials and quality control for AM-produced medical devices. The sessions emphasised the transformative potential of additive manufacturing in producing highly customised, anatomically precise, and functionally optimised implants tailored to individual patient needs.

The event concluded on a highly optimistic note, with speakers reiterating the importance of interdisciplinary collaboration and continuous knowledge exchange between countries. The workshop not only showcased the tangible outcomes of the "add-bite" project but also reinforced the broader vision of leveraging science and technology for improved healthcare outcomes through innovation in implant design and manufacturing.

Bilateral Workshops

Inter-Disciplinary Approach to Sustainable Habitats using AI-ML Tools

The IGSTC supported bilateral workshop titled "Inter-Disciplinary Approach to Sustainable Habitats using AI-ML Tools," held from 24th–26th February 2025 at the Indian Institute of Science (IISc), Bengaluru.

Organized by Prof. L.N. Rao from IISc and Prof. Christina Bogner from the University of Cologne, the event brought together 29 experts from India and Germany to address sustainability challenges in water and wastewater management, air quality, energy systems, agriculture, and environmental policy through the lens of artificial intelligence and machine learning.

The workshop aimed to promote Indo-German collaboration, stimulate interdisciplinary research, and identify opportunities for future joint initiatives under IGSTC's WISER and PECFAR programs. Over three days, the participants explored a range of topics including AI-integrated watershed management, circular economy approaches to urban water treatment, sustainable farming practices, and green materials for energy systems. Legal

frameworks, policy perspectives, and digital innovations like AI-based digital twins were also discussed to ensure holistic approaches to sustainability.

On the first day, sessions focused on water security, wastewater reuse, and agriculture, highlighting cutting-edge research on microplastic pollution, decentralized reuse technologies, and the role of AI in improving crop resilience. The second day turned to energy, materials science, and policy, with presentations on battery modeling, plasma pyrolysis, and nanomaterials for advanced water treatment. Legal scholars shared insights into water rights and regulatory frameworks essential for technology deployment. The final day concluded with presentations on sustainable cities, environmental education, and AI-enabled infrastructure planning. A field visit to Bengaluru International Airport offered a practical view of rainwater harvesting, renewable energy integration, and circular waste management in action.

The workshop yielded several key outcomes, including the identification of interdisciplinary research themes, the seamless integration of law and policy with emerging technologies, and the generation of ideas for faculty exchanges, joint publications, and AI-driven sustainability startups. It concluded with a strong commitment to ongoing collaboration and innovation between Indian and German institutions. Marking a significant milestone, the event advanced cross-border partnerships aimed at delivering transformative solutions for a sustainable future.

GIND-BOPM 2025

The Germany–India Brain & Oncology Personalized Medicine Workshop 2025, held on March 9–10 at Mahindra University, Hyderabad, marked a major milestone in Indo-German biomedical collaboration. Jointly organized by the Apollo Hospitals Educational and Research Foundation (AHERF) and the University of Duisburg-Essen and supported by the Indo-German Science & Technology Centre (IGSTC), the workshop brought together more than 25 domain experts representing over 20 premier academic, clinical, and research institutions from both countries. Co-chaired by Dr. M. V. Sasidhar from AHERF and Dr. Basant Thakur from University Hospital Essen, the workshop aimed to foster high-level scientific dialogue and explore collaborative opportunities in the fields of circulating biomarkers, precision medicine, and translational research related to oncology and neurology.

The first day of the workshop opened with in-depth discussions at the cutting edge of oncology diagnostics and therapeutics. Central themes included pioneering innovations such as AI-powered multi-analyte biomarker platforms, droplet digital PCR for clinical diagnostics, functional tumor models for drug screening, and single-cell multi-omics approaches to map tumor evolution. A standout moment was the proposal for an AI-driven liquid biopsy platform aimed at revolutionizing early cancer detection. Participants also tackled key translational challenges, emphasizing the urgency of regulatory harmonization, standardized protocols, and large-scale clinical validation to close the gap between lab-based discoveries and real-world clinical applications.

On Day 2, the focus shifted to neurology, spotlighting exosome-based diagnostics, miRNA profiling, and vesicle-mediated drug delivery systems in the treatment of neurological disorders such as Alzheimer's

disease, Parkinson's disease, epilepsy, pediatric brain tumors, and high-grade gliomas. A proposed roadmap for validating neuronal exosome biomarkers—particularly in Alzheimer's and dementia—sparked wide interest. Further sessions explored the diagnostic potential of miRNA signatures and the promise of vesicle-based delivery systems to enhance therapeutic precision. The day concluded with a thought-provoking panel discussion on next-generation neurology research, highlighting the need for collaborative therapeutic translation, greater access to biobank resources, and cohort-scale biomarker validation initiatives spanning India and Germany.

The workshop yielded several impactful outcomes which included the formation of interdisciplinary working groups focused on biomarker science and personalized medicine, and the launch of a collaboration mapping and resource-sharing initiative to streamline efforts across institutions. AHERF and the University of Duisburg-Essen also agreed to jointly apply for the establishment of an Indo-German Centre dedicated to oncology and neurology research. In another notable development, AHERF signed a Confidentiality Disclosure Agreement (CDA) with the University of Freiburg to initiate collaborative biomarker research in the area of prostate cancer.

Dr. Saroj Kumar of AIIMS Delhi remarked on the transformative potential of AI-driven liquid biopsy in reshaping early cancer diagnostics, while Dr. Dirk Kuhlmeier from Fraunhofer IZI underscored the promise of exosome-based detection platforms in tackling early-stage neurological disorders. The organizing committee expressed sincere gratitude to all participating researchers, institutions, and stakeholders, and extended special thanks to Dr. Rajindera Chauhan of Mahindra University for graciously hosting the event and facilitating a vibrant platform for academic and scientific exchange between India and Germany.

IGWTRA-2025

IGSTC supported Workshop on Translational Research in Andrology, held during February 28 to March 1, 2025, at Kasturba Medical College (KMC), Manipal, Manipal Academy of Higher Education, was a collaborative initiative between the Centre of Excellence in Clinical Embryology, Kasturba Medical College, Manipal, and the Centre for Reproductive Medicine and Andrology, University of Münster, Germany. Prof Satish Adiga and Prof Stefan Schlatt jointly hosted the event which integrated cutting-edge male reproductive research into clinical practice, focusing on the diagnosis and treatment of male infertility.

Participants presented significant Centers of Excellence of both countries which created a unique scenario for exchange on basic and clinical aspects in Andrology.

The brainstorming sessions discussed the innovative, clinical, translational, and collaborative research in reproductive health, strongly emphasizing idiopathic male infertility, non-invasive methods for sperm selection, stem cell-based fertility preservation, in vitro spermatogenesis, and their genetic, epigenetic, and immunological implications.

The key outcomes and achievements of the workshop include scientific presentations where the experts discussed mechanisms of sperm motility, idiopathic male infertility, and clinical challenges in diagnosing and treating male infertility. Several new ideas erupted during the brainstorming sessions, which have

the potential to become major projects. German professionals gained insights into the diverse medical challenges faced by the Indian fertility centres and research institutes, while Indian professionals benefited from Germany's cutting-edge facilities and research approaches in translational andrology. The developments from this meeting enhanced expertise and skill sets in both countries, strengthening global efforts in male reproductive health. The Indo-German collaborative meeting provided a platform for young scientists to present their research work and receive constructive feedback. Industry collaborations led the path for new start-ups in andrology clinics, and networking among young scientists led to discussions on joint collaborative projects between India and Germany.

Beyond the scientific agenda, the workshop offered rich cultural exposure that further deepened the spirit of collaboration. German participants experienced a vibrant showcase of Indian cultural traditions through a captivating evening of performances.

Overall, the workshop emphasized translational research, fostering industry-academia collaboration and opening paths for start-ups in andrology. Specific outcomes include strategic plans to use non-invasive tools to diagnose idiopathic male infertility, develop region-specific semen normograms for fertility evaluation, and bilateral research on gene panels to understand failure in assisted reproduction. The event has laid a strong foundation towards bridging the gap between experimental research and clinical practice in male fertility. Supported by the IGSTC, the workshop not only catalysed new scientific initiatives but also showcased cross-cultural engagement in strengthening global partnerships and advancing male reproductive health.

Women Involvement in Science & Engineering Research (WISER)

Dr. Shilpi Verma

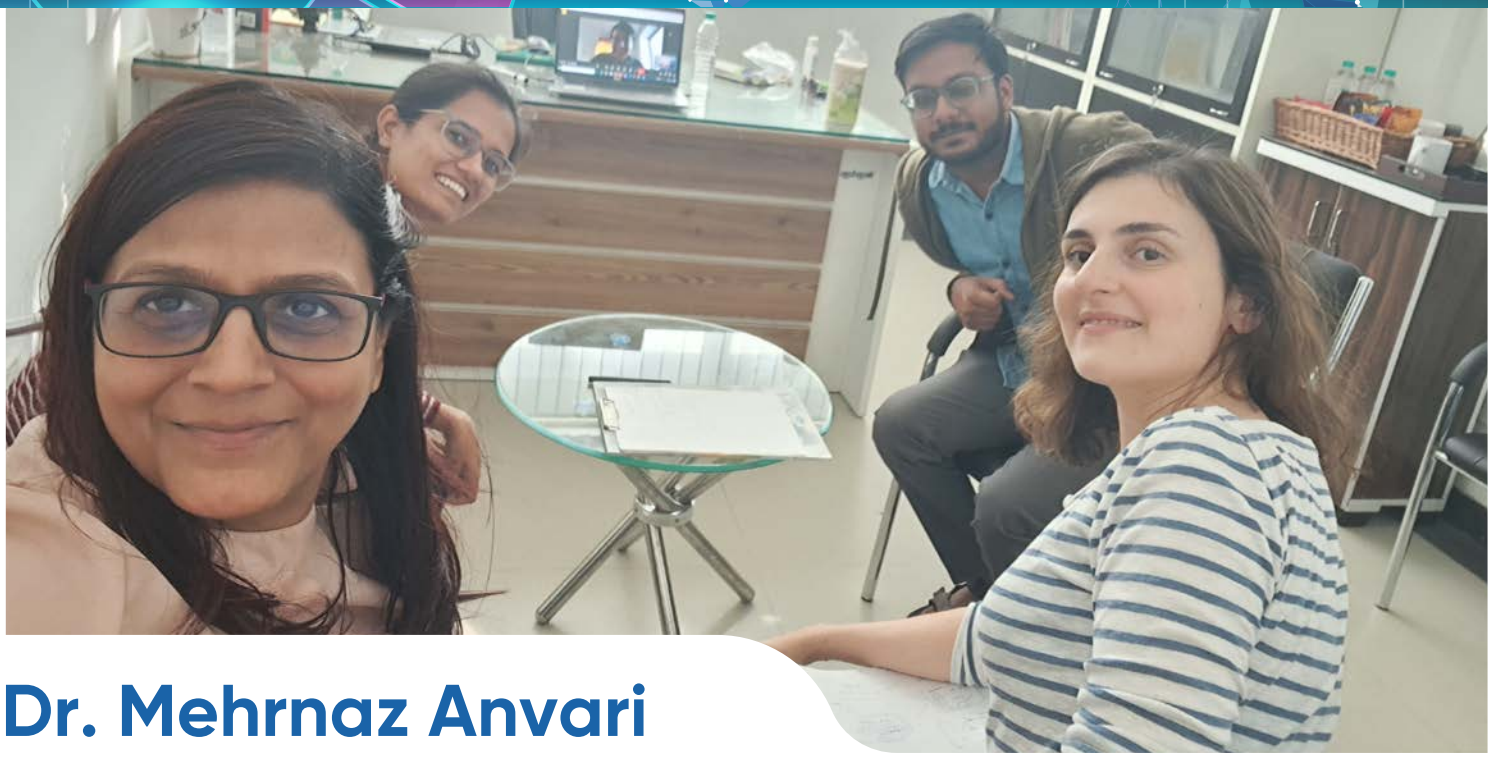
Thapar Institute of Engineering and Technology

Dr. Shilpi Verma, Assistant Professor at the Department of Energy and Environment, Thapar Institute of Engineering and Technology (TIET), has been awarded the IGSTC WISER-2024 Award. As part of this award, she embarked on a research visit to Karlsruhe Institut für Technologie (KIT), Germany where she was hosted at the renowned Engler-Bunte-Institut—specifically, its Water Chemistry and Water Technology Division—under the esteemed mentorship of Prof. Harald Horn, a global authority in water chemistry and treatment technologies.

During her WISER research visit, Dr. Verma delved into cutting-edge studies on wastewater treatment, focusing on advanced oxidation processes (AOPs), catalytic degradation of emerging contaminants, and, notably, the development of novel upconversion photocatalytic materials. These materials aim to harness solar energy for the efficient degradation of persistent poly- and perfluoroalkyl substances (PFAS), offering a promising solution to one of the most pressing environmental challenges of our time. Her exposure to KIT's world-class laboratories and its vibrant research culture profoundly enriched her scientific outlook. A highlight of her visit was her interaction with Prof. Dr. habil. Fritz H. Frimmel, an internationally acclaimed expert in water treatment, whose insights helped refine her strategies for contaminant removal and process optimization. Dr. Verma also visited the DVGW Research Center at KIT, where she observed the functioning of pilot-scale reactors designed for applied water treatment research. Her explorations spanned membrane filtration, AOPs, and biological treatment systems, with a strong focus on in-situ analytical methods.

As part of her academic immersion, Dr. Verma participated in the evaluation of Bachelor's and Master's student research projects, gaining insights into the pedagogical practices and academic rigor at KIT. She delivered a presentation on her ongoing research and the IGSTC-WISER program, sharing insights with an international audience. Furthermore, she had the opportunity to engage in insightful discussions with Prof. Robert Nerenberg from the University of Notre Dame, during his visit to KIT. His expertise in biofilms and membrane-biofilm reactors (MBfRs) provided valuable perspectives that deepened her understanding of sustainable and energy-efficient water treatment technologies.

Dr. Verma's work contributes meaningfully to Sustainable Development Goal 6 (SDG 6): Clean Water and Sanitation by advancing scientific strategies for ensuring efficient, scalable, and sustainable access to clean water. Her work advances scalable, efficient, and sustainable strategies for water purification and exemplifies the spirit of Indo-German collaboration, women's empowerment in STEM, and global innovation in environmental engineering.



Dr. Mehrnaz Anvari

Fraunhofer Institute for Algorithms and Scientific Computing SCAI

Dr. Mehrnaz Anvari from Fraunhofer Institute for Algorithms and Scientific Computing (SCAI), Germany is an Awardee of IGSTC WISER 2024. She has been collaborating with Prof. Sarika Jalan from the Complex Systems Lab, IIT Indore, on research project titled "The Role of Higher-Order and Symplectic Interactions in Power Grid Stability."

Dr. Anvari, an expert in modelling grid fluctuations, and Prof. Jalan, a renounced scientist for her pioneering research on higher-order network interactions, collaborated to address a pressing global challenge: enhancing the resilience of power grids in the face of increasing integration of renewable energy sources like wind and solar. Their project advances the state of the art by incorporating higher-order and symplectic interactions into KO models to better reflect the realities of modern power networks.

As part of the fellowship, Dr. Anvari visited IIT Indore for an in-depth scientific engagement with Prof. Jalan and her research group. During her visit, she actively participated in academic discussions with faculty and students and delivered a research presentation at a colloquium hosted by the institute. The visit fostered meaningful knowledge exchange and established a strong foundation for

long-term research collaboration between the two institutions.

Dr. Anvari presented Preliminary outcomes of their joint research at the prestigious European Dynamics Days 2024 conference. The collaboration has already yielded three co-authored research papers. Dr. Anvari also got the opportunity to explore Indian culture, enjoy local cuisine, and visit to historical landmarks in Indore, making her visit both scientifically productive and culturally enriching.

This fruitful collaboration reemphasized the essence of WISER —fostering international scientific excellence while empowering women researchers through purposeful engagement and collaborative innovation.

Dr. Sofia Dembski

Fraunhofer Institute for Silicate Research ISC

Dr. Sofia Dembski from the Fraunhofer Institute for Silicate Research ISC, Germany, is a recipient of the IGSTC WISER award, recently concluded a successful collaborative research stay at the DBT–National Institute of Animal Biotechnology (NIAB), India. Hosted by Dr. Sonu Gandhi, her visit aimed at fostering international scientific collaboration and empowering women in research and innovation under WISER award.

This Indo-German collaborative project is dedicated to validating RENACER®—an innovative, next-generation bioresorbable silica gel nonwoven engineered for the treatment of chronic and infected wounds. At the Fraunhofer Institute for Silicate Research ISC, cutting-edge pressure spinning and electrospinning technologies are harnessed to fabricate high-performance silica gel fibers. These are then subjected to comprehensive in-vitro and in-vivo validation at DBT–NIAB, India. A central focus of the initiative lies in functionalizing the nonwoven material with antimicrobial agents, aiming to significantly elevate its therapeutic efficacy and clinical impact.

During her research stay in India, Dr. Sofia Dembski, alongside her Indian collaborators, placed a strong emphasis on hands-on, collaborative experimentation—particularly in areas where sample handling plays a critical role in ensuring reliable outcomes. Joint sample preparation for in-vitro studies at NIAB was a key focus, facilitating consistency and reproducibility across both institutions. Special attention was dedicated to degradation studies and cell culture experiments, which are highly sensitive to procedural variations. To address this, the teams implemented standardized experimental protocols across all critical stages of the research.

Dr. Dembski underscored the invaluable nature of in-person scientific collaboration. While virtual meetings support international cooperation, she emphasized that face-to-face interactions foster richer dialogue, spur spontaneous innovation, and deepen mutual understanding—elements she considers essential for the success of bilateral research efforts.

A significant milestone achieved during her stay was the completion of a joint manuscript titled “Synergistic Micro-Nano Architecture in Silica Fiber Scaffolds Accelerates Wound Healing”, which was finalized at NIAB and has since been submitted for publication.

Beyond the scientific collaboration, the visit offered a deeply enriching cultural experience. Accompanied by her colleague Dr. Bastian Christ, Dr. Dembski expressed heartfelt appreciation for the warmth and hospitality of their Indian hosts. They were profoundly inspired by India’s cultural diversity, rich traditions, and vibrant social fabric, making the visit not only scientifically rewarding but also personally memorable.

This collaboration stands as a testament of how the WISER programme is empowering international women scientists, fostering high-impact research, and building bridges of innovation and mutual respect between India and Germany.

Dr. Shrutidhara Sarma

IIT Jodhpur

Dr. Shrutidhara Sarma from IIT Jodhpur has been awarded the IGSTC WISER 2022 to collaborate with Prof. Andreas Dietzel at Technische Universität Braunschweig, Germany. Their joint research project focuses on the development of flexible and stretchable sensor systems tailored for advanced healthcare applications.

Dr. Sarma's project, TESSLA (Towards the Development of an Ultrasensitive Strain Measurement System Using Laminated Nanocomposites), aims to advance respiratory support for premature infants, who frequently rely on ventilators due to underdeveloped lungs. The project addresses the critical need for intelligent, responsive sensors capable of capturing real-time respiratory signals to synchronize oxygen delivery with the infant's natural breathing rhythm.

TESSLA integrates soft, skin-like sensor patches that detect subtle chest movements associated with respiration, enabling timely activation of ventilatory support. In parallel, a machine learning-based classifier is being developed to enable real-time identification of breathing patterns, enhancing the precision and adaptability of the system.

By combining cutting-edge sensor technology with intelligent data analysis, the project aspires to deliver a non-invasive, cost-effective, and personalized respiratory monitoring solution—particularly tailored for neonates in resource-limited settings.

At the Institut für Mikrotechnik (IMT), Technische Universität Braunschweig, Dr. Sarma collaborated with the Printed Electronics Laboratory to develop a range of advanced strain-sensing patches. This partnership provided her with access to cutting-edge printing technologies and biocompatible materials, significantly enhancing the scope and quality of her research. Her work under this collaboration has already yielded five publications in high-impact journals, including Sensors and Actuators Reports, and has been

featured at prominent international conferences such as APSCON 2024 and 2025. A key milestone of the project was the development and demonstration of the first working prototype of the sensor system, which was showcased to the Science Ministers of both Germany and India during the Golden Jubilee celebration of Indo-German Science & Technology Cooperation in October 2024.

Beyond the work, Dr. Sarma embraced the cultural experience of her stay in Braunschweig—exploring the city's historic landmarks and forming lasting personal connections. Highlights included a memorable Indian dinner hosted by Sabine Kral-Aulich and a heartfelt farewell gathering with colleagues and friends.

Upon returning to India, Dr. Sarma visited AIIMS Jodhpur to engage with clinicians and observe the practical challenges of deploying the sensor system in real-world medical settings. These interactions provided valuable user-centric insights that informed refinements to the device, enhancing its suitability for use in low-resource environments.

Looking ahead, Prof. Andreas Dietzel plans to visit India to further strengthen the collaboration by engaging directly with Indian healthcare professionals and contributing to the translational aspects of the project—underscoring the shared commitment to bringing this impactful innovation from lab to bedside. Dr. Sarma describes the WISER fellowship as a deeply enriching experience that allowed cross-border, interdisciplinary research. This Indo-German collaboration highlights the potential of global partnerships in building smart, affordable healthcare technologies that can improve neonatal care and reduce mortality, both in India and beyond.

Dr. Kala S

Indian Institute of Information Technology Kottayam

Dr. Kala S, Assistant Professor and Head of the Intelligent Integrated Circuits and Systems (I2CS) Research Lab at the Indian Institute of Information Technology (IIIT) Kottayam, Kerala, was awarded the IGSTC WISER 2023. She collaborated with Prof. Dr. Akash Kumar, Professor and Chair of Embedded Systems at the Faculty of Electrical Engineering and Information Technology, Ruhr University Bochum (RUB), Germany, on the project titled "Sparse Matrix Multiplication Co-Processor for Deep Learning Applications on the RISC-V Platform."

The objective of this project is to design and develop an efficient architecture for neural networks aimed at implementing AI-based systems. The growing popularity of deep learning algorithms has led to an increasing demand for specialized accelerators tailored to matrix-matrix multiplication tasks. While many matrix multipliers are designed around systolic array architectures, they struggle to efficiently handle sparse operations. Sparse matrices, common in deep learning, are more complex than their dense counterparts and require additional circuitry for processing. The irregular memory access patterns inherent in sparse operations create challenges for performance, as traditional architectures often fail to fully exploit the available memory bandwidth and computational resources. This inefficiency highlights the need for new hardware architectures optimized for sparse matrix operations to improve overall deep learning performance. This project focus on developing a novel architecture for sparse neural networks on hardware platform.

As part of the IGSTC WISER grant activities, Dr. Kala S visited Ruhr University Bochum (RUB) in 2024 and 2025 to advance the project work focused on accelerating deep neural networks on hardware platforms for AI applications. This collaborative

effort has resulted in the successful publication of several research articles, including those in SCI-indexed journals. During her visits, Dr. Kala engaged extensively with researchers across related fields, gaining valuable insights into cutting-edge research and ongoing projects within Prof. Dr. Akash Kumar's group. These interactions fostered meaningful knowledge exchange and technology sharing, significantly enriching her understanding of hardware implementation challenges and solutions.

The expertise and experience of Prof. Akash Kumar's team in hardware acceleration have substantially strengthened Dr. Kala's research approach, providing her with critical perspectives to tackle complex problems more effectively. Several additional research articles are currently underway, reflecting the continued progress of the collaboration.

Building on the success of these visits, the partnership between IIIT Kottayam and RUB has been expanded to multiple levels, creating further opportunities for joint research, development, and innovation. During her time in Bochum, she fully embraced Germany's rich cultural heritage, exploring the vibrant atmosphere of nearby cities like Cologne and Dortmund. She delighted in the local traditions, savouring traditional foods and enjoying the music that filled the air. Her adventures were further enriched by breathtaking views of the Rhine River, with the Rhine promenade offering serene moments of reflection. Strolling through the charming streets of Düsseldorf added to the experience, making her time in Germany truly unforgettable.

Industrial Fellowship 2024

Dr. Sachin Rahi

Airbus Defence and Space GmbH

Dr. Sachin Rahi is an awardee of IGSTC Postdoctoral Industrial Fellowship (PDIF) 2024 at Airbus Defence and Space GmbH. He completed his Ph.D. in Electrical Engineering from the Indian Institute of Technology Jodhpur, where his doctoral work centred on flexible organic transistors for e-textiles and memory applications. With a growing interest in flexible and wearable electronics for aerospace systems, Dr. Rahi is now contributing his expertise to cutting-edge innovation at one of the world's foremost aerospace companies.

At Airbus's Central Research & Technology (ACRT) facility in Munich—the innovation nucleus of Airbus Defence and Space—Dr. Rahi collaborates with the Materials Science Department. This cutting-edge hub fosters interdisciplinary research in advanced materials, hybrid structures, printed and hybrid electronics, and additive manufacturing, creating a dynamic environment for high-impact industrial innovation.

Dr. Rahi's current research centers on the development of flexible transistors based on printable organic and oxide semiconductors, with the aim of integrating them into next-generation aerospace platforms. These lightweight, bendable devices hold the potential to significantly improve the efficiency, reliability, and sustainability of future aerospace systems. Yet, the harsh environmental conditions inherent to aerospace applications—marked by intense thermal stress and mechanical strain—pose severe engineering challenges. To overcome these, Dr. Rahi is engaged in the fabrication and characterization of flexible transistors, rigorously testing their performance and durability using Airbus's state-of-the-art thermal chambers and aerospace-grade testing infrastructure.

The industrial collaboration through IGSTC has played a pivotal role in helping Dr. Rahi align his academic research with real-world industry demands. The close partnership with Airbus has not only enabled access to state-of-the-art facilities but has also allowed him to adapt his research for scalable, practical applications, which is crucial for the transition toward fully printed and integrated electronics in aeronautics. While the research outcomes are currently in progress, the industrial exposure and collaborative work have already begun shaping potential breakthroughs in aerospace electronics.

Beyond the lab, Dr. Rahi has enjoyed the rich cultural experiences Germany has to offer. From vibrant local festivals and diverse cuisine to picturesque landscapes, his time in Germany has been both professionally rewarding and personally enriching. A notable highlight was his visit to the BAU Trade Fair 2025 in Munich—one of Germany's largest and most prestigious trade events. The fair provided an excellent platform to explore global innovations and trends across industries and engage with thought leaders and technology experts from around the world.

Dr. Himanshu Gauttam

Airbus Central Research and Technology (Space and Defence)

Dr. Himanshu Gauttam, recipient of the IGSTC Postdoctoral Industrial Fellowship (PDIF) 2024, is currently working at Airbus Central Research and Technology (Space and Defence) in Germany under the mentorship of Dr. Paulo Mendes. Dr Gautam has completed his Ph.D. in July 2024 from the Atal Bihari Vajpayee Indian Institute of Information Technology and Management (ABV-IIITM), Gwalior, where his research introduced an Efficient Edge Intelligence Framework aimed at empowering the execution of resource-intensive solutions, such as Deep Learning (DL) models, on resource-constrained edge devices. His work prioritized near-real-time responsiveness, low latency, reduced bandwidth and energy consumption, and enhanced data privacy—making significant strides in the fields of Edge-AI, IoT, Cyber Physical Systems, and Industry 4.0 & 5.0.

Dr. Gauttam is focusing on designing efficient Extended Reality (XR) solutions for aviation applications at Airbus. These systems are being developed with a focus on reduced latency, high reliability, enhanced Quality of Service (QoS) and Quality of Experience (QoE). His research is pushing the frontier of industrial innovation by applying AI to aviation-specific decision-making processes. The project adopts a hybrid architecture—blending Artificial Intelligence, Edge Computing, and Distributed Computing—to deliver optimized XR solutions for demanding aviation scenarios. One of the early outcomes of this research is a comprehensive review article titled "Edge-AI: A Systematic Review on Architectures, Applications, and Challenges," which is currently under peer review.

Dr. Gauttam credits the industry-academia collaboration in Germany as a catalyst for achieving these ambitious goals. Working with Airbus has provided invaluable access to cutting-edge technologies, real-world problem statements, and high-tech infrastructure often beyond the scope of traditional academic research. This collaboration has enabled a synergistic exchange of knowledge—where academic rigor meets industrial pragmatism—sharpening his methodologies and reinforcing the real-world applicability of his work. Exposure to multidisciplinary expertise has also broadened his problem-solving capabilities and enriched his understanding of complex, cross-domain industrial challenges.

Beyond research, the IGSTC Fellowship has opened avenues for wider industry exposure and networking. Dr. Gauttam had the opportunity to attend the BAU 2025 Trade Fair in Munich, a globally recognized platform for state-of-the-art industrial innovations. Events like these not only highlighted emerging technologies across sectors but also facilitated connections with leading experts and innovators.

Culturally, Dr. Gauttam's time in Germany has been both transformative and inspiring. Immersed in German values of precision, efficiency, and clear communication, he found his own professional and personal approach evolving. He fondly recalls participating in vibrant local traditions, including Oktoberfest and the Christmas Markets, which deepened his appreciation for Germany's cultural richness. Interacting with colleagues from diverse backgrounds enhanced his intercultural awareness, adaptability, and global outlook.

Dr. Prince Kumar Rai

Airbus Defence and Space

Dr. Prince Kumar Rai, recipient of the IGSTC Postdoctoral Industrial Fellowship (PDIF) 2024, is currently serving as a Guest Scientist at Airbus Defence and Space, Munich. He completed his Ph.D. in Mechanical Engineering from IIT Jodhpur in 2024, with a thesis titled "Studies on Electrochemical-Assisted Manufacturing Techniques and Associated Applications."

Dr. Rai brings deep expertise in electrochemical-assisted manufacturing, additive manufacturing, coatings, and microfabrication. His work is driven by a strong commitment to innovation and interdisciplinary collaboration in advanced manufacturing and materials development. Through this fellowship, he aims to contribute to cutting-edge aerospace research while fostering stronger ties between Indian academia and German industry.

As part of his postdoctoral research, Dr. Rai, focused on addressing key challenges associated with additively manufactured aerospace components—particularly issues concerning surface integrity, mechanical reliability, and corrosion susceptibility. His work explored advanced surface treatment techniques aimed at forming protective layers that enhance component performance and corrosion resistance without compromising processing efficiency.

Dr. Rai carried out extensive mechanical and electrochemical characterizations and subjected treated components to rigorous environmental testing designed to simulate real-world aerospace conditions, ensuring their long-term durability and operational effectiveness.

The IGSTC Industrial Fellowship provided Dr. Rai a unique opportunity to collaborate closely with

experts at Airbus Defence and Space, gaining firsthand insights into the evolving needs and strategic directions of aerospace research and development. This exposure enabled him to align his research with current industry priorities and develop practical, high-impact solutions.

At Airbus Defence and Space—a pivotal division of the global aerospace giant Airbus Group—Dr. Prince Kumar Rai has been actively involved in high-impact research initiatives at the company's advanced research center. His work has driven innovation in surface engineering and materials science, contributing directly to the advancement of next-generation aerospace technologies.

His experience working within an industrial R&D environment not only deepened his understanding of emerging technologies but also enhanced his ability to address real-world engineering challenges. This has significantly contributed to his professional development and positioned him for a successful career in advanced manufacturing and aerospace innovation.

Beyond his scientific achievements, Dr. Rai's stay in Germany offered a deeply enriching cultural experience. Living in Munich, a city known for its engineering excellence and cultural heritage, he embraced the local way of life—attending traditional festivals like Oktoberfest, exploring historic Bavarian towns, and enjoying the region's cuisine and music. These experiences not only enhanced his intercultural competence but also contributed meaningfully to his personal growth.

Dr. Sanjeet Singh

Airbus Ottobrunn

Dr. Sanjeet Singh, recipient of the IGSTC Postdoctoral Industrial Fellowship (PDIF), is currently undertaking his research at Airbus Defence and Space, Ottobrunn, under the mentorship of Dr. Elmar Bonaccurso. A specialist in acoustic solutions for aerospace applications, Dr. Singh completed his Ph.D. at IIT Kanpur, where his doctoral research made significant contributions to projects at Boeing India Pvt. Ltd. He is also the holder of 13 Indian design and utility patents and is in the process of securing a U.S. patent, reflecting his commitment to innovation and applied research.

At Airbus Ottobrunn, Dr. Singh's research is centered on enhancing the acoustic efficiency of aerospace components. His work on improving acoustic liners—used in aircraft engines and fuselage systems—addresses the critical challenge of aircraft noise reduction, especially in light of tightening global noise regulations and the rising need for quieter aircraft in urban environments and near airports.

Pushing the frontiers further, Dr. Singh is exploring the application of 4D printing to develop programmable acoustic metamaterials. These smart materials adapt in response to environmental stimuli such as temperature, pressure, or sound frequency, offering transformative potential in real-time noise control. This research could redefine noise-canceling technologies in aerospace systems, setting new standards for soundproofing and acoustic management.

The IGSTC PDIF has been instrumental in enabling Dr. Singh to integrate theoretical insights with practical industrial challenges. His collaboration with experts at Airbus has enriched his perspective, allowing him to align his research more closely with real-world aerospace needs. The advanced research ecosystem in Germany—home to both world-class academic institutions and industrial leaders—has provided an ideal environment for his innovation to thrive.

Dr. Singh's work has also contributed to design optimization strategies for next-generation aerospace components, strengthening his industrial research capabilities and reinforcing academic-industry linkages between India and Germany. His fellowship experience stands as a testament to the impact of international collaboration in driving forward engineering solutions for a quieter, more efficient aerospace future.

Beyond the professional growth, Dr. Singh's experience in Germany has been personally enriching. He has embraced German culture, enjoying local festivals, historical cities, and traditional cuisine. His time in Germany has also broadened his intercultural perspective, allowing him to interact with diverse communities and develop a deeper appreciation for cultural diversity. This cultural exchange has greatly enriched his experience, contributing to both his personal and professional growth.

Paired Early Career Fellowship in Applied Research (PECFAR)

Dr. Mehmet Dinc

Hahn-Schickard-Gesellschaft für angewandte Forschung e.V.

Dr. Mehmet Dinc, Head of Functional Materials at Hahn-Schickard, Ulm, Germany, has been awarded the IGSTC PECFAR 2024 in collaboration with Dr. Snehasis Bhakta, Assistant Professor at Cooch Behar College, West Bengal, India for a joint research project titled: "Concurrent Selective Depletion of High-abundant Albumin and Antibodies from Human Serum using Surface-imprinted Nanocomposites."

This innovative project addresses a significant challenge in proteomics: the high levels of serum proteins like human serum albumin (HSA) and immunoglobulins (IgGs), which often hinder the detection of low-abundant biomolecules crucial for diagnostics. The collaboration has led to considerable research advancements. The team developed a novel synthesis strategy for protein-selective nanomaterials using molecular imprinting techniques. They optimized monomer systems and imprinting strategies, working on multi-template imprinting and nanoparticle mixtures to achieve concurrent depletion of both HSA and IgGs. Their efforts resulted in the successful development of nanomaterials capable of selectively binding HSA, showing promising depletion efficiency in early tests.

Dr. Dinc's research visit to Cooch Behar College played a pivotal role in enhancing the collaboration through in-depth, hands-on experimental sessions and strategic planning. He also contributed to academic capacity building in the region by delivering invited lectures at Dinhata College, A.B.N. Seal College, and Cooch Behar Panchanan Barma University, fostering rich scientific dialogue and encouraging local academic engagement with cutting-edge research in functional materials and nanobiotechnology.

Additionally, Dr. Dinc visited IIT Delhi, where he met with Prof. Prashant Mishra and his team to discuss prospective collaborations in nanomedicine and biosensing, further expanding the Indo-German research network initiated under PECFAR.

Beyond the laboratory, Dr. Dinc's time in India offered a deeply immersive cultural experience. He celebrated the festival of Holi, engaged with local traditions, and experienced the warmth and hospitality of Indian society. These personal and cultural interactions added a unique and enriching dimension to the fellowship, strengthening the bonds of international scientific cooperation.

Dr. Konrad Wartke

Goethe University Frankfurt

Dr. Konrad Wartke from Goethe University Frankfurt, Germany, and Ashish Gaurav from CSIR-Central Scientific Instruments Organisation (CSIR-CSIO), India, have been jointly awarded the IGSTC PECFAR 2024. This fellowship supports their collaborative research at the intersection of artificial intelligence (AI) and healthcare, with a specific focus on developing innovative technologies for elderly care.

Dr. Wartke, a research assistant in the Department of Computer Science at Goethe University, specializes in integrating prior knowledge into machine learning systems and AI system engineering. His work enhances the robustness and explainability of machine learning models by embedding domain-specific knowledge, particularly from physics. The collaborative project is based in the Cognitive Vision Systems lab at Goethe University, led by Prof. Ramesh, and applies structured world models to real-world challenges including logistics forecasting, drone-based crack detection, and traffic sign recognition.

Their joint research focuses on non-intrusive monitoring of elderly patients using radar-based sensors, aiming to develop privacy-preserving systems for real-time fall detection. This technology has the potential to significantly reduce injury risk, alleviate loneliness, and improve overall care standards for the elderly—issues of growing global relevance.

During his visit to India, Konrad Wartke contributed to the setup of an experimental environment simulating fall and normal movements. The team carried out sensor performance evaluations and began developing a synthetic, physics-informed dataset critical for training reliable AI models. The approach includes geometric deep learning and integrates prior knowledge about human activity to enhance accuracy and minimize false alarms.

Beyond the core research, the PECFAR facilitated academic outreach and cultural exchange. The team visited prominent institutions including IIT Ropar, Thapar University, Chitkara University, and NIELIT Ropar to foster collaborations, discuss explainable AI systems, and introduce the PECFAR initiative to young researchers. Cultural immersion in Chandigarh, traditional puja participation, and exploration of local cuisine enriched the experience and strengthened cross-cultural bonds.

Dr. Jan Josef Friedrich

RWTH Aachen University

IGSTC awarded the PECFAR 2024 to Dr. Rathan Samala, Assistant Professor, Faculty of Mathematics at the Indian Institute of Petroleum and Energy, Visakhapatnam, and Dr. Jan Friedrich, post-doctoral researcher, Institute of Geometry and Applied Mathematics at RWTH Aachen University, for a joint project on "multidimensional nonlocal conservation laws". Both researchers work on problems in applied mathematics, particularly focusing on numerical solutions of partial differential equations (PDEs).

Nonlocal conservation laws are one specific type of PDEs including a space dependent integral term inside the flux which makes their analysis very challenging. But they can describe various real-world phenomena related to moving crowds, such as the behavior of traffic or pedestrians. To achieve accurate model predictions, efficient numerical methods based on finite volumes are essential. Therefore, the focus of this joint project is the development of new numerical schemes that can accurately approximate the solutions of these nonlocal models.

During Dr Friedrich's research visit to the Indian Institute of Petroleum and Energy, he met Dr. Rathan Samala's team, consisting of talented young PhD researchers. Based on a central framework, a specific numerical method was derived and successfully implemented, yielding highly accurate results across various modeling equations during numerical tests. This method presents several opportunities for future extensions to enhance accuracy even further.

Some potential extensions were discussed during the second part of the research stay at Mahindra University in Hyderabad alongside Dr. Samala. During this visit, Jan presented a talk on nonlocal conservation laws, highlighting some initial results from the project.

In addition to their research activities, Jan enjoyed his time in Visakhapatnam while immersing himself in Indian culture—particularly sampling delicious spicy food. Visiting the beach in Visakhapatnam, exploring Hyderabad's landmarks like the Charminar and Golconda Fort, and experiencing travel across India by train will all be unforgettable memories. The research stay at the Indian Institute of Petroleum and Energy, Visakhapatnam has opened doors for collaborations while allowing them to explore promising new research directions for nonlocal conservation laws.

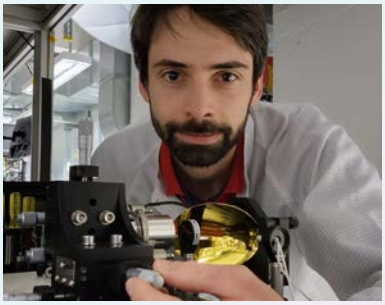
Dr. Marcus Seidel

Deutsches Elektronen-Synchrotron (DESY)

Dr. Marcus Seidel, Junior Group Leader at Deutsches Elektronen-Synchrotron (DESY) and the Helmholtz-Institute Jena, has been awarded the IGSTC PECFAR 2024. As part of this fellowship, he is collaborating with Dr. Kalaivanan Nagarajan from the Department of Chemical Sciences at the Tata Institute of Fundamental Research (TIFR), Mumbai, on a project that investigates the interaction between vibrational transitions and optical modes in a Fabry-Perot cavity.

Dr. Seidel's research focus on ultrafast and high-power lasers and cavity-polariton spectroscopy. The research aims to investigate how polaritons, which are hybrid light-matter states, can influence chemical reactivity. By manipulating the optical part of these states, the project seeks to enhance our understanding of how polaritons can modify chemical processes. This work has the potential to unlock new approaches for controlling chemical reactivity, offering exciting prospects for future innovations in chemistry and materials science.

Through the IGSTC PECFAR, Dr. Seidel focusess to combine the expertise of both TIFR and his own experience in ultrafast lasers to push the



boundaries of cavity-polaritonics. The expected outcomes of this research could have significant implications for the development of novel materials and devices in fields such as photonics, materials science, and chemistry, by leveraging the unique properties of polaritons to drive advances in these areas.

Dr. Seidel is looking forward to pursuing this research under the IGSTC fellowship program and contributing to the growing field of cavity-polaritonics, aiming to open new doors for innovation in polaritonic materials and devices. This collaboration exemplifies the potential of the IGSTC fellowship to foster international cooperation and advance scientific frontiers.

Dr. Stefan Wiefels

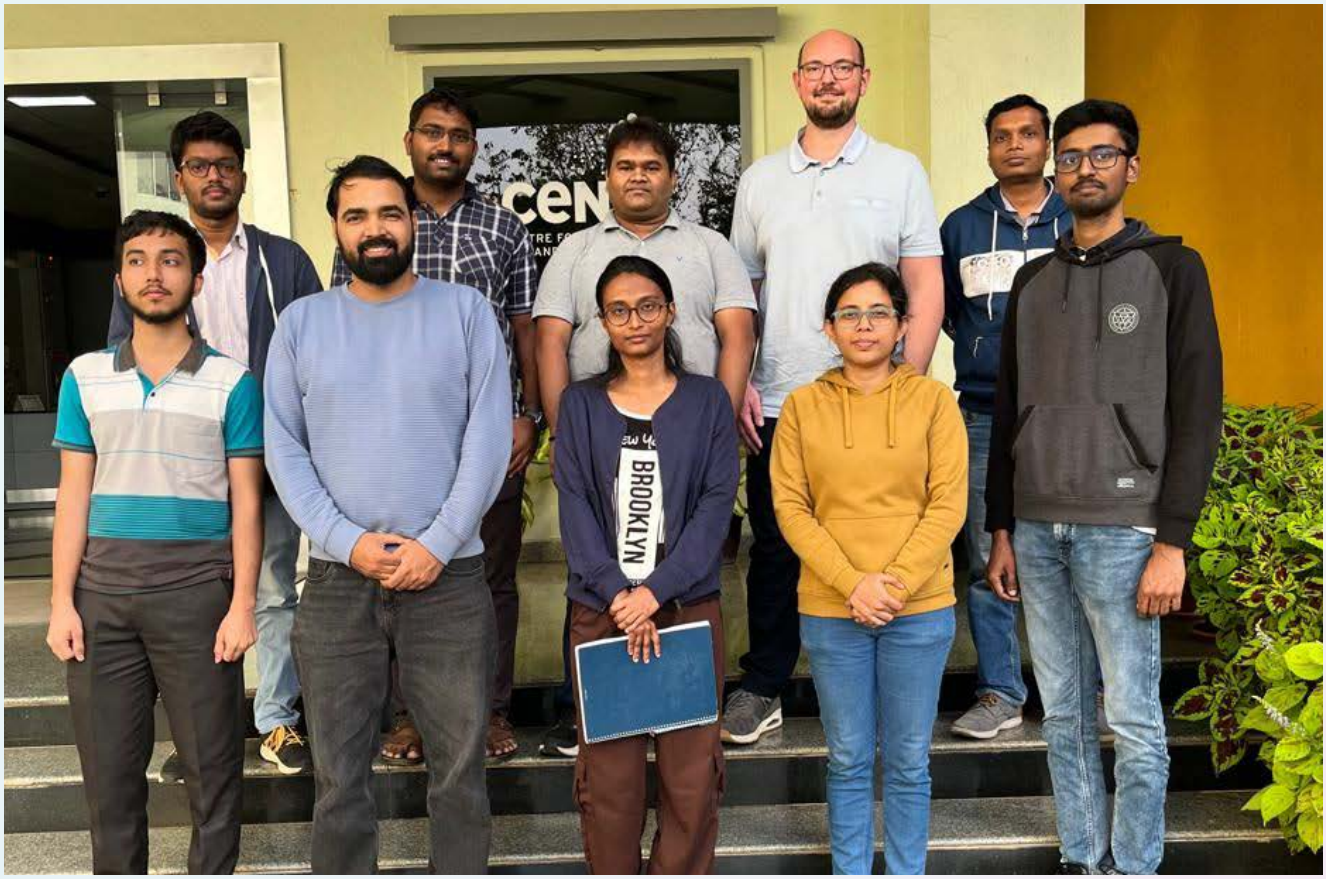
Forschungszentrum Jülich GmbH

Dr. Stefan Wiefels, a recipient of the IGSTC PECFAR 2024 Award, is collaborating with Dr. Shivendra Kumar Pandey from NIT Silchar on advancing research in memristive technologies. He leads a research group at the Peter Grünberg Institute for Electronic Materials (PGI-7), Forschungszentrum Jülich, where his focus lies in the electrical characterization and reliability of memristive devices such as Redox-based ReRAM, phase change memory (PCM), and 1T1R architectures.

His work centers on developing automated, advanced measurement schemes to analyze large datasets, enabling a deeper understanding of device variability and the identification of rare failure mechanisms. In addition, his team explores variability-aware algorithms and neuromorphic functionalities to facilitate future on-chip integration of these devices—paving the way for more reliable and intelligent memory solutions in next-generation computing systems.

As part of the PECFAR program under IGSTC, Dr. Wiefels and Dr. Pandey conducted joint experiments and held in-depth discussions on the electrical characterization of phase change memory and valence change-based resistive memory devices. Their collaborative work aimed to deepen understanding of these emerging technologies through hands-on investigation and shared technical insights.

During the fellowship, Dr. Wiefels also met with leading researchers including Dr. Sreetosh Goswami at CeNSE, IISc, Dr. Amit Verma at IIT Kanpur, and Dr. Sandeep Kumar at NIT Delhi. These meetings led to fruitful scientific exchanges



and the identification of potential future collaborations, which are currently being explored, further strengthening Indo-German ties in the field of advanced electronic materials.

In addition to his academic engagements, Dr. Stefan Wiefels enjoyed a deeply enriching cultural experience during his visit to India. Traveling across diverse regions—from the far east to the south and through the vibrant capital, New Delhi—he explored iconic landmarks like the Taj Mahal and immersed himself in India's rich culinary and cultural diversity. The hospitality and friendships formed during his stay added a personal dimension to the professional exchange.

This visit not only enhanced mutual understanding but also laid a strong foundation for future collaborative research between institutions. The extended time spent together enabled detailed planning and idea exchange, strengthening bilateral scientific ties and supporting the long-term professional growth of both research teams. This collaboration exemplifies the spirit of international scientific exchange fostered by the IGSTC fellowship, which is crucial for advancing cutting-edge research and fostering long-term partnerships in the field of memristive devices and materials science.

Small Immediate Need Grants (SING)

Prof. Hridayesh Prakash, Deputy Director of the Amity Centre for Translational Research at Amity University, has been awarded the IGSTC SING in collaboration with Prof. Andreas Weigert from the Institute of Biochemistry, Faculty of Medicine, Goethe University Frankfurt, Germany.

This Indo-German partnership harnesses their complementary expertise in sphingolipid biology to pioneer innovative therapeutic approaches aimed at restoring gut immune homeostasis in Inflammatory Bowel Diseases (IBD)—a group of chronic, debilitating disorders including Crohn's disease and ulcerative colitis, for which no definitive cure currently exists. Their research focuses on sphingolipid-based interventions, with the goal of modulating immune responses and mitigating disease progression by targeting key metabolic pathways implicated in gut inflammation.

Sphingolipids are dual-specific host metabolites that play a crucial role in regulating various pathophysiological processes. Among the conditions influenced by sphingolipid signaling are Inflammatory Bowel Diseases (IBD), including Crohn's disease and ulcerative colitis—chronic, debilitating disorders characterized by disrupted gut immune homeostasis, mucosal inflammation, and compromised intestinal barrier function. Despite significant advances, no definitive cure currently exists.

Under the IGSTC SING framework, Prof. Prakash and Prof. Weigert are investigating whether targeted modulation of the sphingosine-1-phosphate (S1P) pathway can effectively suppress gut inflammation. The S1P–S1PR1 axis, known to govern lymphocyte trafficking, has already gained attention through promising clinical results with novel modulators such as Ozanimod and Etrasimod in the treatment of ulcerative colitis. However, their research goes further, uncovering that S1P also directly influences immune cell activation via receptor-specific signaling—a novel insight with powerful therapeutic implications. Using a combination of S1PR modulators, siRNA-mediated genetic knockdown, and in vitro immune-epithelial co-culture models, the team aims to delineate how the S1P/C-1P rheostat can modulate the immune landscape of the gut. This work holds significant promise in identifying sphingolipid-based interventions as a potential therapeutic strategy for IBD—a life-threatening disease with limited treatment options.

As part of the IGSTC SING collaboration, Prof. Prakash and Prof. Weigert (Goethe University Frankfurt) are advancing research on sphingolipid-based interventions for IBD. During Prof. Prakash's visit to Frankfurt in November 2024, the team initiated co-culture experiments using monocyte cell lines and damaged intestinal epithelial cells to simulate IBD conditions in vitro.

The study aims to reprogram inflammatory immune cells using sphingolipid mimetics and inhibitors, exploring their role in dampening gut inflammation. These 2D experiments will progress to organ-on-chip platforms and eventually to in vivo models, potentially offering new therapeutic strategies for this life-threatening and currently incurable disease.


IGSTC
Networking
& Events

IGSTC at BAU Munich 2025 — Showcasing Indo-German innovation in architecture, sustainability, and smart infrastructure.

R. Madhan, Director IGSTC, visited Karlsruhe Institute of Technology (KIT) to review progress on the IGSTC 2+2 Project "ECOPAVE" for sustainable concrete pavements using industrial waste.

Director IGSTC engaged in project discussions, lab tour, and faculty interactions during his visit to SASTRA Deemed University with WISER and PECFAR awardees

Director IGSTC met the Consul General of India in Frankfurt to discuss Indo-German collaboration in science and technology

NOMIS team conducted a field testing and farmer awareness in West Bengal using developed advanced microfluidic-electrochemical sensors for detecting the concentration of pesticides in agricultural land.

R. Madhan, Director IGSTC, visited IIT Madras to review progress of the 2+2 project RAMFLICS.

H.E. Ambassador Ajit Gupte addressed the IGSTC-supported InDeVet workshop at University of Leipzig, joined by Rector Prof. Eva Inés Obergfell

Prof. Andreas Pinkwart met IGSTC Director Mr R Madhan to discuss strengthening collaboration between TU Dresden and the Indian S&T ecosystem through IGSTC

Mr. R Madhan, Director, IGSTC visited WISER Awardee Dr. Rajamalli Pachai Gounder's lab at IISc Bangalore

Mr. R Madhan, Director, IGSTC visited WISER Awardee Dr. Medhavi Vishwakarma's lab at IISc Bangalore.


IGSTC
Outreach
Events

Outreach at VNIT Nagpur

Outreach at CSIR NEERI

Outreach at MGR University

IGSTC delegation visited Fraunhofer IAIS

IGSTC Programmes

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