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अमृत महोत्सव

Annual Report 2024-25



Indian National Science Academy
<https://insaindia.res.in>

Brief History

The Indian National Science Academy (INSA) was established in January 1935 to promoting science in India and to harness scientific knowledge for the cause of humanity and National Welfare. The foundation of the Academy, earlier known as the National Institute of Sciences of India (NISI), was the outcome of joint endeavours of several individuals and organizations, with the Indian Science Congress Association (ISCA) playing a leading role.

Towards the end of 1930, the then Government of India consulted various State (then provincial) Governments, Scientific Departments, Learned Societies, Universities and the ISCA seeking their opinion on the desirability of forming a National Research Council that would adhere to and cooperate with the International Research Council and its affiliated Unions. Simultaneously, during a visit to India, Sir Richard Gregor, the Editor of Nature also held discussions with the Editor of Current Science on the promotion of an Indian Academy of Sciences. The proposal was considered by various eminent scientists whose views regarding the composition and functioning of such a national council were put up in the form of a resolution to the ISCA during its Pune Session.

At a special meeting of ISCA held in Mumbai in January 1934 to consider the proposal, the President of the ISCA, Professor MN Saha, made a strong plea in support of an Indian Academy of Sciences on the model of the Royal Society, London. The General Committee of the ISCA unanimously accepted the proposal for the formation of a national scientific society and formed an 'Academy Committee', which was requested to submit a detailed report for consideration at the next session of the ISCA. The Committee submitted the report in January 1935 incorporating (i) the aims and objectives of the proposed national scientific society; (ii) its draft constitution; (iii) names of 125 Foundation Fellows selected by a Special Committee of Specialists; and (iv) names of 25 scientists as members of the provisional Council of the Academy.

The report of the Academy Committee was placed by Dr LL Fermor (President, 22nd Session, ISCA) before a Special Meeting of the Joint Committee on January 3, 1935. The recommendations of the Academy Committee were accepted as a unanimous resolution by the ISCA, thus laying the foundation of the National Institute of Sciences of India as an all-India body of scientists. An inaugural meeting of the National Institute of Sciences of India (NISI) was held on January 7, 1935 under the Chairmanship of Dr JH Hutton (President, 23rd Session, ISCA) in Calcutta. The first President of NISI, Dr LL Fermor, delivered the Inaugural Address. The Institute, thus, started functioning with its Headquarters at the Asiatic Society of Bengal, 1 Park Street, Calcutta, from that day.

After ten years of its foundation, the Government was urged to recognize the NISI as the representative body of scientists. In October 1945, after due diligence, the Government decided to recognize the National Institute as the premier scientific society representing all branches of science in India. The Headquarters moved over to Delhi in May 1946, and the Government commenced providing sufficient grants to meet expenses on travel, publications, research fellowships, and for allocating grants-in-aid to other scientific societies for bringing out their publications. The Government also sanctioned a capital grant for the Headquarters building in 1948.

On April 19, 1948, Pandit Jawaharlal Nehru, the then Prime Minister of India, laid the foundation stone of the building. The office of NISI moved to its present premises on Bahadur Shah Zafar Marg, New Delhi in 1951. In January 1968, it was designated as the adhering organization in India to the International Council for Science (ICSU) on behalf of the Government of India.

The National Institute of Sciences of India was renamed as the Indian National Science Academy (INSA) in February 1970.

ANNUAL REPORT

2024-25



INDIAN NATIONAL SCIENCE ACADEMY
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Highlights

- The Academy elected 61 Fellows and 6 Foreign Fellows to the Fellowship during the year 2024-25.
- 20 young researchers were selected by the Academy for the INSA Young Associates for the year 2024.
- 20 young researchers were selected by the Academy for the INSA Associate Fellows for the year 2024.
- 7 INSA Distinguished Lecture-1 Fellows and 9 INSA Distinguished Lecture-2 Fellows were selected for the year 2024.
- 2 Award Lectures were delivered.
- 1 Presidential Lecture, Lectures by 7 INSA Distinguished Lecture-1 Fellows and 9 INSA Distinguished Lecture-2 Fellows, 51 New Fellows, 2 New Foreign Fellow, 17 INSA Young Associates, 23 INSA Associate Fellows (including 5 IAF, 2023), 2 INSA History of Science Young Associates and 1 INYAS Chair were delivered during 90th Anniversary General Meeting (2024) held at SRM Institute of Science and Technology, Chennai during 9-10 December 2024.
- Five Indian scientists have been elected to various positions in the ISC and its unions, and thirty-eight scientists have been nominated for various ISC and union positions.
- As nominated by the Academy, a three-member delegation of Prof. Ashutosh Sharma, President, INSA; Professor Tarun Souradeep, Director, Raman Research Institute and Dr Shishir Shrotriya, Faculty at the Research and Information System for Developing Countries (RIS) and Head of the Centre for Maritime Economy and Connectivity, New Delhi, participated in the BRICS Academies Forum Meeting held in Moscow, Russia, from May 29-30, 2024.
- As nominated by the academy, Prof. Narinder K Mehra, Vice President, INSA attended 6th General Assembly of AASSA, hosted by AASSA and the National Academy of Science and Technology, Philippines, held on 30th October 2024 in Manila, Philippines, coinciding with the AASSA-NAST PHL Symposium on Digital Transformation in Healthcare on 29-30 October 2024.
- As nominated by the Academy, 24 member's delegation led by Prof. Ashutosh Sharma, President-INSA visited the Royal Society UK to participate in the 5th INSA-RS Yusuf Hamied Bilateral Workshop held from 26-27 November, 2024. This in-person event focused on two vital themes: Health and Biodiversity:
- The event featured two plenary sessions and 18-20 invited speakers, evenly split between the two themes.
- **Theme Chairs:**
- **Health:** The Science and Technology Base for Improving Access to Healthcare
 - *Indian Chair:* Professor Narinder K Mehra,

Vice President, INSA

○ *UK Chair:* Professor Andrew Farmer, Chair of the NIHR HTA Programme and Professor at the University of Oxford.

● **Biodiversity:** *Water for Sustainability*

○ *Indian Chair:* Professor Virendra M Tiwari, Director, CSIR-NEIST and Vice President, INSA

○ *UK Chair:* Professor Lorraine Maltby, OBE, University of Sheffield

- Each stream included presentations, expert panels, and facilitated discussions aimed at enhancing institutional linkages and addressing shared global challenges.
- The Academy nominated Dr Kalachand Sain, Director, Wadia Institute of Himalayan Geology, Dehradun to participate in the National Academy of Sciences of Sri Lanka (NASSL)-IAP-AASSA Project titled “Resilience to High Impact Low Occurrence (HILO) disasters: A cross-sector comparison” held in Colombo, during 5-7 September 2024.
- As nominated by the Academy, Dr Samagra Agarwal has been selected for IAP Young Physician Leaders Programme 2024.
- The Academy nominated Professor Narinder K Mehra, Vice President, INSA for the position of for the AASSA Executive Board Member-at-Large (2024-2027). Professor Mehra has been elected as Treasurer of the Association of Academies and Societies of Sciences in Asia (AASSA) for the term 2024-27.
- The INSA-AASSA Symposium on ‘Science Policy Futures for Asia,’ was successfully organized by INSA in its premises from September 1-3, 2024, in New Delhi. It gathered experts from AASSA member academies, International Science Council (ISC), InterAcademy Partnership (IAP), INSA etc., to discuss emerging science policies shaping Asia’s future.

- The INSA-NASEM Workshop was held from September 9-11, 2024, at the Indian National Science Academy in New Delhi, brought together scientists and policymakers to discuss collaborative research and policy development in critical areas like biotechnology, health, and environmental sustainability. The workshop focused on strengthening Indo-U.S. ties, sharing best practices, and fostering innovation through joint initiatives.
- Twenty Indian scientists were supported by the Academy for attending ISC (International Science Council) sponsored conferences and the General Assembly abroad.
- In the 2024-25 call, 104 applications were received, of which 37 were awarded the India Science and Research Fellowship (ISRF) Programme.
- **G20 Brazilian Presidency:** As nominated by the S20 Engagement Group Apex Committee two-member delegation comprising Prof. Ashutosh Sharma, President INSA and Prof. Shekhar C Mande, Council Member to attended the S20 Final Summit 2024 held in Brazil during 1-2 July 2024.
- **G20 South Africa Presidency:** The Academy nominated Professor Madhavan Nair Rajeevan, FNA, Vice Chancellor, Atria University, and Former Secretary, Ministry of Earth Sciences and Dr Dhruvajyoti Mandal, Scientist C, Department of Science & Technology for the Science20 (S20) South Africa 2025 Inception Meeting, held in Pretoria, South Africa, from 25-27 February 2025. The Academy of Science of South Africa (ASSAf) is hosting the S20 under the theme “Climate Change and Well-being.”
- Transforming the Thar Ecoregion through Startups, Innovation and Entrepreneurship for Sustainable Development (THRIVE 2025)” Conference during 19th- 21st March 2025, at IIT Jodhpur.

- Research Article titled “Building a Bio-economy through Non-Timber Forest Produce in Jammu and Kashmir” accepted for publication in Proceedings of Indian National Science Academy on 30 April, 2025.
- Policy Dialogue during 5th INSA-RS Yusuf Hamied Bilateral Workshop.
- Establishment of INSA-Centre for Science, Technology & Innovation Policy (CSTIP): The Centre was inaugurated with initial funding support from the DST-Centre for Policy Research, marking the beginning of its activities.
- As part of CSTIP initiatives, a landmark MoU with IIT Delhi, IIT Kanpur & RIS. The MoU was signed to mark a new chapter in CSTIP journey to harness science and technology for both national and global progress.
- Indian National Science Academy (INSA) and National Centre for Good Governance (NCGG) jointly organized Leadership Development Program in Science & Technology (INSA-NCGG LEADS -2024) from 1-7 April 2024 and from 08-14 July, 2024 at INSA, New Delhi.
- The Academy launched the “INSA Distinguished Public Lecture Series” an initiative aimed at promoting science and fostering intellectual discourse by hosting eminent scientists and researchers to share their insights with the wider community. Two INSA Distinguished Public Lecture was organized.
- A book release event was organized on 23rd July, 2024 in INSA Auditorium.
- As announced by the Hon’ble Prime Minister, the Government of India has declared 23rd August of every year as “National Space Day” to commemorate the success of Chandrayaan-3 mission. The Indian National Science Academy (INSA) celebrated this occasion.
- The Indian National Science Academy organized National Science Day on 28 February 2025, at INSA Auditorium, New Delhi. INSA also participated and coordinated in organising National Science Day by DST at Vigyan Bhawan on 28 February 2025.
- Indian National Science Academy celebrated International women’s Day on 8th March 2025 with a special book release ceremony and thought-provoking discussions on women’s role in science, deep tech, and artificial intelligence at INSA auditorium.
- The Indian National Science Academy established Indian National Young Academy of Sciences (INYAS) in December 2014. Fifty six outreach activities have been carried out by INYAS members.
- Under the joint Science Education Programme of three academies, 1059 summer research fellowships were provided. 79 fellowships were provided under Focus Area Science Technology Summer Fellowship (FAST-SRF). Further four refresher courses for teachers and forty six lecture workshops for teachers and students were held.
- Twenty-four school teachers from twelve schools from the Delhi-NCR region participated in the INSA-Teachers Training Program (INSA-TTP).
- Five INSA Distinguished Professors, seventy-nine Senior Scientists, and forty-one Honorary Scientists were provided funding for research.
- Under the INSA Visiting Scientist Programme, seventy-four scientists were awarded Visiting Fellowships to conduct collaborative research and training in India.
- Under the INSA scheme for Partial Financial Assistance for holding National/International Conference/Seminars in India, thirty-one proposals were provided partial funding.
- Twenty-six research projects on the history of science were supported, which included six new and twenty ongoing studies.

- One Seminar on the History of Science was organized at Tezpur University, Assam, which was attended by 200 students and scholars.
- The INSA Library subscribed to eight online and three print versions of journals.
- Three quarterly Journals, Proceedings of the Indian National Science Academy (PINSAs), two issues of Volume 90 (2024) and two issues of Volume 91 (2025), Indian Journal of Pure and Applied Mathematics (IJPAM), three issues of Volume 54 (2023) and one issue of Volume 55 (2024), and Indian Journal of History of Science (IJHS), four issues of Volume 59 (2024) were published.
- INSA organized a special lecture on “Deep Learning Embedded Waste Management” by Professor (Dr) Deepak Kumar, during National Learning Week 2024, under Mission Karmayogi.



Foreword

It gives me great pleasure to present the Annual Report of the Indian National Science Academy (INSA) for the year 2024–25. This report offers a comprehensive overview of the Academy's ongoing initiatives as well as the new programmes and strategic collaborations introduced over the past year. It reflects the Academy's steadfast commitment to scientific excellence, national development, and meaningful global engagement.

Among our most important responsibilities is the election of exceptional scientists to the Fellowship – a recognition of their outstanding contributions to science and technology. This year, 61 eminent scientists from India and 6 distinguished scientists from abroad were elected to the Fellowship, highlighting the continued growth and diversity of our scientific community. Additionally, the selection of 20 INSA Young Associates and 20 Associate Fellows signals the Academy's sustained focus on nurturing young scientific talent.

The Academy's intellectual vibrancy was further showcased through prestigious lectures – including the INSA Distinguished Lecture series, award lectures, and the Presidential Lecture – delivered during the 90th Anniversary General Meeting. These events offered platforms to celebrate and disseminate scientific thought leadership.

INSA also broadened its international footprint through active participation in major scientific forums such as the BRICS Academies Forum in Moscow, the AASSA General Assembly in Manila, and bilateral cooperation with the

Royal Society in the UK. The Academy's participation in the Science20 (S20) engagements under both the Brazilian and South African G20 presidencies reaffirmed India's emerging leadership in global science diplomacy.



A major institutional milestone was the establishment of the INSA-Centre for Science, Technology & Innovation Policy (CSTIP), launched with initial support from the DST-Centre for Policy Research. Strategic partnerships through MoUs with IIT Delhi, IIT Kanpur, and RIS have set the foundation for CSTIP to drive evidence-based policymaking and promote science for societal progress.

The Academy remained actively engaged in academic and policy dialogue through events like the INSA-AASSA Symposium on *Science Policy Futures for Asia*, the INSA-NASEM Workshop on biotechnology and sustainability, and the "THRIVE 2025" conference on innovation and entrepreneurship held at IIT Jodhpur. A notable highlight was the acceptance of a policy research article on building a bio-economy in Jammu & Kashmir, underscoring INSA's expanding relevance in regional and national development.

Our commitment to education and outreach remained strong, with more than 1,000 summer research fellowships awarded under the Joint Science Education Programme. The Indian National Young Academy of Sciences (INYNAS) led 56 outreach activities, while training programmes,

refresher courses, and workshops enriched teaching and learning in science across schools and colleges. Celebrations of National Science Day, National Space Day, and International Women's Day highlighted the Academy's continued efforts to promote inclusivity and public engagement with science. The Leadership Development Program in Science & Technology (INSA-NCGG LEADS - 2024), jointly organized with the National Centre for Good Governance, provided a unique platform to build leadership capacities in the science and technology ecosystem.

Through its National Commission for History of Science, INSA supported 26 research projects covering diverse themes such as metallurgy, mathematics, ecology, architecture, science education, and manuscript studies in Sanskrit, Malayalam, and Persian. These initiatives strengthened interdisciplinary research and preserved India's rich scientific heritage.

Publishing high-quality scientific literature remains a core endeavour of the Academy. Regular issues of the *Proceedings of the Indian National Science Academy* (PINSAs), *Indian Journal of Pure and Applied Mathematics* (IJPAM), and *Indian Journal of History of Science* (IJHS) were published during the year, continuing to provide a platform for scholarly exchange and visibility to Indian science.

In support of research by superannuated scientists, the Academy extended funding under its Science Promotion Programme to 5 INSA Distinguished Professors, 79 Senior Scientists, and 41 Honorary Scientists. Additionally, 74 scientists

received Visiting Fellowships, and financial assistance was provided for 31 national and international conferences/Seminars held in India.

As part of its efforts to promote the use of Hindi, the Academy observed Hindi Fortnight from 14-28 September 2024. The celebrations included literary competitions, exhibitions, and a poetry recitation programme, promoting cultural and linguistic inclusivity within the scientific ecosystem.

As we look back on the achievements of this year, it is evident that INSA continues to serve not only as a guardian of scientific excellence but also as a catalyst for innovation, collaboration, and public engagement in science. These accomplishments are the result of collective efforts—from our Fellows and Associate Fellows to young scientists, partner institutions, and international collaborators. We extend our sincere gratitude to the Department of Science and Technology for its continued financial and institutional support.

I would like to express my heartfelt appreciation to the scientific community, administrative team, and staff of the Academy for their dedicated work and valuable contributions in compiling and completing this Annual Report.

Professor Ashutosh Sharma
President
Indian National Science Academy



Council and Meetings

The management of the affairs of the Academy is entrusted to its Council, which is composed of a President, six Vice-Presidents, and 20 Members representing different branches of science. These members are elected for a period of three years. In addition, six INSA Fellows representing each of the cooperating organizations, namely, the Government of India (DST), the National Academy of Sciences India (NASI), Allahabad, the Indian Academy of Sciences (IASc), Bengaluru, the Indian National Academy of Engineering (INAE), New Delhi, the National Academy of Agricultural Sciences (NAAS), New Delhi, National Academy of Medical Sciences (NAMS), New Delhi make the Council a 33-member body (**Annexure-I**). The Council is assisted by the Commission, Advisory/Standing Committees, and subject-specific Sectional/National Committees and Special Committees. One of the prime responsibilities of the Council is to recognize excellence in science by electing scientists as Fellows, Foreign Fellows, INSA Young Associates, INSA Associate Fellows and INSA Distinguished Lecture Fellows of the Academy.

COUNCIL MEETINGS

During 2024-25, the Council met seven times in hybrid mode: May 8-9, 2024, September 20, 2024, December 9-10, 2024, December 18, 2024 (Special Council meeting), December 24, 2024 (Special Council meeting), January 9, 2025 (Special Council meeting) and March 13, 2025 (Special Council meeting). The Annual General Meeting and the 90th Anniversary General Meeting were

held along with the September and December meetings of the Council, respectively.

ANNUAL GENERAL MEETING

The Annual General Meeting was held in hybrid mode on September 20, 2024.

The Annual General meeting was inaugurated by Professor Ashutosh Sharma, President, INSA.

The Academy at its Annual General Meeting announced the following:

- 61 Indian scientists elected as INSA Fellows
- 6 Overseas scientists elected as Foreign Fellows
- 2 Vice-Presidents and 8 Council members
- 16 INSA Distinguished Lecture Fellows (IDL-1:7, IDL-2:9)
- 20 INSA Young Associates
- 20 INSA Associate Fellows

ANNIVERSARY GENERAL MEETING

The 90th Anniversary General Meeting was held (in person) during December 09-10, 2024 at SRM Institute of Science and Technology, Chennai.

In the Anniversary General Meeting, the Presidential address by President, INSA, lectures from new INSA Fellows, Foreign Fellows, INSA Young Associates, INSA Associate Fellows, INSA History of Science Young Associates, INSA Distinguished Lecture Fellows 1 & 2 and lecture by INYAS chair was organized. These were:

A. PRESIDENTIAL ADDRESS BY PRESIDENT, INSA

The inauguration was followed by the Presidential address on “*Structure and Processes of S & T together with that Vexing Question of Sustainability*”, delivered by Professor Ashutosh Sharma, President INSA.

A summary of the lecture and brief profile is attached in Annexure-II.

After the Presidential lecture, parallel sessions were conducted where new INSA Fellows, INSA Young Associates, INSA Associate Fellows, INSA History of Science Young Associates, INSA Distinguished Lecture-1 Fellows, INSA Distinguished Lecture-2 Fellows and INYAS Chair delivered lectures on 9-10 December 2024, in SRM Institute of Science and Technology, Chennai.

B. LECTURES BY NEW FELLOWS OF SCIENCE IN TRANSLATION AND SCIENCE FOR SOCIETY

Chair: Professor Ashutosh Sharma, President, INSA

Dr Anil Kakodkar

Dr VK Saraswat

Dr S Somanath

Dr SV Kamat

Dr Krishna M Ella

Ms Vartika Shukla

Dr KN Sivarajan

Dr Abhay Bang

Mr S Kris Gopalakrishnan

Mr Arvind Gupta

Dr Rajendra Singh

A summary of the above lectures and brief profiles are given in Annexure-III.

C. SESSIONS - THE FOLLOWING SESSIONS WERE CONDUCTED DURING THE MEETING

Session 1

Sectional Committee I- Chair: Professor Kapil Paranjape

- **Lecture New Fellow**
 - Professor Mahesh Kakde
 - Professor Neela Nataraj
- **Lecture INSA Young Associate**
 - Dr Ratna Pal
- **Lecture INSA Associate Fellow**
 - Dr Manas Ranjan Sahoo
- **Lecture PREVIOUS INSA Associate Fellow**
 - Dr Haripada Sau

Sectional Committee II - Chair: Professor Kalobaran Maiti

- **Lecture of INSA Distinguished Lecture-2 Fellow**
 - Professor Rajesh Gopakumar
- **Lecture New Fellow**
 - Professor Dipankar Bhattacharya
 - Professor Sanjay Kumar
- **Lecture of INSA Distinguished Lecture-1 Fellow**
 - Dr Veerendra Kumar Sharma
- **Lecture INSA Young Associate**
 - Dr Sourav Dutta
- **Lecture INSA Associate Fellow**
 - Professor Kamal Priya Singh
 - Professor Raghunath Sahoo
- **Lecture PREVIOUS INSA Associate Fellow**
 - Dr Kasturi Saha

Session 2

Sectional Committee III- Chair: Professor M Lakshmi Kantam

- **Lecture of INSA Distinguished Lecture-2 Fellow**
 - Professor Srinivasan Natarajan
- **Lecture New Fellow**
 - Professor Rahul Banerjee
 - Professor Sirshendu Dasgupta
 - Professor Abhishek Dey
 - Professor Jayanta Halder
 - Professor Sankar P Rath
 - Professor AK Sahoo
 - Professor Balasubramanian Sundaram
 - Professor KM Sureshan
 - Professor Siva Umapathy
- **Lecture of INSA Distinguished Lecture-1 Fellow**
 - Dr Ramendra Sundar Dey
- **Lecture INSA Young Associate**
 - Dr Awadhesh Narayan
 - Dr Pankaj Chauhan
 - Dr Mrinmoyee Basu
- **Lecture INSA Associate Fellow**
 - Professor Chidambaram Gunanathan
 - Professor Sukhendu Mandal
 - Dr Surya Prakash Singh
- **Lecture INSA History of Science Young Associate**
 - Dr Asadulla Asraf Ali

Session 3

Sectional Committee IV - Chair: Dr Kalachand Sain

- **Lecture of INSA Distinguished Lecture-2 Fellow**
 - Professor Harsh Kumar Gupta

- **Lecture New Fellow**
 - Dr VVSS Sarma
- **Lecture of INSA Distinguished Lecture-1 Fellow**
 - Professor Vikram Vishal
- **Lecture INSA Young Associate**
 - Dr Rishitosh Kumar Sinha
- **Lecture INSA Associate Fellow**
 - Professor Supriyo Mitra
 - Dr Tanushree Bhattacharya

Sectional Committee X - Chair: Dr MS Chauhan

- **Lecture of INSA Distinguished Lecture-2 Fellow**
 - Professor Rup Lal
- **Lecture New Fellow**
 - Dr Parveen Chhuneja
 - Professor DA Nagegowda
 - Dr AK Shasany
- **Lecture of INSA Distinguished Lecture-1 Fellow**
 - Dr Amit Kumar Rai
- **Lecture INSA Young Associate**
 - Dr Md Iqbal Raja Khan
 - Dr Veda Krishnan
 - Dr Kalikrishna Hazra
- **Lecture INSA Associate Fellow**
 - Dr Sudhir Pratap Singh
 - Professor Kashmir Singh
- **Lecture New Foreign Fellow (Video Lecture)**
 - Professor Prabhu Pingali

Session 4

Sectional Committee V-Chair : Professor Santosh Kapuria

- **Lecture of INSA Distinguished Lecture-2 Fellow**

- Professor Sankar Kumar Pal
- **Lecture New Fellow**
 - Professor Sivaji Chakravorti
 - Professor Sirshendu De
 - Professor Animangsu Ghatak
 - Professor Debdeep Mukhopadhyay
 - Professor Satyam Suwas
- **Lecture of INSA Distinguished Lecture-1 Fellow**
 - Professor M Tanveer
- **Lecture INSA Young Associate**
 - Dr Surendra Nadh Somala
 - Dr Sriparna Saha
- **Lecture INSA Young Associate**
 - Dr Bahni Ray
 - Dr Swatantra Pratap Singh
- **Lecture INSA Associate Fellow**
 - Professor Parag Ratnakar Gogate
 - Professor Vineeth N Balasubramanian
 - Professor Neetu Singh
 - Professor Neelima Satyam
- **Lecture Previous INSA Associate Fellow**
 - Dr Sandeep Anand
- **Lecture New Foreign Fellow**
 - Professor Santokh Singh Badesha
- **Lecture INSA History of Science Young Associate**
 - Dr Swathy Manohar

Session 5

Sectional Committee VI - Chair: Professor Nirupama Mallick

- **Lecture of INSA Distinguished Lecture-2 Fellow**
 - Dr Eklabya Sharma

- **Lecture New Fellow**
 - Professor SP Sane
 - Professor TNC Vidya
- **Lecture INSA Young Associate**
 - Dr Gaurav Majumdar
- **Lecture INSA Associate Fellow**
 - Dr Anzar Ahmad Khuroo
- **Lecture PREVIOUS INSA Fellow**
 - Professor SK Barik
- **Lecture PREVIOUS INSA Associate Fellow**
 - Dr Arjun Srivathsa

Sectional Committee IX- Chair : Professor Rakesh Aggarwal and Dr T Ramamurthy

- **Lecture of INSA Distinguished Lecture-2 Fellow**
 - Professor Kumaravel Somasundaram
- **Lecture New Fellow**
 - Professor Sanjay Behari
 - Professor Neerja Bhatla
 - Professor Jayanta Bhattacharya
- **Lecture New Fellow**
 - Professor GK Makharia
 - Professor VB Patravale
 - Professor Ashish Suri
- **Lecture of INSA Distinguished Lecture-1 Fellow**
 - Dr Tarun Kumar Sharma
- **Lecture INSA Young Associate**
 - Dr Neha Jain
- **Lecture INSA Associate Fellow**
 - Dr Girdhari Lal
 - Dr Biswanath Maity

Session 6

Sectional Committee VII - Chair: Dr Sagar Sengupta

- **Lecture of INSA Distinguished Lecture-2 Fellow**
 - Professor Vidita Ashok Vaidya
- **Lecture New Fellow**
 - Professor Amit Awasthi
 - Professor AK Banerjee
 - Dr Santosh Chauhan
 - Dr Manoj Majee
 - Dr Ellora Sen
 - Professor Amit Singh
- **Lecture INSA Young Associate**
 - Dr Jogender Singh
- **Lecture PREVIOUS INSA Associate Fellow**
 - Dr Mahak Sharma

Sectional Committee VIII - Chair: Dr Rajan Sankaranarayanan

- **Lecture of INSA Distinguished Lecture-2 Fellow**
 - Professor JB Udgaonkar
- **Lecture New Fellow**
 - Professor Gautam Basu
 - Professor Radhakrishnan Mahalakshmi
 - Professor Rishikesh Narayanan
 - Professor Pinaki Talukdar
- **Lecture of INSA Distinguished Lecture-1 Fellow**
 - Dr Jiban Jyoti Panda
- **Lecture INSA Young Associate**
 - Dr Gaurav Ahuja
- **Lecture INSA Associate Fellow**
 - Professor Timir Tripathi

Summary of the lectures and brief profiles are attached in Annexure-IV.

INVAS LECTURE

Chair: Professor Indranil Manna, Vice-President (Science & Society), INSA

- Dr Nishant Chakravorty, Chairperson, INYAS

A summary of the lecture and brief profile is attached in Annexure-V.

FELLOWS AND FOREIGN FELLOWS

The Academy elects, through a careful evaluation, Fellows and Foreign Fellows each year from amongst the nominations made by the existing Fellows. The election to the Fellowship is restricted to Indian citizens and any foreign scientist holding an OCI/PIO Card and working in India for at least 10 years only and is limited to a maximum of 100 each year (20 Fellows will be elected from the two new categories Science in Translation and Science for Society (10 each) and remaining ten sectional committees will now elect up to 80 Fellows). Election to the Fellowship of the Academy is a recognition of the excellent scientific contributions made by a scientist.

Foreign Fellows are eminent scientists who have been rewarded for their contributions to science and are domiciled outside the territorial limits of India. These scientists must have contributed to and enriched the scientific progress of India through their direct involvement.

During the period 2024-25, the Academy elected 61 scientists as Fellows, and 6 overseas scientists as Foreign Fellows. The number of Fellows at present is 1066 out of a total of 2088 elected since inception. Similarly, presently there are 104 Foreign Fellows out of a total of 313 elected so far.

INDUCTION TO FELLOWSHIP OF THE ACADEMY

During the Anniversary General Meeting,

Professor Ashutosh Sharma, President INSA, presented Scrolls and Angavastram to the 60 Fellows (w.e.f. 1.1.2025 including previous Fellows) and one Foreign Fellow. Fellows were, thereafter, inducted into the Fellowship, took the oath, and signed the Fellowship Register.

The details of elected Fellows and Foreign Fellows inducted to the Fellowship during the Anniversary General meeting on December 10, 2024 are given in Annexure-VI and Annexure-VII.

INSA YOUNG ASSOCIATES AND INSA ASSOCIATE FELLOWS 2024

20 INSA Young Associates and 20 INSA Associate Fellows received the Fellowship. During the Anniversary General Meeting, Professor Ashutosh Sharma, President, INSA presented Certificate and Angavastram to the 17 INSA Young Associates and 25 INSA Associate Fellows (including 7 previous INSA Associate Fellows of 2023). Thereafter, they were inducted to the Fellowship, took the oath, signed the INSA Young Associates and INSA Associate Fellowship Register.

Details are given in Annexure VIII (IYA) and Annexure-IX (IAF).

INSA HISTORY OF SCIENCE YOUNG ASSOCIATES

2 INSA History of Science Young Associates (Dr Asadulla Asraf Ali, Department of Chemical Science, Tezpur University and Dr Swathy Manohar, Department of Civil Engineering, IIT Bombay) received the Fellowship. During the Anniversary General Meeting, Professor Ashutosh Sharma, President, INSA presented Certificate and Angavastram to them. Thereafter, they were inducted to the Fellowship, took the oath, signed the INSA Young Associates and INSA Associate Fellowship Register.

INSA DISTINGUISHED LECTURE 1 & 2 FELLOWS 2024

7 INSA Distinguished Lecture-1 Fellows and 9 INSA Distinguished Lecture-2 Fellows had received the Fellowship. During the Anniversary General Meeting, Professor Ashutosh Sharma, President, INSA presented Citation and Angavastram to all 16 Lecture Fellows.

Details are given in Annexure-X (IDL-1) and Annexure-XI (IDL-2)

RETIRING COUNCIL MEMBERS

- i. Professor Narinder K Mehra, Vice-President
- ii. Professor SR Wadia, Vice-President
- iii. Dr Srivari Chandrasekhar, Member
- iv. Professor Chitra Sarkar, Member
- v. Professor Maithili Sharan, Member
- vi. Dr Amit Prakash Sharma, Member
- vii. Professor Sudeshna Sinha, Member
- viii. Professor Vidita AVaidya, Member
- ix. Professor Gur Kulkarni, Additional Member (Representative Govt. of India, Department of Science and Technology)
- x. Professor Anurag Sharma, Additional Member (Representative The National Academy of Sciences (India), Allahabad)
- xi. Professor Ramakrishna Ramaswamy, Additional Member (Representative The Indian Academy of Sciences, Bengaluru)
- xii. Professor GD Yadav, Additional Member (Representative The Indian National Academy of Engineering, New Delhi)
- xiii. Dr Kamal Bujarbaruah, Additional Member (Representative National Academy of Agricultural Sciences, New Delhi)
- xiv. Dr Deepak K Tempe, Additional Member (Representative National Academy of Medical Sciences, New Delhi).

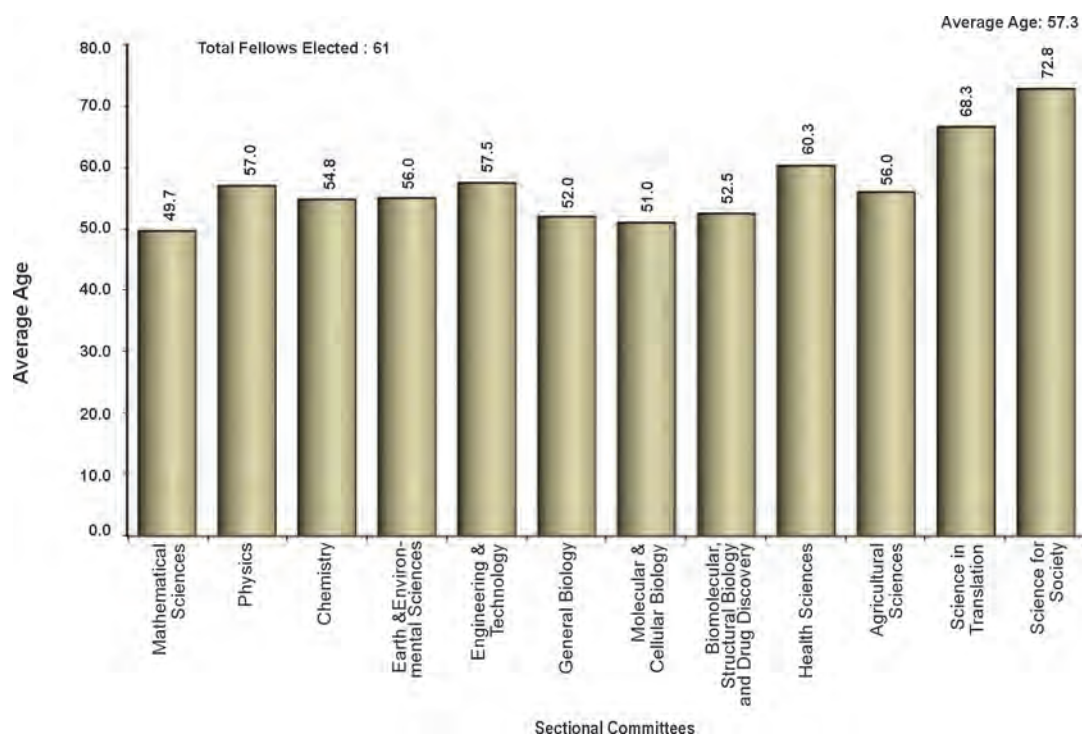
FELLOWS DECEASED DURING 2024-25

With profound grief the Academy reports the sad demise of the esteemed Fellows during 2024-25 (**Annexure XII**).

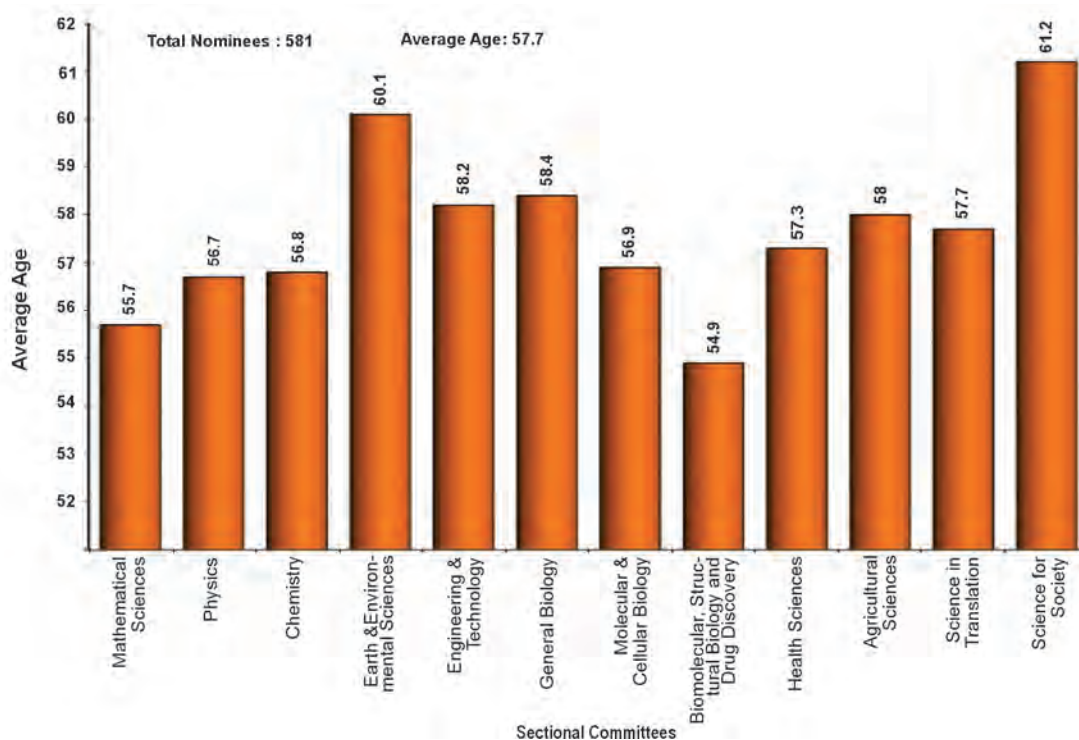
STATISTICS OF NOMINATIONS AND ELECTION TO FELLOWSHIP

Data relating to the nominations received and Fellows elected in the year 2024 are given in the following graphs. The number of the Fellows elected in 2024 is 61. Only 21 out of 1066 Fellows are below 50 years. Likewise, at present, only 121 women are Fellows of the Academy. Out of a total of 581 nominations, only 82 nominations of women scientists were received by the Academy for consideration of Fellowship in 2025.

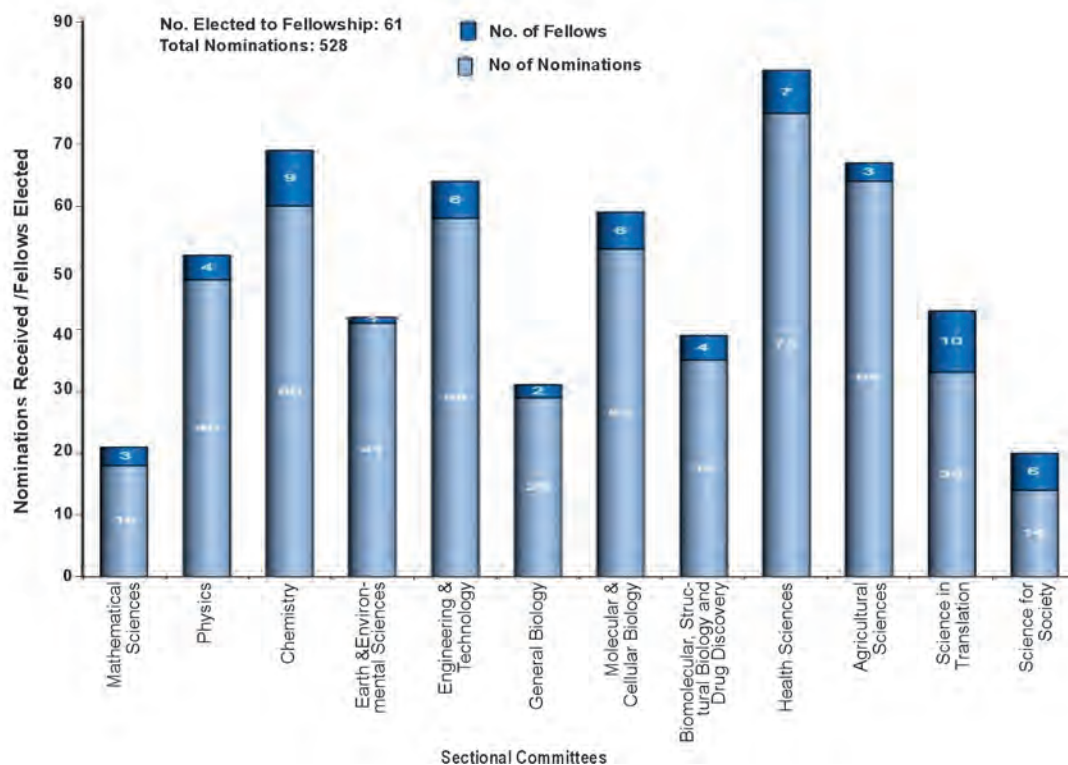
Committee-Wise Average Age of Fellows Elected in 2024



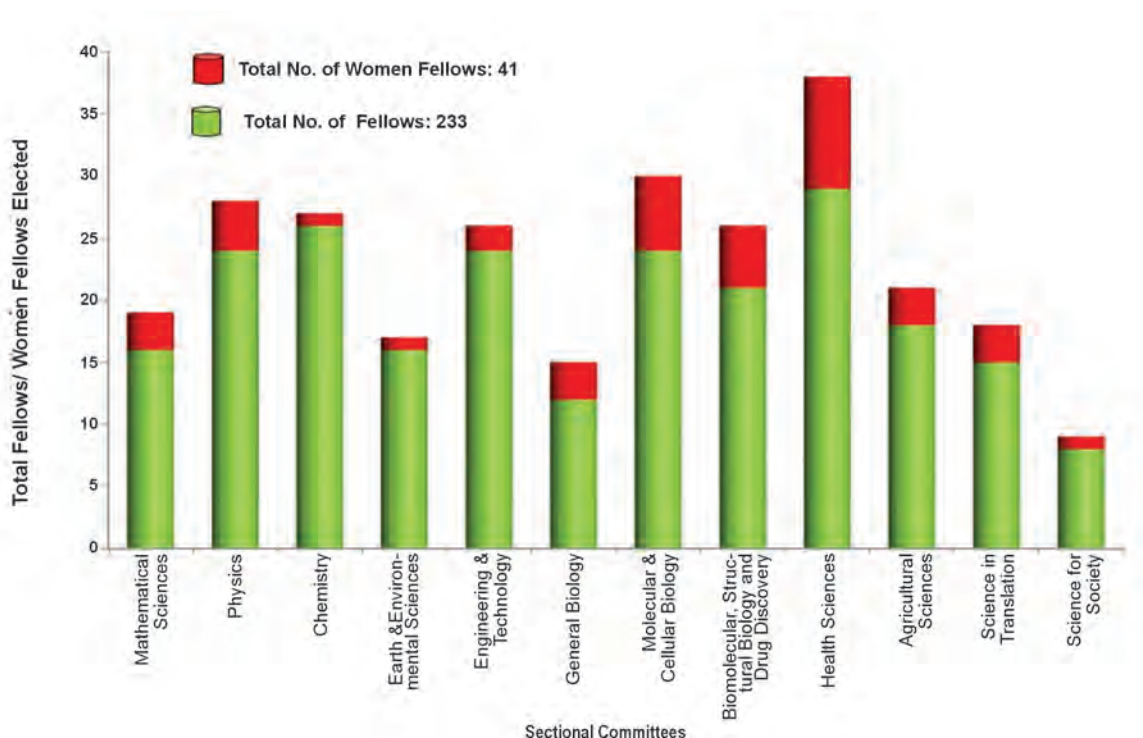
Committee-Wise Average Age of Nominees in 2024 for the consideration in 2025



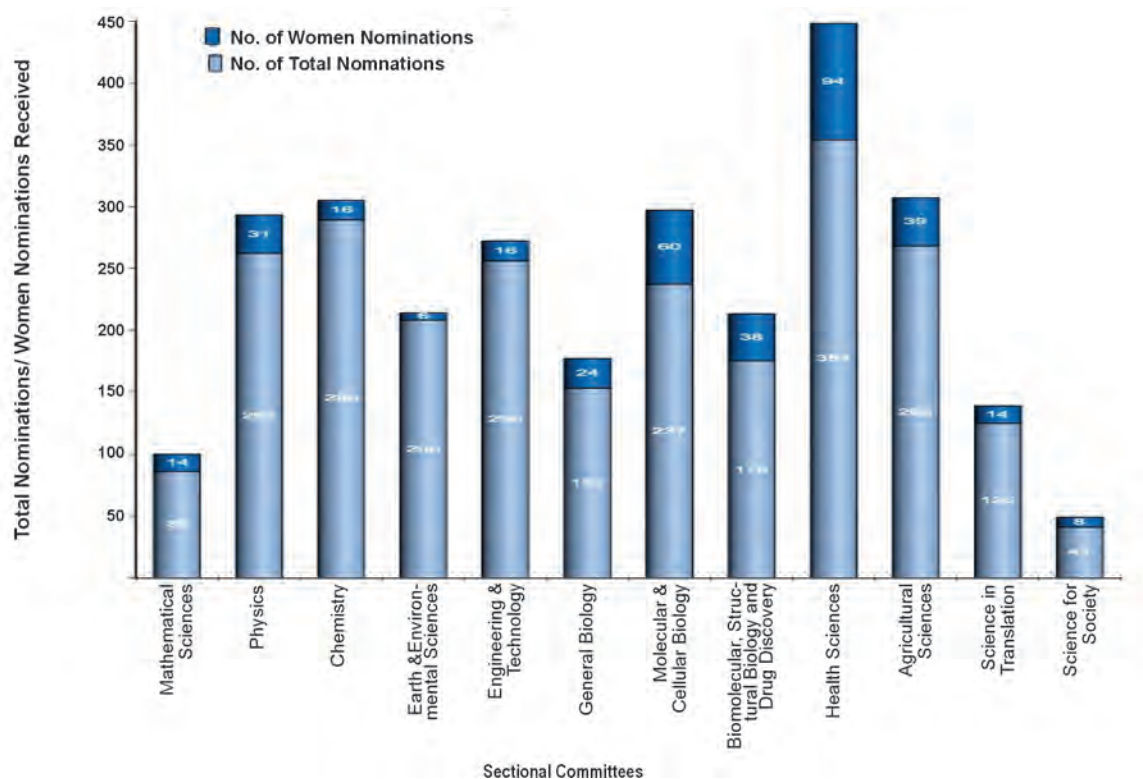
Committee-Wise Nominations and Fellows Elected during 2024



Committee-Wise Representation of Women elected in the Fellowship



Committee-Wise Total Nominations and Women Nominations during 2021-2025





INSPIRE

INSPIRE is one of the innovative programs developed by the Department of Science & Technology to attract talent to the study of science at an early stage and help to build the required critical human resource pool for strengthening and expanding the Science & Technology system and R&D base. It is a programme with a long-term foresight. INSPIRE aims at attracting talent from a very early age (10 years) and continues recognizing the talent up to 32 years. INSA, on behalf of DST, has taken up the responsibility of INSPIRE Faculty Fellowship for young talents in the age group of 27-32 years. Selection is done

once a year to attract young Indian research scientists in the country and abroad. Each selected INSPIRE Faculty Fellow will be eligible to receive a consolidated amount of Rs. 1,25,000/- per month as fellowship with annual increment of Rs. 2,000/-. In addition, a Research Grant of Rs. 7.0 lakh every year for 5 years will also be provided to each successful candidate. This programme is operated through nine subject wise selection committees followed by an Apex committee. Since 2011, 21 sessions have been completed with selection of 2241 candidates out of 28732 nominations received.



International Programme

INTERNATIONAL SCIENCE COUNCIL (ISC)

The Indian National Science Academy is the adhering body in India to the International Science Council (ISC), formerly known as International Council for Science (ICSU) and to its 25 international Unions/Committees. The Academy has constituted subject-related National Committees to coordinate with ISC activities in India. These Committees are responsible for projecting the achievements of Indian science abroad and also liaise with their individual international Unions/Committees.

The Academy facilitates participation of eminent Indian scientists to present achievements of Indian science in ISC-sponsored General Assemblies/ Congresses and also to deliberate on policy matters that affect the International Science and Technology environment. On recommendation of the National Committees, the Academy nominates Indian scientists for executive positions in the ISC bodies. The National Committee also recommends hosting of General Assembly/ Congress/ International Conferences of the International Unions in India.

Indian scientists elected in various positions of ISC and its Unions

- As nominated by the Academy, Professor Anindita Datta, University of Delhi has been elected as one of the Vice Presidents of International Geographical Union (IGU) in the General Assembly held in Dublin, Ireland for the term 2024-2028.
- Dr Pankaj Kumar, Associate Professor,

Department of Geography, Delhi School of Economics, University of Delhi, elected as Assistant Secretary-General (co-opted), Executive Committee, IGU for the period 2024-2026.

- Professor Sandhya S. Visweswariah, FNA has been selected as the President-Elect of (International Union of Biochemistry and Molecular Biology) IUBMB for the term 2027-2030.
- Dr Subbarao M. Gavaravarapu, Scientist-F & Head, Nutrition Information, Communication & Health Education (NICHE), ICMR-National Institute of Nutrition, has been selected as an IUNS Fellow.
- Professor Rebecca Kuriyan Raj, Professor and Head, Division of Nutrition, St John's Research Institute and Convenor, Nutrition Society of India, Bangalore Chapter has been selected as an IUNS Fellow.

Scientists nominated for various positions of ISC and its Unions

- The Academy nominated Dr Prema Ramachandran, Director of Nutrition Foundation of India for the IUNS Living Legends award.
- The Academy nominated Professor Ruchi Anand, FNA, for the position of International Union of Pure & Applied Biophysics (IUPAB) Councilor.
- The Academy recommended the following three members of the INSA-ISC National Committee for the IUPAB council elections.

- Dr Amitabha Chattopadhyay, FNA, Chair IUPAB National Committee
- Dr Aravind Penmatsa, Member, IUPAB
- Dr K.R. Mahendran, Member, IUPAB

The Academy has nominated following 15 scientists in different commissions of the International Union of Pure and Applied Physics (IUPAP):

Professor Venu Gopal Achanta-C2: The commission on Symbols, Units, Nomenclature, Atomic Masses and Fundamental Constants-Member

1. Dr Abhishek Dhar-C3: The Commission on Statistical Physics-Member
2. Dr Pankaj Jain-C4: The Commission on Astroparticle Physics-Member
3. Dr Sakuntala Chatterjee-C6: The Commission on Biological Physics-Member
4. Dr Samit Ray-C8: The Commission on Semiconductors-Member
5. Dr Anil Prabhakar-C9: The Commission on Magnetism-Member
6. Dr Shobhana Narasimhan-C10: The Commission on Structure and Dynamics of Condensed Matter-Chair
7. Dr Sandip Trivedi-C11: The Commission on Particles and Fields-Member
8. Dr Ambarish Kunwar-C13: The Commission on Physics for Development-Member
9. Dr Arun Grover-C14: The International Commission on Physics Education-Member
10. Dr Urbasi Sinha-C15: The Commission on Atomic, Molecular, and Optical Physics-Member
11. Dr Amita Das-C16: The Commission on Plasma Physics-Secretary
12. Dr Parinda Vasa-C17: The Commission on Laser Physics and Photonics-Secretary
13. Dr Justin David-C18: The Commission on

Mathematical Physics-Member

14. Dr Anupama GC-C19: The Commission on Astrophysics-Member

- The Academy nominated Professor Dipendra Prasad, FNA Department of Mathematics, Indian Institute of Technology Bombay, as a member of the International Mathematical Union (IMU) Nominating Committee.

- The Academy nominated Dr G Bhanuprakash Reddy, Chair, INSA-ISC-IUNS (International Union of Nutritional Science) Committee for the IUNS Nominating Committee for Council Members as representative of the Adhering Body (NSI).

- The Academy nominated 16 scientists in different positions for the IUPAC Election 2026-2027. The nominated candidates are as follows. Final Nominees (Titular Member/Associate Member/National Representative)

1. CHEMRAWN - Chemical Research Applied to World Needs: Prof Vivek Polshettiwar, TIFR Mumbai- Associate Member
2. COCI - Committee on Chemistry and Industry: Dr Ch Raji Reddy, CSIR-IICT- National Representative
3. CPCDS - Committee on Publications and Cheminformatics Data Standards: Prof Vandana Bhalla, Guru Nanak Dev University- National Representative
4. ICTNS - Interdivisional Committee on Terminology, Nomenclature and Symbols: Professor A K Tyagi, BARC/HBNI Mumbai- Associate Member
5. ICGCSD - Interdivisional Committee on Green Chemistry for Sustainable Development: Professor Anuj Kumar Sharma, IIT Roorkee- Associate Member
6. CCE - Committee on Chemical Education: Prof Uday Maitra, IISc Bangalore -Associate Member
7. Div I - Physical and Biophysical Chemistry Division: Professor Swagata Dasgupta, IIT

Kharagpur - National Representative

8. CI.1 - Commission on Physicochemical Symbols, Terminology, & Units: Professor Ishu Saraogi, IISER Bhopal-National Representative
9. Div II - Inorganic Chemistry Division: Professor Rajiv Gupta, University of Delhi-Associate Member
10. C II.1 - Commission on Isotopic Abundances and Atomic Weights: Professor Archita Patnaik, IISER Berhampur-National Representative
11. Div III - Organic and Biomolecular Chemistry Division: Professor Jyotirmayee Dash, IACS Kolkata - Associate Member
12. Div IV - Polymer Division: Professor Dibyendu Das, IISER Kolkata -Associate Member
13. Div V - Analytical Chemistry Division: Professor T Pradeep, IIT Madras-Associate Member
14. Div VI - Chemistry and the Environment Division: Professor Ravi Singh, IIT Delhi-Associate Member
15. Div VII - Chemistry and Human Health Division: Professor SG Srivatsan, IISER Pune-Associate Member
16. Div VIII - Chemical Nomenclature and Structure Representation Division: Professor Mayashankar Singh, Banaras Hindu University- Associate Member

ISC Subscription

INSA pays annual subscription of ISC and its affiliated Unions on the basis of invoices received from the respective unions. During the year, a sum of Rs. 336.22 lakhs were paid towards subscriptions to ISC and its affiliated unions.

Participation / Representation in the International ISC meetings

1. The Academy nominated the following members attended the IUNS Virtual General Assembly Meeting on June 20, 2024:
 - Dr G Bhanuprakash Reddy (Voting Member): Chair, INSA-IUNS National Committee
 - Dr S. Kowsalya (Observer): Member, INSA-IUNS National Committee
 - Dr Pranati Das (Observer): Member, INSA-IUNS National Committee
 - Dr A. Sundaravalli (Observer): Member, INSA- IUNS National Committee
 - Dr Sylvia Fernandez Rao (Observer), Member, INSA- IUNS National Committee
 - Dr G M Subba Rao (Observer), Secretary, Nutrition Society of India (NSI)
2. The Academy nominated Professor Rup Lal to attend the International Union of Microbiological Societies (IUMS) Congress in Florence, Italy during 23-25 October 2024.
3. 13 Indian scientists were supported by the Academy for attending the ISC (International Science Council) sponsored conferences and General assembly in abroad.

Important Meetings in India

- CODATA National Committee convened a meeting (hybrid mode) on July 10, 2024, for strategic planning of the committee's tenure.
- The ISC National Committee Meeting was held on August 20, 2024 at the INSA premises (hybrid mode). The meeting was chaired by the President of INSA, Professor Ashutosh Sharma. Professor Narinder K. Mehra, Vice-President (International), was the Member Secretary. All the National Committee Chairpersons presented their activity reports at the meeting.

INTERNATIONAL COLLABORATION AND EXCHANGE PROGRAMME

Since its inception, the Academy has fostered healthy scientific relationship with prominent scientific academies and organizations globally so as to develop and promote internationalization of science. These relationships cover exchange of information/ publications and visits, organization of joint symposia/seminars and collaborative research projects with the Science Academies/ Organizations in 50 countries in Europe, Asia, North America, South America and Latin America.

Visits / Participation of INSA Delegations Abroad

- As nominated by the Academy, a three-member delegation of Professor Ashutosh Sharma, President, INSA; Professor Tarun Souradeep, Director, Raman Research Institute and Dr Shishir Shrotriya, Faculty at the Research and Information System for Developing Countries (RIS) and Head of the Centre for Maritime Economy and Connectivity, New Delhi, participated in the BRICS Academies Forum Meeting held in Moscow, Russia, from May 29-30, 2024.
- As nominated by the academy, Professor Narinder K Mehra, Vice President, INSA attended 6th General Assembly of AASSA, hosted by AASSA and the National Academy of Science and Technology, Philippines, held on 30th October 2024 in Manila, Philippines, coinciding with the AASSA-NAST PHL Symposium on Digital Transformation in Healthcare on 29-30 October 2024.
- Dr Alison Noble, Foreign Secretary, Royal Society, UK visited INSA on 8th November 2024 to discuss about the possible avenues of the bilateral cooperation between the two academies.
- As nominated by the Academy, 24 member's delegation led by Professor Ashutosh

Sharma, President-INSa visited the Royal Society UK to participate in the 5th INSA-RS Yusuf Hamied Bilateral Workshop held from 26-27 November, 2024. This in-person event focused on two vital themes:

- Health: The Science and Technology Base for Improving Access to Healthcare
- Biodiversity: Water for Sustainability

The event featured two plenary sessions and **18-20 invited speakers**, evenly split between the two themes.

Theme Chairs:

- **Health:**
 - *Indian Chair:* **Professor Narinder K. Mehra**, Vice President, INSA
 - *UK Chair:* **Professor Andrew Farmer**, Chair of the NIHR HTA Programme and Professor at the University of Oxford
- **Biodiversity:**
 - *Indian Chair:* **Professor Virendra M. Tiwari**, Director, CSIR-NEIST and Vice President, INSA
 - *UK Chair:* **Professor Lorraine Maltby**, OBE, University of Sheffield

Each stream included presentations, expert panels, and facilitated discussions aimed at enhancing institutional linkages and addressing shared global challenges.

- The bilateral meeting between the Presidents of the Academies, Professor Ashutosh Sharma of INSA and Sir Adrian Smith of the Royal Society UK was held on 25th November 2024 at the Royal Society's premises in the UK. The two Presidents explored avenues for enhancing research partnerships, facilitating knowledge exchange, and promoting science diplomacy for advancing Indo-UK relations in science, technology, and innovation.
- A very productive meeting of INSA and Royal Society, UK delegation with

Indian High Commission was held on 27th November 2024 at Indian High Commission, UK. They have shown interest in science-based collaboration between UK and INSA.

Indian Representation at International Forum

- The Academy nominated Dr Kalachand Sain, Director, Wadia Institute of Himalayan Geology, Dehradun to participate in the National Academy of Sciences of Sri Lanka (NASSL)-IAP-AASSA Project titled “Resilience to High Impact Low Occurrence (HILO) disasters: A cross-sector comparison” held in Colombo, during 5-7 September 2024.
- The Academy nominated following two candidates for 2024 IAP Young Physician Leaders (YPL) Programme. This prestigious event was held on 11-13 October 2024, in conjunction with the World Health Summit (WHS) in Berlin, Germany, from 13-15 October 2024:
 - Dr Samagra Agarwal, Assistant Professor Department of Gastroenterology and Human Nutrition Unit, All India Institute of Medical Sciences, New Delhi
 - Dr Manasa Reddy Vadhi, Assistant professor, Department of Pediatric Surgery, AIIMS, Bibinagar (HMR).

As nominated by the academy, Dr Samagra Agarwal has been selected for IAP Young Physician Leaders Programme 2024.

- The Academy nominated Professor Narinder K Mehra, Vice President, INSA for the position of for the AASSA Executive Board Member-at-Large (2024-2027). Professor Mehra has been elected as Treasurer of the Association of Academies and Societies of Sciences in Asia (AASSA) for the term 2024-27.

Organising International Conferences in India

- The U.S. National Academies of Sciences, Engineering, and Medicine (NASEM), in collaboration with the Indian National Science Academy (INSA) and other partners, organised two virtual workshops in August 2024. The first, on August 28, focused on opportunities for biotechnology cooperation, while the second, on August 30, explored critical and emerging biotechnologies in India and the U.S.
- The INSA-AASSA Symposium on ‘Science Policy Futures for Asia,’ was successfully organized by INSA in its premises from September 1-3, 2024, in New Delhi. It gathered experts from AASSA member academies, International Science Council (ISC), Inter Academy Partnership (IAP), INSA etc., to discuss emerging science policies shaping Asia’s future. The symposium fostered collaboration across diverse fields, emphasizing innovation, sustainability, and the role of science in addressing regional challenges. The detailed report and the Policy Paper have been prepared on the themes of the INSA-AASSA symposium held from 1-3 September 2024 and sent to AASSA on 6 December 2024.
- The INSA-NASEM Workshop was held from September 9-11, 2024, at the Indian National Science Academy in New Delhi, brought together scientists and policymakers to discuss collaborative research and policy development in critical areas like biotechnology, health, and environmental sustainability. The workshop focused on strengthening Indo-U.S. ties, sharing best practices, and fostering innovation through joint initiatives.

Science 20 (S20) / Group of Twenty (G20) Initiatives

G20 Brazilian Presidency

The S20 Engagement Group Apex Committee nominated the two-member delegation comprising Professor Ashutosh Sharma, President INSA and Professor Shekhar C Mande, Council Member to attend the S20 Final Summit 2024 held in Brazil during 1-2 July 2024.

G20 South Africa Presidency

The Academy nominated Professor Dr Madhavan Nair Rajeevan, FNA, Vice Chancellor, Atria

University, and Former Secretary, Ministry of Earth Sciences, for the Science20 (S20) South Africa 2025 Inception Meeting, held in Pretoria, South Africa, from 25–27 February 2025. The Academy of Science of South Africa (ASSAf) is hosting the S20 under the theme “Climate Change and Well-being.” This theme underscores the profound impacts of climate change on various aspects of human health and well-being, including physical, mental, social, financial, and emotional dimensions. Dr Dhrubajyoti Mandal, Scientist C, Department of Science & Technology, also attended the meeting as the DST representative.



INSA-Centre for Science, Technology & Innovation Policy

National Brainstorming Session on Transforming Science, Technology and Innovation Ecosystem of India

The Indian National Science Academy (INSA) and the Department of Science and Technology (DST) government of India organized a one-day “National Brainstorming Session on Transforming Science, Technology and Innovation Ecosystem of India” on 22nd May 2024 at the Indian National Science Academy (INSA).

This session focused on enhancing India’s Science, Technology, and Innovation ecosystems, addressing key areas like research, equity, technology development, international cooperation, and governance. Prof. Abhay Karandikar, Secretary of DST, highlighted DST’s role in developing Science and Technology Policies to facilitate R&D and the importance of agile and adaptive policies to keep pace with the rapidly transforming ecosystem. He emphasized the need for a robust basic science research ecosystem to drive discoveries and inventions. Prof. Ashutosh Sharma, President of INSA, discussed the extensive stakeholder consultation involved in forming science, technology, and innovation policies. He stressed the importance of effective policies, citing the National Geospatial Policy’s benefits. Dr. Akhilesh Gupta, Senior Adviser at DST, outlined DST’s policy research initiatives and the formulation of the Science, Technology, and Innovation Policy (STIP) 2020. The session aimed to develop a roadmap for national science policy, identify specific policy recommendations, foster collaboration among

stakeholders, and establish a platform for ongoing dialogue and policy development.



Roundtable Discussion on Enhancing Labor Force Participation Rates (July 5, 2024)

In partnership with Womennovator, hosted a roundtable discussion focused on increasing labor force participation, especially among

women, and aligning workforce development with the needs of the modern economy.

#LetsPledgeTogether

BRINGS YOU AN AMAZING SPEAKER PANEL FOR **LABOUR FORCE PARTICIPATION RATE**

CA Tripti Shinghal Somani
Founder - Womeninnovator

Payal Kanodia
Chairperson - YFLO Delhi

Kanta Singh
Deputy Country Representative - UN Women India

Prof. Ashutosh Sharma
President, Indian National Science Academy

HOSTED BY:



“Two Day Inter-University Academic Brainstorming Event” (23rd-24th August, 2024)

This event was hosted by (Sher-e-Kashmir University of Agricultural Sciences and Technology) SKAUST University, featured significant contributions from INSA. Professor NK Mehra, Vice President (International Affairs) INSA, addressed the impact of climate change and antimicrobial resistance on human health, emphasizing the need for healthcare



innovation. Prof. Ashutosh Sharma, President of INSA, highlighted the importance of advancing research infrastructure and fostering innovation among young students and women, particularly in agriculture, health, and environmental conservation. The event's session on “Young Scientists and Women in Science,” chaired by Prof. Sharma, focused on balancing the energy of young scientists with the wisdom of experienced researchers, driving meaningful dialogue and a push for change.

One-Day Workshop on Systems Thinking for Technology and Policy (August 30, 2024)

A workshop on systems thinking, in collaboration with DST, explored the use of innovative methodologies to address complex technological and policy challenges. This workshop aimed to equip participants with the tools to adopt

a systems-thinking approach in policy-making processes.

Publication

Book Review

Science and Diplomacy: A New Dimension of International Relations by Pierre-Bruno Ruffini
Author: Famida Khan and Brajesh Pandey published in Science Diplomacy Review by Research and Information System for Developing Countries (RIS),

Research Article titled “Building a Bio-economy through Non-Timber Forest Produce in Jammu and Kashmir” accepted for publication in *Proceedings of Indian National Science Academy* on 30 April, 2025

Authors - Ashutosh Sharma, Akhilesh Gupta, Famida Khan, Veda Krishnan

Article on “Science Beyond Borders: Policies, Opportunities, and Challenges” published in *Science Diplomacy* (quarterly science digest, By CSIR-NIScPR)

Authors: Famida Khan, Jyotesna Maurya

INSA announced establishment of a Centre for Science, Technology & Innovation Policy (CSTIP)

October 2024, the CSTIP exemplifies our commitment to advancing India’s science and technology landscape through dedicated policy advisory, advocacy, and impactful research. Guided by an esteemed advisory board of INSA fellows and science policy experts, INSA-CSTIP is devoted to advancing research, fostering innovation, and generating evidence to feed evidence based policies, that address India’s contemporary challenges and future opportunities. Through this initiative, we aim to build a resilient and innovative India, promoting interdisciplinary collaboration for a sustainable future.

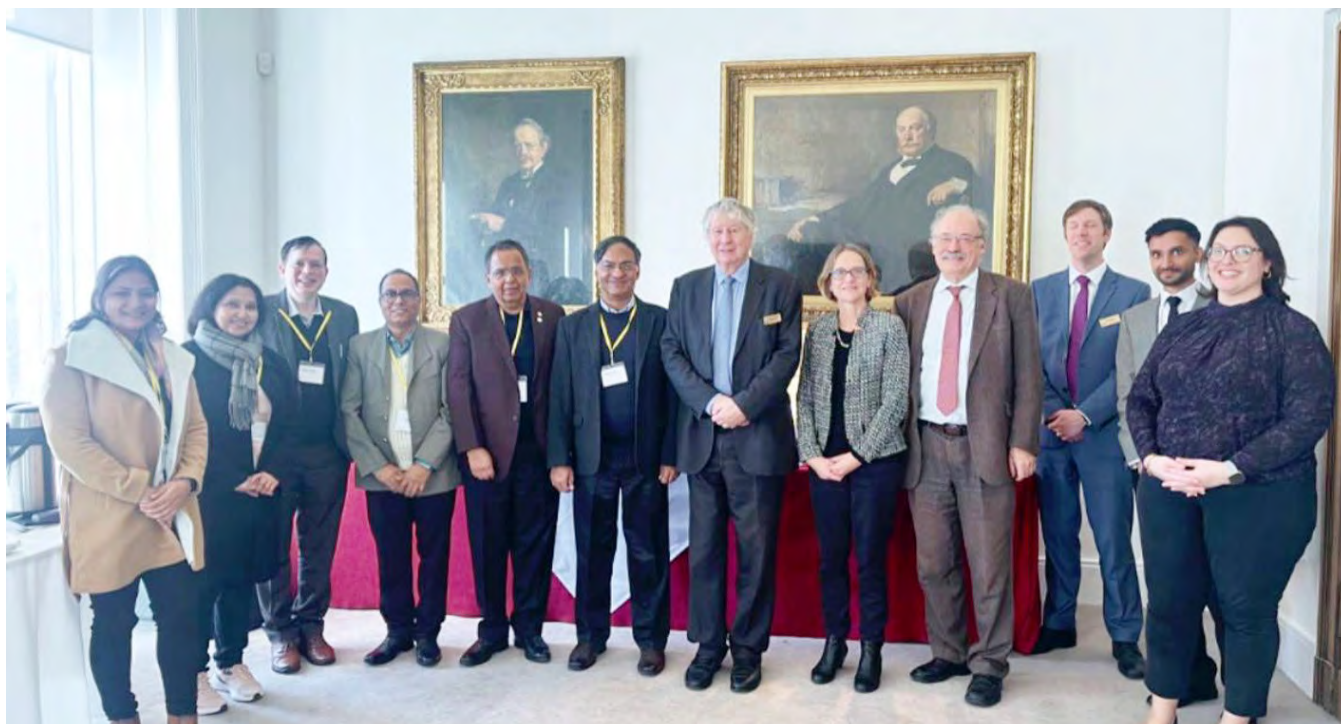
MoU with IIT Delhi

As part of CSTIP initiatives, a landmark MoU with IIT Delhi. The MoU was signed to mark a new chapter in CSTIP journey to harness science and technology for both national and global progress.



5th INSA-Royal Society Yusuf Hamied Bilateral Workshop

A 24 member’s delegation led by Professor Ashutosh Sharma; President INSA visited the Royal Society UK to attend the 5th INSA-RS Yusuf Hamied Bilateral Workshop held from 26-27 November, 2024. The bilateral meeting between the Presidents of the Academies, Professor Ashutosh Sharma of INSA and Sir Adrian Smith of the Royal Society UK was held on 25th November 2024 at the Royal Society’s premises in the UK. The two Presidents explored avenues for enhancing research partnerships, facilitating knowledge exchange, and promoting science diplomacy for advancing Indo-UK relations in Science, Technology, and Innovation.



Women in Optics and Photonics in India 2024 (6–8 December)

Professor Ashutosh Sharma, President of the Indian National Science Academy (INSA), and Dr Tessy Thomas, Former Director General of DRDO, held an inspiring and insightful discussion with women researchers and faculty members at IIT Bombay. The conversation addressed key challenges faced by women in STEMM, including flexible work policies, childcare, family support, and more, while exploring actionable solutions to overcome these barriers.

A Panel discussion on “Policies for Women Researchers and Careers in Publishing” organized during the conference, Ms Famida Khan (Project Scientis-II) participated as a panellist and highlighted about the challenges faced by women researchers, existing policies, their implementation, advocacy, and the role of institutions in driving change.





INSA's 91st Foundation Day: Panel Discussion on "The Role of Scientific Academies in Policy Advice & Advocacy"

On the occasion of INSA's 91st Foundation Day-7 January 2025, the INSA-Centre for Science, Technology & Innovation Policy organized a distinguished panel discussion on "The Role of Scientific Academies in Policy Advice & Advocacy." The event featured eminent experts who engaged in insightful deliberations on how scientific academies can evolve as proactive and influential entities in addressing contemporary challenges. The discussion underscored the growing need for academies to strengthen their role in shaping policy and advocacy, ensuring a more impactful contribution to science and society.

INSA at International Conference on STI Indicators for R&D Governance

On the occasion of the 4th Foundation Day of CSIR-NIScPR, the International Conference on "Aligning Science, Technology & Innovation Indicators for Effective R&D Governance" was held on 14-15 January 2025. The event featured an insightful lecture by Professor Ashutosh Sharma, President, INSA.

Professor Sharma emphasized the need to harmonize invention and innovation to

build a resilient ecosystem. He highlighted the importance of integrating cultural and behavioral dimensions into science and advocated for multidimensional indices that capture the interconnected aspects of sustainable development, including climate change and the impact of AI. He urged policymakers to adopt a holistic and nuanced approach to science, governance, and innovation.

Dr Brajesh Pandey, Executive Director, INSA, chaired a session on "Measuring the Social Impact of R&D." In his address, he showcased how innovations like solar panels have positively impacted rural communities by replacing coal-based fuels and embedding lab-grown technologies into everyday life. The session included presentations from academia and research institutions, focusing on health, grassroots innovation, gender, and institutional social responsibility. It underlined the need to integrate social perspectives into scientific efforts to ensure inclusive and sustainable development.

Conference on: "Transforming the Thar Ecoregion through Startups, Innovation and Entrepreneurship for Sustainable Development (THRIVE 2025)" during 19th-21st March 2025, at IIT Jodhpur

The Indian Institute of Technology Jodhpur, in collaboration with the Indian National Science Academy (INSA) and the International Society for Energy, Environment, and Sustainability (ISEES), hosted THRIVE 2025, an international conference focused on global sustainability challenges, with a special emphasis on the Thar region. The event brought together startups, entrepreneurs, industry leaders, policymakers, and academia to drive innovation and collaboration.

Chief Guest Dr VK Saraswat, Member, NITI Aayog, highlighted the strategic importance of transforming the region. Professor Ashutosh Sharma, President, INSA, stressed the need for disruptive yet balanced solutions, while Prof. Avinash Kumar Agarwal, Director, IIT Jodhpur, emphasized interdisciplinary research.

Dr. Akhilesh Gupta, Former Secretary, SERB, reflected on sustainability in fragile ecosystems.

The conference featured insightful discussions led by distinguished speakers from BHEL, BESTIU, NLU Jodhpur, Gati Shakti Vishwavidyalaya, IISER Mohali, NIT Surathkal, MNIT Jaipur, and BITS Pilani. Professor Sharma chaired a special session on transforming the Thar eco-region through startups and innovation, focusing on policy-driven sustainable solutions. Dr Brajesh Pandey, Executive Director, INSA, and Dr Kinkini Dasgupta Mishra, Scientist-F, INSA, co-chaired sessions on “Sustainability in Business” and “Indigenous Arts, Skills, Heritage, Tourism and Sustainability”, respectively. The event concluded with a commitment to establishing the Thar region as a hub for sustainable development and entrepreneurial excellence.





Science Promotion

One of the basic mandate of the Indian National Science Academy is the promotion of science in India and harnessing scientific knowledge for the welfare of humankind. The Academy has evolved mechanisms over the years to identify and promote scientific endeavours and projects in various institutions around the country that hold promise and potential.

The Academy believes that the right support at the right time for fruitful scientific projects can help in achieving results with immense benefits for the country. INSA has supported several such endeavours in the past as part of its Science Promotion Programme. The Academy has also assisted in organizing seminars/symposia/conferences at national as well as international levels on contemporary issues of wide-ranging implications for the country, thus furthering the cause of Indian science.

During the year, the Academy used its own resources to support various schemes under the Science Promotion Programme. These include: (i) INSA Distinguished Professorships, (ii) INSA Senior Scientists, (iii) INSA Honorary Scientists, (iv) INSA Visiting Fellowships. In addition, the Academy also provided assistance for organizing National/International Conferences, Seminars and Symposia.

INSA DISTINGUISHED PROFESSORS

The Academy initiated Ten Professorial Chairs named as INSA Distinguished Professors with effect from January 1, 2018. Each of the INSA Distinguished Professor receives consolidated

honorarium of Rs.1.00 lakh per month and a contingency grant of Rs.2.00 lakhs per annum and shall be attached to some recognized research institution/Universities in India. The Distinguished Professors have been provided flexibility within their annual contingency and honorarium of Rs 14 Lakhs w.e.f. 1st April 2025. The INSA Distinguished Professors are expected to participate in outreach programmes for school and college students as a part of the award.

Currently 05 Fellows are holding the position, they are as follows:

1. Professor N Sathyamurthy
(01.01.2024-09.07.2026)
2. Professor Anurag Kumar
(01.01.2024-31.12.2026)
3. Professor Mewa Singh
(01.04.2024-10.04.2026)
4. Professor Deepak Dhar
(22.04.2024-29.10.2026)
5. Professor Chitra Sarkar
(17.10.2024-16.10.2027)

A brief highlights of the research works carried out by the INSA Distinguished Professors are mentioned in (*Annexure-XIII*).

INSA SENIOR SCIENTISTS AND INSA HONORARY SCIENTISTS

The Academy has instituted a scheme for its Senior Scientists and Honorary Scientists to continue their highquality research in their specialized disciplines through recognized institutions/universities in India after their superannuation. The objective of the programme

is to continue to engage and utilize the expertise of superannuated Fellows of INSA.

The honorarium of INSA Senior Scientist is Rs. 50,000/- per month and the contingency is Rs. 1,00,000/- per annum w.e.f., 1st January, 2024.

During 2024-25, 79 Fellows were holding position of INSA Senior Scientists and 41 of Honorary Scientists under this programme.

The list of Senior and Honorary Scientists is given in *Annexure-XIV*. A brief highlights of the research works carried out by the senior and honorary scientists are mentioned in (*Annexure-XV*).

INTERNATIONAL/NATIONAL SEMINARS/ SYMPOSIA/CONFERENCES

The Academy provides partial financial support of Rs. 1,00,000/- (maximum) for National/

International conferences/symposia/seminars/summer/winter schools and a maximum of 40 conferences can be supported in a financial year. Proposals are received by the Academy throughout the year. Academy supported following 35 Conference / Seminars / Symposia/ Workshops during the financial year 2024-2025, which is given in *Annexure-XVI*.

INSA VISITING SCIENTIST PROGRAMME

In 1991, the Academy instituted the INSA Visiting Scientist Programme with the aim to provide specialized training or to conduct advanced research in any Indian research institutes/laboratories other than one's own institution. Following 74 scientists were offered the Visiting Fellowship under this programme for collaborative research, and to receive training for furtherance of their research capabilities within the country during the year 2024-2025. A list is given in *Annexure-XVII*.



History of Science

India has a long tradition in science and technology with important discoveries in mathematics, astronomy, metallurgy and medicine. There is also a vast repository of traditional knowledge of herbal medicine, nutrition, water harvesting, etc. This scientific tradition needs to be studied, analyzed and documented for posterity.

As part of its History of Science programme, the Academy has been at the forefront of catalyzing and supporting programmes that seek to document, analyze and preserve India's scientific heritage. Such programmes have not only thrown light on scientific methodologies followed in India in the past but have also provided solutions to some intractable problems that the country faces today.

The collection of source material, compilation, documentation, translation, and critical evaluation are major activities of the History of Science programme, which also includes writing monographs, organizing discussion meetings and publishing the quarterly journal—the *Indian Journal of History of Science (IJHS)*. The programme is managed and organized under the guidance of the Indian National Commission for the History of Science and the Research Council.

The 20th project investigators' meeting, along with the Research Council and National

Commission for History of Science meeting, was held in hybrid mode during 15-16 May 2024 to assess the progress of ongoing projects and consider the new proposals received for support. The commission recommended 06 new projects for financial support for 2024-25. It also renewed 20 ongoing projects for financial support on diverse topics like metals and metallurgy, mathematics and astronomy, ecology and forestry, art and architecture, science education and society, history, science and culture, critical study of manuscript-based study from Sanskrit, Malayalam, Persian and other sources. 09 projects were accomplished during the current financial year. The highlights of the work done by the projects is described in *Annexure-XVIII*.

During its mid-year meeting, the commission organized a history of science seminar entitled

“Materials from Ancient and Medieval” Period at Tejpur University, Assam on 09-10 September 2024. A total of thirteen papers were presented during the seminar on diverse areas of science and technology of architecture, archaeometallurgy, and mineral acids.

In 2024, Volume 59 of *IJHS*, containing 414 pages, was published. The impact factor of *IJHS* increased to 0.5 in the year 2024 from 0.002 in 2023.



Science and Society

Under the science & society programme, the Academy endeavours to address issues pertaining to science and technology that are of relevance to the society. Some of the initiatives are: Organizing lectures to generate curiosity among students about science and nurture their minds towards scientific research, Science education programme and study group for preparation of evidence-based well considered documents and topical seminars of societal relevance to initiate enthusiasm and positive discussion amongst the scientific community and influence science policy. Activities of Science and Society division during the year are given below.

Leadership Development Program in Science & Technology (LEADS April-2024)

Indian National Science Academy (INSA) and National Centre for Good Governance (NCGG) jointly organized Leadership Development Program in Science & Technology (INSA-NCGG



The Inaugural session (LEADS-2024)

LEADS April-2024) from 1-7 April 2024 at INSA, New Delhi.



Valedictory Session LEADS-2024



Participants Leads-2024

INSA Distinguished Public Lecture Series

The Academy launched the “INSA Distinguished Public Lecture Series” an initiative aimed at

promoting science and fostering intellectual discourse by hosting eminent scientists and researchers to share their insights with the wider community.

The fourth lecture of the INSA Distinguished Public Lecture Series was delivered by Professor Shekhar C. Mande, Former Director General CSIR and Secretary DSIR, Govt. of India, on “Viksit Bharat@2047, The Role of Science & Technology” on 26th April 2024 at 3:00 pm in INSA Auditorium.



Professor Shekhar C Mande delivering INSA Distinguished Lecture

Book Release Event on 23rd July, 2024

A book release event was organized on 23rd July, 2024 in INSA Auditorium at 11.00 a.m. The title of the Book which was released is

“Women shaping Scientific Frontiers from Lab Coats to Leadership”, authored by Dr Archana Sharma & Harshita KS. The book was released by Chief Guest Dr Vijay Kumar Saraswat, Hon’ble Member NITI Aayog.

LEADS - July, 2024

Indian National Science Academy (INSA) and National Centre for Good Governance (NCGG) organised the third batch of INSA-NCGG Leadership Development Programme in Science and Technology from 08-14 July, 2024 at INSA, New Delhi.



LEADS-2024 July Inauguration

LEADS July-2024 aimed to bridge the gap between scientific community and administrative ecosystem. The week long residential programme



Valedictory Programme LEADS-2024 July

encompassed lectures from eminent personalities in various topics of administration, financial management and legal compliance, skills for leadership, effective communication and policy execution. The programme hosted total 37 participants from 14 states of India. The participants are affiliated to premium scientific institutions across the nation. The program proved to be a testament in the realm of science, technology and administration.

Celebration of National Space Day and INSA Distinguished Public Lecture

As announced by the Hon'ble Prime Minister, the Government of India has declared 23rd August of every year as "National Space Day" to commemorate the success of Chandrayaan-3 mission. To celebrate this occasion the Indian National Science Academy (INSA) organised INSA Distinguished Public Lecture on 22nd August 2024 titled *Indian Lunar Exploration Program* delivered by Professor Anil Bhardwaj, Director, Physical Research Laboratory, Ahmedabad and a QUIZ Competition on 23 Aug 2024 to foster interest in space science among school students.

Students of Classes 8th, 9th, and 10th from three different schools, PM Shri Kendriya Vidyalaya Narela, The Andhra Education Society DR DDM Sr Sec School, New Delhi, and Delhi World Public School, Noida Extension, participated in this quiz competition.



INSA Distinguished Public Lecture



Celebration of National Space Day

An online meeting with all the INSA local Chapter Conveners was held on 4th October 2024

An online meeting of INSA Ethics committee was held on 4th October 2024.

Foundation Day Celebration of @90 Glorious Years of INSA

The Indian National Science Academy (INSA) celebrated its **Foundation Day** on **Tuesday, 7th January 2025**, marking **90 years of scientific excellence**. The event was held at the **INSA Auditorium, Jubilee Building**, at **10:00 AM** and was attended by **Fellows, Members of INSA, scientists from various institutions, policymakers, and students**.

Professor Sanjay Puri, Vice-President, INSA, set the context, followed by the **Inaugural Address** delivered by **Professor Ashutosh Sharma, President, INSA**. A special session was organized to **honour senior INSA Fellows and former employees aged 70 years and above**, along with **INSA staff who have completed 25 years of service in the Academy**.



Professor Sanjay Puri, Vice-President, INSA, delivering lecture during INSA Foundation Day

A **Panel Discussion** on *"The Role of Scientific Academies in Policy Advice & Advocacy"* featured distinguished experts, including **Dr. V. M. Tiwari, Vice-President (Publications), INSA**, **Dr. Renu Swarup, Former Secretary, DBT**, and **Dr. Sunita Narain, Centre for Science and Environment**, among others.

The event concluded with the **INSA Distinguished Public Lecture** delivered by **Professor Ajay K Sood, Principal Scientific Advisor, Government of India**, on the theme *"My Journey from Vigyan to Vigyan Bhawan."* This was followed by an engaging **Q&A session** and a **group photograph**.

The celebration served as a moment to **reflect on INSA's rich legacy** while reaffirming its commitment to **advancing scientific excellence, policy engagement, and societal impact**.

National Science Day Celebration

The Indian National Science Academy organized **National Science Day** on **28 February 2025**, at **INSA Auditorium, New Delhi**. A significant feature of the program was the felicitation of **INSA President, Professor Ashutosh Sharma**, on being conferred the prestigious **Padma Shri award**, in recognition of his outstanding contributions to **Science and Technology**.



Lighting of the lamp on National Science Day

Presidential address was delivered by **Professor Ashutosh Sharma**. He emphasized the role of education, innovation programmes like **MANAK** and **NIDHI**, and the need to excel in emerging technologies. **Professor Balram Bhargava, Padma shri** delivered the keynote address, urging youth to harness **R&D infrastructure** and opportunities for building a **Viksit Bharat**.



Felicitations of INSA President, Professor Ashutosh Sharma, on being conferred the prestigious Padma Shri award



Dr Sanjay Behari, addressing the audience on National Science Day



Professor Balaram Bhargava, Padma Shri addressing the audience on National Science Day



President INSA addressing the audience on National Science Day

Dr Sanjay Behari, Director, SCTIMST, highlighted the significance of interdisciplinary sciences, especially at the intersection of engineering and medicine.

A stimulating panel discussion moderated by Dr Shashi Bhushan Pandey, Scientist G, DST, brought together experts from academia, industry, and research to explore strategies for empowering youth in science and technology.

The event concluded with the prize distribution for SARANSH 2024, a Ph.D. thesis competition organized by INYAS. Large number of students and teachers attended the programme.

INSA also participated and coordinated in organising National Science Day by DST at Vigyan Bhawan on 28 February 2025 on the theme "Empowering Indian Youth for Global

Leadership in Science & Innovation for Viksit Bharat." The Hon'ble Union Minister of State (Independent Charge) for Science & Technology, Dr Jitendra Singh, graced the occasion and felicitated Professor Ashutosh Sharma, President, INSA, on being awarded the prestigious Padma Shri for his outstanding contributions to science and engineering.

International women's Day

Indian National Science Academy celebrated International women's Day on 8th March 2025 with a special book release ceremony and thought-provoking discussions on women's role in science, deep tech, and artificial intelligence at INSA auditorium. The theme was "Empowering Women in Deep Tech Innovations & AI for a Sustainable Future".



Lighting of the lamp on International women's Day

On this special occasion, INSA organized an event aimed at inspiring young women college students, researchers, and innovators by exploring the transformative role of Deep Tech Innovations and Artificial Intelligence (AI) in Sustainability.

The event featured the unveiling of book on Chandrima Shaha: A Lifelong Journey of Scientific Inquiry, authored by Dr Rajinder Singh and Professor Suprakash C. Roy. The book was released by Chief Guest Professor A.K. Sood, Principal Scientific Advisor (PSA), Government of India, who also delivered an inspiring Lecture on "Empowering She." Professor Chandrima Shaha, the first female president of INSA and Senior Scientist at IICB Kolkata, shared her remarkable journey in science, reflecting on her experiences and contributions to the field.



Book release on International women's Day

The ceremony set the stage for deeper discussions on women's leadership in STEM, innovation, and policy.



Prof Ajay Sood, PSA, Govt of India, delivering lecture on International women's Day

The celebration also included engaging thematic lectures on deep tech and AI. Dr Subi Chaturvedi, Global SVP, InMobi Group, delivered a talk on AI for Sustainability, exploring how artificial intelligence is revolutionizing climate solutions, smart cities, and energy efficiency. Dr Vartika Shukla, FNA, CEO, Engineers India Ltd., addressed Women in Technology: Challenges & Opportunities, emphasizing the structural barriers in STEM and the need for policy interventions.

A panel discussion explored the transformative potential of AI and deep tech across industries,



President, INSA addressing the audience on International women's Day



Executive Director, INSA addressing the audience on International women's Day

challenges in funding and mentorship, and the need for stronger policies to support women in leadership and innovation. This was followed by an interactive session with INSA Fellows and Associates, chaired by Professor Ashutosh Sharma, where participants discussed the role of academies in promoting women in STEM and shared insights from leading researchers.

Lectures by INSA Fellows/Young Scientists (YS)/teacher Awardees (TA)/INYAS members to young students and teachers of schools and colleges in the remote / rural areas/ less privileged schools or Government schools of urban areas

The Academy supports a scheme under which lecture-cum-interaction meetings were organized by Fellows at schools/colleges in areas which were away from the urban areas. 2016 onwards INSA young scientists and INSA teacher awardees were included in this programme. In the year 2017 the Academy decided to include members of INDIAN NATIONAL YOUNG ACADEMY OF SCIENCES (INYAS) in this programme. Now INSA Associate Fellows are also included in this programme. The President, INSA, suggested that any new category of fellowship/membership within INSA will be incorporated into this programme.

Forty three lectures were delivered during FY 2024-25 (*Annexure-XIX*).

Partial assistance by INSA for participation in International Conferences abroad sponsored by agencies other than ISC and its listed bodies

Partial assistance is provided by INSA for participation in International Conferences abroad sponsored by agencies other than ISC and its listed bodies (called Non-ISC Conferences). Forty scientists were supported during 1.4.2024 -31.3.2025.

The Indian National Science Academy established Indian National Young Academy of Sciences (INYAS) in December 2014. Following outreach activities have been carried out by INYAS members

1. **Scientist-Student Interaction:** One-day scientific lecture-cum-scientist-student interaction programme among the students of Vavdi School, Ghogha, Bhavnagar on 01 March, 2024 on the occasion of National Science Day in the campus of CSIR-Central Salt & Marine Chemicals Research Institute, Bhavnagar, Gujarat organized under CSIR-Jigyasa program in association with INYAS. About 100 school students and their teachers visited the institute and saw closely the science happening here. The school students interacted with scientists of different domains and got to know the importance of science in day-to-day life and career paths available in science for them.
2. **National Science Day-2024 Celebration organised by INYAS West Zone:** INYAS-West Zone chapter organized the National Science Day Program on March 02, 2024, at K. J. Somaiya College of Science And Commerce, Mumbai. Mr. S. K. Malhotra, former Head, & Spokesperson, Public Awareness Division of DAE, Raja Ramanna Fellow and Secretary, Atomic Energy Education Society, has delivered a popular lecture on 'Atmanirbharta as Pursued in Department of Atomic Energy'.



One-day scientific lecture-cum-scientist-student interaction programme



IN-YAS-West Zone chapter organized the National Science Day Program

3. **International Women's Day:** On 4th March 2024 INYAS in collaboration with IIT Ropar women's forum to engage students in thought-provoking poster, slogan, and rangoli competitions. Inspirational talks from the esteemed Padma Shri Janak ji on Sustainability and by former DST Scientist S K Varshney about gender equality.
4. **Women's Day- Women in Science and Technology:** Sri Guru Gobind Singh College, in collaboration with INYAS, organized an event centered on the theme "Women in Science and Technology" on March 13, 2024. This event celebrated the remarkable achievements of women who defied conventional boundaries, showcasing their unwavering brilliance in driving breakthroughs across research, innovation, and discovery.
5. **Inspire Inclusion- International Women's Day at IIT Indore:** The event was organized



International Women's Day Celebration organized by INYAS at IIT Ropar

by IIT Indore in collaboration with INYAS, on 15 March 2024 for college students. Its primary objective was to commemorate International Women's Day, centering on the theme of "Inspire Inclusion." This overarching theme is aimed at acknowledging and celebrating the diverse experiences, voices, and contributions of women globally. Through a series of thought-provoking discussions and engaging activities, the celebration highlighted the essence of inclusivity, fostering dialogue, understanding, and collective action toward achieving a more equitable future. Approximately 119 students from diverse colleges in Indore, namely Chameli Devi

Group of Institutions, SAGE University, and IIT Indore, enthusiastically participated in the event.

6. **Inspire Inclusion- International Women's Day at Sri Sathya Sai College for Women, Bhopal:** A workshop on Career Opportunities in Science was conducted for the UG and PG students pursuing science by the INYAS members, Dr Archana Singh, CSIR-AMPRI, and Dr Paramita Das, IISER Bhopal at Sri Sathya Sai College for Women, Bhopal on March 15, 2024. The Director, Principal, teachers, and about one hundred UG/PG students attended the workshop. The students



Women's Day- Women in Science and Technology organized by INYAS in collaboration with Sri Guru Gobind Singh College



Inspire Inclusion- International Women's Day organized by INYAS incollaboration with IIT Indore

and teachers interacted with the speakers and asked questions about fellowships, internships, and other possibilities. An overwhelming response was received from the students and teachers.

7. **Science Experiment Demonstration:** On 16th Mar 2024, a team of volunteer from IIT Jodhpur visited Mahatma Gandhi Government School



Workshop on Career Opportunities in Science organized by INYAS



Demonstration of Science Experiment by INYAS Member

located in Jhipasani Village, Rajasthan. The purpose of the visit was to conduct science experiment demonstrations for students and develop curiosity towards science among them. During the visit, a series of 22 science experiments were designed for students.

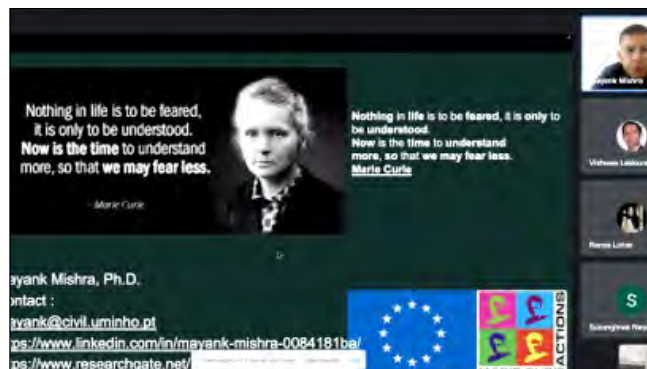
8. The event "Science Camp on Experiential AgriAnalytics: Field-to-Lab Knowledge



Group Picture for the event 'Science Camp on Experimental AgriAnalytics'

Pathways" was organized by INYAS from 1st to 5th July 2024 at ICAR-CMFRI, Kochi, with the participation of 21 students and 30 farmers. The Science Camp on 'Experiential AgriAnalytics: Field-to-Lab Knowledge Pathways' provided a transformative experience for all attendees, fostering a profound grasp of agricultural science and fisheries through interactive learning and data analysis. The camp covered a wide array of topics, including data management, urban farming, seaweed culture, waste management, nutraceuticals, and their significance, alongside advanced techniques for weather data collection. It included field and laboratory visits to familiarize participants with modern scientific equipment and procedures. Participants actively engaged in activities designed to replicate real-world agricultural scenarios, with sessions facilitating farmer interactions to underscore the importance of data-driven decision-making in agricultural practices.

9. The event "PhD in Europe with MSCA Doctoral Network Program" was organized by INYAS on 11th July 2024 through an online medium. The talk was organized to guide master's degree students who want to pursue their PhD studies in Europe via MSCA doctoral programs. The talk answered questions that students have, in addition to some questions they haven't yet thought of about carrying out doctoral research in Europe. The talk delved into several topics, such as the



Online talk on 'PhD in Europe with MSCA Doctoral Network Program'

selection procedure for doctoral candidates, the importance of MSCA fellowships for master's students, success stories of previous applicants who have succeeded in securing a PhD position abroad, tips and suggestions, and the speakers' experiences of obtaining a PhD degree in Europe.

10. The Poetry Writing & Painting Competition for school kids of Classes VI – X was organized by INYAS on 13th July 2024 at IISER Thiruvananthapuram with the theme "What Science Means to Me?" The program was targeted at school children in Thiruvananthapuram. The event aimed to inspire students to reflect on the significance of science in their lives and to creatively express their ideas. A key takeaway of the program was to encourage young minds to engage with scientific concepts in a



Participants of Poetry Writing & Painting Competition at IISER Thiruvananthapuram

meaningful way. Additionally, students and their accompanying parents were given a brief introduction to the Indian National Young Academy of Science (INIAS), its various initiatives, and an overview of the IISER education system.

11. The event “Career Guidance for Government School Students on Higher Studies” was organized by INIAS on 15th July 2024 at S.S.V. Higher Secondary School, Kodumudi. To inspire rural students to pursue higher education on their own, the event included a brief discussion of higher education prospects, a list of institutions for science, engineering, technology, and other related fields, their corresponding entrance exams, and the admissions process.



Interaction during ‘Career Guidance for Government School Students on Higher Studies’

12. The event “Discover Your Path: Career Exploration in Science” was organized by INIAS on 19th July 2024 through an online medium in collaboration with the Knowledge and Awareness Mapping Platform (KAMP) and CSIR-AMPRI Jigyasa. Teachers and about one hundred school students from 9th to 12th standard attended the workshop. The students were introduced to defining and redefining their careers and professional development phases to gain a clear vision of their future careers and seek appropriate opportunities. They were introduced to the career guidance kit prepared by the INIAS team. During the session, various



Online session during the event ‘Career Exploration in Science’

opportunities for jobs, internships, higher studies, PhD, and postdoctoral options both in India and abroad were discussed. The students and teachers interacted with the speakers and asked questions about fellowships, internships, and other possibilities.

13. The “Multidisciplinary Science Symposium (MSS)” was jointly organized by Nitte University and the Indian National Young Academy of Science (INIAS) on 14th June 2024. Held at NGSM Institute of



Various talks during the Multidisciplinary Science Symposium

Pharmaceutical Sciences, the event gathered 65 participants, including experts, researchers, and students from 15 institutions. The symposium covered diverse topics, including nanotechnology, materials science, physics, astrophysics, bio-inorganic chemistry, and Perovskite Semiconductors. The Chief Guest, Dr Harishkumar Madhystha from the University of Miyazaki, Japan, inaugurated the event, while Professor Dr M.S. Moodithaya, Vice-Chancellor of Nitte Deemed to be University, presided. Key sessions were led by Dr Aditya Sadhanala on Perovskite Semiconductors and H S S Ramakrishna Matte on inorganic materials, alongside other notable speakers. The event concluded with positive feedback from attendees, who appreciated the platform for interdisciplinary discussions and knowledge exchange.

14. The workshop “Futuristic School Education in India,” held on 17th July 2024 at IIT (BHU), brought together 62 participants to explore the integration of technology and personalized learning into the education system. Discussions centered on leveraging digital tools such as AI, Virtual Reality (VR), and Augmented Reality (AR) to create interactive and engaging learning environments. Emphasis was placed on skill-based learning, focusing on critical thinking, problem-solving, and emotional intelligence to better prepare students for the challenges of the future. Additionally, the concept of personalized learning paths



Participants during the INYAS Workshop held at IIT BHU

was explored, highlighting the need for curricula to adapt to the unique needs and pace of individual students. The workshop underscored that embracing innovations like AI and adaptive learning will help foster creativity and emotional intelligence, ensuring students are equipped with essential skills for a rapidly evolving world.

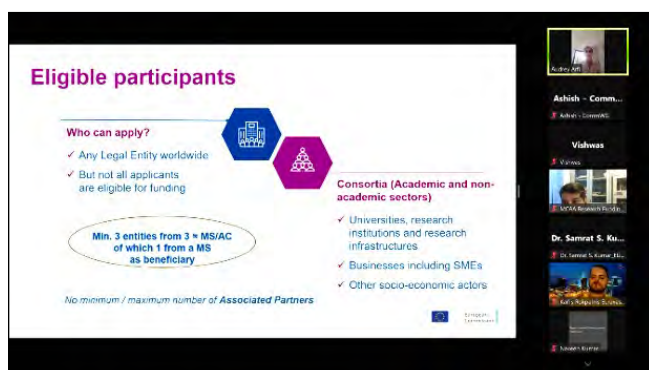
15. The National Research Workshop on “Mastering the Art of Science Research Proposal Writing” was held on 27th July 2024 at Sacred Heart College, Thevara, Kochi, with 75 participants, including research scholars and college teachers. The workshop focused on essential strategies for crafting successful grant proposals, emphasizing the alignment of proposals with funding agencies’ missions, creating compelling narratives, and structuring budgets effectively. Participants engaged in interactive sessions, including proposal writing exercises and peer review, while learning to identify suitable funding opportunities. The workshop also highlighted common pitfalls in grant writing and shared real-life examples to enhance the competitiveness of proposals. Attendees left equipped with practical tools for improving communication with funding



The resource person during the interaction session on the National Research Workshop

agencies, responding to reviewers' comments, and ultimately increasing their chances of securing research funding.

16. The online session "To Know About MSCA Doctoral Network," held on 7th August 2024, attracted 104 participants and provided a comprehensive overview of the Marie Skłodowska-Curie Actions (MSCA) Doctoral Network. The lecture covered various dimensions of MSCA's working, including the



Online interactive session during the talk

levels within the Doctoral Network, expected outcomes for candidates and organizations, key strategies, and the bottom-up nature of the program. The speaker explained the

implementation process, eligibility criteria for participants and countries, funding mechanisms, and award criteria, concluding with a detailed application procedure and resource links for further guidance. The session was highly informative, offering participants valuable insights into the MSCA Doctoral Network's global importance, scholarship details, and opportunities for collaborative PhD programs between academia and industry.

17. The event "Significance of Science and Technology Projects in Rural Areas for Empowering the Tribal Community of India" was held on 14th August 2024 at Govt. Hr. Sec. School, Athanavur, Yelagiri Hills, with 429 participants. Organized in collaboration with the Department of Science and Technology (DST) as part of the tenth anniversary celebration of INSA-INYAS through its flagship event "RuSETUP," the program aimed to educate students from the Scheduled Tribal area about the transformative impact of science and technology on local livelihoods. The event emphasized the role of technology in creating sustainable solutions that enhance the welfare of the community, focusing on skill development and livelihood improvement.

Students were introduced to various science and technology-based projects, with lectures and hands-on field visits offering practical training. The highlight of the event was a lecture on DST-supported technological systems implemented at the project site, followed by a field visit to a biomass-driven trigeneration system, allowing students to grasp the real-world applications of these innovations. Through



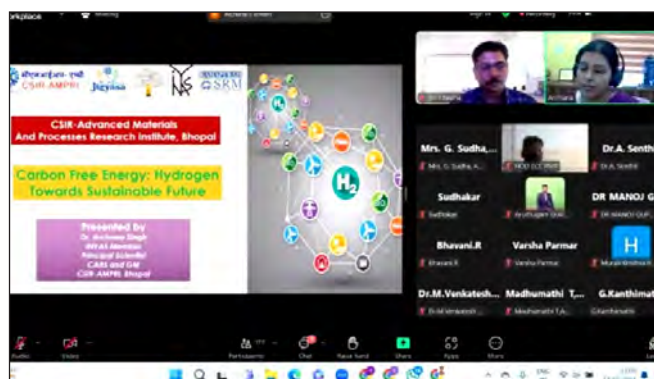
Group of school students during the INYAS event

this workshop, students gained insight into how science and technology can contribute to their personal growth and create future opportunities for their community.

18. The “National Symposium on Futuristic Green Energy Technology,” jointly organized by the Department of Physics and CSIR-Advanced Materials Processes Research Institute (CSIR-AMPRI) in association with INYAS under the CSIR-Jigyasa Skill India program, was held virtually on 23rd July 2024, with 300 participants comprising school students, faculty members, diploma students, and research scholars. The symposium featured three technical sessions covering cutting-edge topics in green energy technology. The inaugural session commenced with a welcome by Dr A. Senthil, followed by a keynote address by Dr Avanish Kumar Srivastava, Director, CSIR-AMPRI, emphasizing the importance of green energy in the Skill India initiative. Dr Manoj Kumar Gupta delivered the first lecture on “Next Generation Green Energy Technology for Powering Portable Devices,” where he discussed advanced nanomaterials, nanocomposites, and piezoelectric nanogenerators. The second session, led by Dr S. Sudhakar, focused on “Science and Technology for Sustainable Development,” highlighting fuel cells and capacitors. The final session, chaired by Dr Archana Singh, was centered on “Carbon Free Energy: Hydrogen towards Sustainable Future,” where she elaborated

on hydrogen storage technologies and applications. Participants actively engaged in discussions, posing insightful questions to the speakers. The event concluded with positive feedback from attendees and a vote of thanks by Dr Satanand Mishra, Jigyasa Coordinator, acknowledging the support of all contributors to the success of the symposium.

19. The event titled “Impact of Science and Technology Intervention on the Socio-economic Development of Eastern Ghats,” held on 15th August 2024 at the DST-Biomass Trigenation Plant in Athanavur Village, Yelagiri Hills, aimed to educate students, local tribal people, and government officials on the science and technology behind government projects and their application for improving livelihoods. Organized by Sakthivadivel Duraisamy, the program included a project site visit and demonstrations that allowed participants to gain hands-on experience. The field visit, coupled with insightful lectures, focused on the role of technology in socio-economic development, particularly for the tribal community in the region. Government officials, including those from the police and forest departments, panchayat officials, and local beneficiaries, were introduced to practical applications of these technological interventions. The event successfully



Participants during the online session



Participants during the interaction session

demonstrated how science and technology can enhance sustainable development and positively impact the livelihoods of tribal populations.

20. The Rural Science Education Training Utility Program (RuSETUP 2024), held on 21st-22nd August 2024 at CCSHAU COA Bawal, Haryana, was organized under the guidance of Professor B.R. Kamboj and Dr Naresh Kaushik, in collaboration with INYAS and VIBHA Haryana. The event, focused on Ancient Indian Mathematics and Applications of Computational Vedic Mathematics, featured Dr Gajendra Pratap Singh from Jawaharlal Nehru University, New Delhi, as the expert speaker. The two-day training program explored the contributions of ancient Indian mathematicians, including Swami Bharti Krishna Tirtha's work on Vedic Sutras and their applications in algebra, geometry, and trigonometry. Dr Singh also discussed the ancient binary number system from Acharya Pignāla's work, Ramanujan's contributions, and parallels to the Pythagorean

theorem in the Sulbha Sutras. A total of 25 math teachers from government schools in Rewari participated, expressing appreciation for the program's relevance and the value of traditional knowledge systems. The participants recommended extending such training sessions to benefit more teachers and students in rural areas, citing the importance of promoting ancient calculation methods.

21. On 24th August 2024, an online session on "Scientific Writing, Peer Reviewing, and Publishing Landscape" was organized by the School of Environmental Sciences, Jawaharlal Nehru University, in association with the Research Funding Working Group - Marie Curie Alumni Association (RFGW-MCAA) and the Indian National Young Academy of Science (INYAS). The event, coordinated by Ashwani Kumar Tiwari, attracted 100 participants and featured Dr Jamie Males, Executive Editor of PLOS Climate Journal, as the speaker. The session covered key aspects of scientific writing, including proper authorship credentials, data source inclusion, and the significance of acknowledging non-author contributors. Dr Males also discussed the peer review process, emphasizing unbiased reviews and manuscript recommendations, alongside the publishing landscape that offers researchers strategic pathways for disseminating their work. Participants from 17 countries engaged in the highly interactive session, gaining practical insights into enhancing the visibility and impact of their research in the scientific community.

गणित शिक्षकों को दिया गया वैदिक गणित का प्रशिक्षण



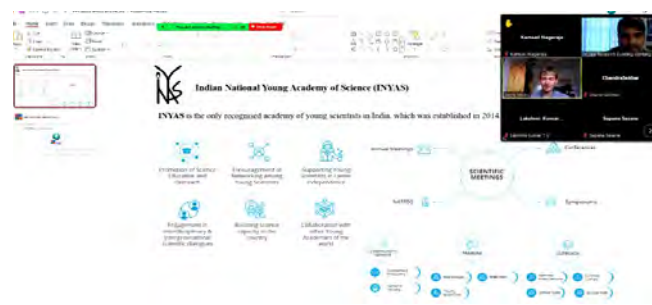
वैदिक गणित पर प्रशिक्षण शिविर में कुलपति बीआर कम्बोज व अन्य। स्रोत: कॉलेज संवाद न्यूज एजेंसी

बावल। भारतीय राष्ट्रीय युवा विज्ञान अकादमी और विज्ञान भारती हरियाणा के सहयोग से बावल कृषि महाविद्यालय में वैदिक गणित विषय पर चल रहे प्रशिक्षण के दूसरे दिन डॉ. गजेंद्र प्रताप सिंह ने द्विआधारी संख्या प्रणाली पर विस्तार से चर्चा की।

उन्होंने आचार्य पिंगला के योगदान पर प्रकाश डाला। कहा कि आचार्य पिंगला देश के बड़े विद्वान थे, जिन्होंने अपने काम छंदसुत्र में सबसे पहले ज्ञात द्विआधारी संख्या प्रणाली का श्रेय दिया जाता है। इस समापन सत्र के दौरान, प्रशिक्षण कार्यक्रम में भाग लेने वाले जिले के 25 सरकारी स्कूलों के गणित शिक्षकों को प्रमाणपत्र दिए गए।

प्राचार्य प्रो. नरेश कौशिक ने कुलपति प्रो. बीआर कम्बोज को धन्यवाद दिया। प्रो. कम्बोज ने ग्रामीण क्षेत्रों में विज्ञान शिक्षा के बारे में जागरूकता बढ़ाने के उद्देश्य से संकाय और छात्रों को ऐसे प्रशिक्षण और कार्यशालाएं आयोजित करने के लिए प्रेरित किया। उन्होंने आश्वासन दिया कि सीसीएस. हरियाणा कृषि विश्वविद्यालय के कृषि महाविद्यालय बावल में भविष्य के प्रशिक्षण कार्यक्रमों के लिए उनके सभी सुझावों पर विचार किया जाएगा। प्रो. कौशिक ने प्रतिभागियों से ग्रामीण क्षेत्रों के छात्रों के लाभ के लिए सभी सत्रों के दौरान एकत्र की गई जानकारी को अपने स्कूलों के छात्रों और अन्य संकाय सदस्यों तक पहुंचाने का आग्रह किया। प्रशिक्षण का समापन डॉ. शरणजीत धवन के औपचारिक धन्यवाद ज्ञापन से हुआ। उन्होंने बावल क्षेत्र के ग्रामीण क्षेत्रों के छात्रों के लिए ग्रामीण विज्ञान शिक्षा प्रशिक्षण उपयोगिता कार्यक्रम (रिसेट अप 2024) संचालित करने के लिए प्रेरणा और समर्थन के लिए भारतीय राष्ट्रीय युवा विज्ञान अकादमी (आईएनवाईएस) के प्रति आभार व्यक्त किया।

Media coverage of the RuSETUP program in Haryana



Online session during the online meeting organised by

22. On 3rd September 2024, a School Teachers Enrichment Workshop was conducted at IIT Madras, coordinated by Anuj Jakhar, with 30 government school teachers from Tamil Nadu participating. The workshop aimed to enhance mathematical understanding among teachers and featured engaging lectures by esteemed speakers, including Dr Srinivas Kotyada, Dr Vijay Kodiyalam, Dr Anuj Jakhar,



Participants during th teachers' workshop organised by INYAS

and Dr G. Arunkumar, covering diverse mathematical topics. A highlight of the event was a visit to the Heritage Centre at IIT

Madras, which provided a unique experience for the participants. The interactive sessions throughout the day encouraged discussions and questions, fostering a collaborative learning atmosphere. The event was highly successful, with all participants providing positive feedback, emphasizing the value of such workshops and expressing a desire for similar events to be organized regularly.

23. On 3rd September 2024, an outreach event titled "Awareness on Electron Accelerators for Societal Welfare" was held at the Electron Beam Centre (EBC) of the Bhabha Atomic Research Centre (BARC) in Navi Mumbai, coordinated by Krishna Kumar Singh. The event aimed to educate undergraduates and postgraduates from two local colleges about the research and development activities in the field of electron beam technology. Over 60 students from Mahatma Phule Science, Arts and Commerce College, Panvel, and C. K. Thakur College, New Panvel, participated in this one-day program. The event commenced with a welcome address by the Project Manager of EBC, followed by an introduction to INYAS activities by Dr Brindaban Modak. A senior official from EBC delivered a comprehensive presentation on the accelerator facility,

covering various aspects of electron beam technology. Participants were divided into two teams for a guided tour of the 10 MeV Radio Frequency Linear Accelerator and the 1 MeV DC accelerator, where researchers explained the applications of electron accelerators in fields such as food, medicine, agriculture, research, security, industry, and waste management. The students expressed enthusiasm and excitement about the innovative technologies developed at EBC. In conclusion, all participants conveyed their gratitude to the INYAS team for organizing such a valuable event that promoted technical awareness of national importance.



Participants during th teachers' workshop organised by INYAS

24. On 10th September 2024, the event “Entrepreneurship: A Step Ahead” took place at IIT Indore, coordinated by Professor Kiran Bala from the Department of Biological Sciences and Bioengineering (BSBE). The initiative, supported by the Indian National Young Academy of Sciences (IN-YAS), aimed to inspire and nurture the entrepreneurial spirit among college students. A total of 85 participants from IIT Indore and Chameli Devi Group of Institutions engaged in an interactive session designed to deepen their understanding of entrepreneurship. The event began with an inaugural address by Professor Kiran Bala, who emphasized the

keynote speaker, Mr. Shanil Kothari, Founder of ListApp, provided an interactive session that covered key entrepreneurial terminology and concepts, shared his startup journey, and underscored the importance of networking, teamwork, and thorough market research. The event successfully created an environment of learning and innovation, emphasizing entrepreneurship as a viable career path and showcasing the vital role of academic institutions in fostering entrepreneurial talent. Such initiatives are essential for empowering students to think creatively, build valuable networks, and acquire the skills necessary to thrive in the dynamic world of startups and



Students during entrepreneurship workshop at IIT Indore

importance of such initiatives for students. Mr. Aditya SG Vyas, CEO of DRISHTI CPS Foundation, delivered an insightful keynote on launching startups, highlighting customer empathy, design thinking, prototyping, and effective marketing strategies. He also discussed the crucial role of academic institutions and government agencies, such as the Department of Biotechnology (DBT) and the Department of Science and Technology (DST), in supporting startups. The second

business ventures.

25. On 11th September 2024, the Indian National Young Academy of Sciences (IN-YAS) held an inspiring outreach event titled “Igniting Young Minds – An Interaction Program on Science and Career Awareness” at Army Public School, Tezpur, Assam. Coordinated by Dr Pankaj Barah from Tezpur University, the program engaged 100 students from classes 9 to 12, providing valuable insights



Students in Science and Career Awareness at Tezpur University

into career trends in STEM fields. Dr Barah conducted a session focused on future opportunities in science and technology, while Dr V. Ramanathan, an INYAS alumnus from IIT-BHU Varanasi, delivered a motivational speech and facilitated hands-on science experiments, encouraging students to explore scientific principles actively. The event was further enriched by the presence of Mrs. Banani Hazarika, Principal of APS Tezpur, Dr Nayanmoni Gogoi from Tezpur University, and Mr. Ankeet Ghosh from APS Tezpur,

creating a dynamic and inspiring atmosphere for the students. Overall, the outreach event successfully ignited curiosity and enthusiasm among students regarding the vast possibilities in STEM, fostering a spirit of exploration and motivating the next generation to pursue careers in science and technology.

26. Indian National Young Academy of Science (INYAS) filled with humongous enthusiasm and charismatic aura started off the the first day of Mid Year Meeting (MYM-2024) and Technical Symposium on “Empowering



INYAS Mid-Year Meeting and Symposium 2024

Young: Leveraging Science and Technology for Sustainable Development” on 26 September, 2024 at IISER Kolkata. This year’s mid year meeting is dynamic and at the same time extensively significant as INYAS is commemorating its grandeur and lustrous journey in its 10th Year of existence. The day initiated with the Technical Session - 1 focusing on the agenda of ‘Agriculture and the agri-food sector’s role in feeding the globe sustainably.’ The session was extensively a knowledge accelerator as it discussed about research initiatives and intricacies in the field of agricultural sciences by the speakers. Following the trajectory of the symposium, the welcome session was graciously attended by honourable dignitaries. Professor Sunil Khare currently designated as Director at IISER Kolkata, Professor Narinder K. Mehra currently serving as Vice President at Indian National Science Academy, Professor Tanusri Saha Dasgupta currently designated as Director at S.N. Bose NCBS and Professor Soumitro Banerjee from IISER Kolkata shared their invaluable insights and thought provoking expertise to the INYAS members and alumni in the field of science, governance and policy formulation. During the inauguration the three publications of INYAS were released by the honourable guests, namely Annual Report 2023-24, Mid Year Newsletter 2024 and MYM-2024 Brochure. Moving ahead Technical Session - 2 highlighted the topic of concern in today’s global panorama, titled ‘Advanced Strategies for Climate Action and Sustainable Development.’ Wherein the speakers flagged their research interest with the SDGs. Following the course of symposium, the special INYAS Session was well articulated to discuss and deliberate upon the current scenario of INYAS’ working in the zonal levels and the future agendas to be focused upon. Concluding the day, Panel Discussion Session - S1 highlighted the pressing topic of ‘Young Scientists in Science Governance’ wherein the panelists discussed about the challenges faced in the arena of science policy and administration. Along with posting

experiential solutions from their knowledge and expertise. Overall the day was filled with notions, deliberations and fruitful interactions. The second day of the INYAS Mid Year Meeting and Technical Symposium started with enhanced enthusiasm and charisma. The third technical session (T3) aimed to discuss elaborately in the diaspora of ‘Affordable Healthcare.’ The speakers portrayed their area of research expertise through which they aim to amalgamate health science and technology for efficient delivery of treatment. Flowing through the course of time, the second satellite session (S2) was initiated which dealt with the significant topic of discussion on ‘Empowering Innovation: Using Startups for Collective Growth.’ The panel witnessed the representation from academia, startup and established industry personnel. The panelists highlighted the challenges and solutions in the industry-academia engagement coupled with the emphasis on mindset change and support required for booming startups in the field of S&T. The S2 session was then followed by the sponsor talk from the representative. Following the trajectory of the day, the fourth technical session (T4) was put forth on the agenda ‘Green Energy: Foundational Research to Technological Innovations.’ The session vehemently discussed about future aspirations in the field of sustainability. Towards the conclusion of second day, the third satellite session themed ‘Integrity in Research: Practices and Challenges.’ The panellists delved into a fruitful brain storming session and put forth the experience gained through their journey of research. The Mid Year Meeting and Technical Symposium 2024 on the agenda of Empowering Young: Leveraging Science and Technology for Sustainable Development unfolded its concluding day three of the vibrant three days meeting cum symposium at IISER Kolkata on 28 September, 2024. The day started with humongous enthusiasm and far fetched vision to contribute for the exponential growth of science and technology for the globe. The fifth technical session (T5) highlighted the topic titled ‘Novel Materials for

Sustainable and Greener Future' which was nothing short of extraordinary and exemplary for the audience. The speakers shared their research ideas that aims to create product sustainability as a whole. Following the trajectory of the day, the final satellite session (S4) proved to be the milestone for the symposium as we had panelists from around the globe who joined online for an enchanting and knowledge abundance session. The S4 revolved around the theme of 'Role of neighboring young academies in building scientific temperament among Asian countries'. The panelists from Nepal, Bangladesh and Sri Lanka along with the representatives from Global Young Academy (GYA) and International Science Council (ISC) shared their valuable perspectives with the audience and also enlightened us about their domain of work, mission and vision. Indian National Young Academy of Science (INYAS) being the host shared its objectives and opened the future platforms for more International collaborations. Overall, the entire span of three days starting from 26 September, 2024 at IISER Kolkata proved to be a marvellous success and added feather to INYAS in its 10 years of existence.

- 27. Science for Society:** The "Science for Society" program, held on October 4, 2024, at the Institute of Chemical Technology (ICT) Mumbai, brought together researchers, scientists, and students to discuss the intersection of science and societal development. Under the theme "Science for Society," the event featured keynote talks by Dr Arindam Sarkar, Dr Mohanapriya K, and Dr R. R. Deshmukh. Topics ranged from decoupled Zn-air rechargeable batteries to plasma applications and non-lithium-based green battery technology. The program emphasized the role of scientific innovation in addressing global challenges like energy transition and sustainability. The enthusiastic



Lecture Session during Science for Society Event

participation of students and stakeholders highlighted the growing interest in leveraging science for societal improvement.

- 28. Addressing Chemical Complexity through Molecular Simulations for Engineering Applications:** On October 17, 2024, INYAS, in collaboration with the Indian Concrete Institute and the Department of Chemistry at IIT Jammu, organized a seminar on "Addressing Chemical Complexity through Molecular Simulations for Engineering Applications." The event featured a talk by Professor Balasubramanian Sundaram from JNCASR, Bangalore, who delved into advanced computational techniques such as coarse-graining, enhanced sampling, and machine-learned potentials. Using case studies on water harvesting, gas storage, and transmembrane processes, Professor Sundaram demonstrated how molecular simulations could solve chemical complexities in engineering. The seminar was attended by 100 participants from diverse disciplines, offering them valuable insights into the practical applications of computational modeling in science and engineering.



Seminar on "Addressing Chemical Complexity through Molecular Simulations for Engineering Applications"

29. Beyond the Classroom: A Journey into Science Careers: On October 14, 2024, a workshop titled "Beyond the Classroom: A Journey into Science Careers" was conducted at IIT (BHU), Varanasi, for high school students from grades 10 to 12. Coordinated by Dr Sanjay Singh, the workshop aimed to inspire students to pursue careers in science

by providing an in-depth understanding of the opportunities available in the field. Esteemed IIT professors, who are also INYAS members, shared personal experiences and professional insights, offering students an invaluable perspective on the scientific landscape. The event included guided tours of cutting-edge facilities at IIT (BHU), such



"Beyond the Classroom: A Journey into Science Careers" was conducted at IIT (BHU), Varanasi

as the Central Instrumentation Facility, Supercomputer Center, and Precision Hub, giving students a glimpse into advanced research and technology. An interactive Q&A session followed, where students engaged with the speakers to clarify doubts and discuss future career possibilities. Feedback from the 110 participants revealed a renewed enthusiasm for science and a deeper interest in exploring careers in the field. The workshop successfully broadened students' perspectives and motivated them to think critically about their contributions to science and technology.

30. RuSETUP: Fostering Curiosity - Science for Young Minds: To celebrate the 10th anniversary of INYAS, a five-day program titled "RuSETUP: Fostering Curiosity - Science for Young Minds" was held from October 21 to 25, 2024, in Ladakh. Organized by CCS Haryana Agricultural University, Hisar, CSIR NIScPR, and the University of Ladakh, the event aimed to spark scientific curiosity among young students and inspire them to embrace science education. The program included expert talks on diverse scientific

topics, addressing the challenges faced by students and presenting practical solutions. Hands-on mathematical activities enhanced logical thinking and problem-solving skills, while sessions conducted in remote locations, such as local schools and the University of Ladakh, made science accessible to all. A career guidance kit developed by INYAS was distributed, providing valuable resources to students for their educational and professional journeys. The event received high praise from participating school faculty members, who commended INYAS's efforts to ignite a passion for science among young learners in Ladakh.

31. Creativity, Innovation, and Research Opportunities in Mathematical Sciences: From October 24 to 26, 2024, the North East Zone of INYAS, in collaboration with Jawaharlal Nehru College, Boko, Assam, hosted sessions on "Creativity, Innovation, and Research Opportunities in Mathematical Sciences" as part of the College's International Conference on the Emerging Role of Mathematics in Science and Technology. The event featured prominent speakers such as Professor



"RuSETUP: Fostering Curiosity - Science for Young Minds" was held from October 21 to 25, 2024, in Ladakh



Sessions on "Creativity, Innovation, and Research Opportunities in Mathematical Sciences"

Pratulananda Das of Jadavpur University, Dr Manjil P. Saikia, Dr Mayuri Chabukdhara of INYAS, and Professor Kanhaiya Jha of Kathmandu University, among others. The sessions covered topics such as fuzzy logic applications, fixed-point theory, space research, and the role of mathematics in science and society. Participants learned about career

opportunities at local, national, and international levels, as well as the importance of creativity and innovation in mathematical sciences. With over 150 attendees, the event successfully highlighted the diverse applications of mathematics, fostering enthusiasm and interest among students and researchers alike.

32. Science Awareness Camp for Students and Farmers: On November 16-17, 2024, the NCR Zone of INYAS conducted a two-day Science Awareness Camp in Agra. The program, coordinated by Drs. Ashwani Kumar Tiwari, Subhash Babu, Pankaj Kumar, and Ranjit Kumar, targeted students and farmers to promote science education and sustainable farming practices. On November 16, events for students from classes 6 to 8 were held at Seth Haridas Vidyalaya, and for classes 9 to 12 at DEI, REI Intermediate College, attracting 68 and 92 students, respectively. The sessions included discussions on significant science topics, demonstrations of scientific instruments, and the distribution of science kits. The following day, a Farmer

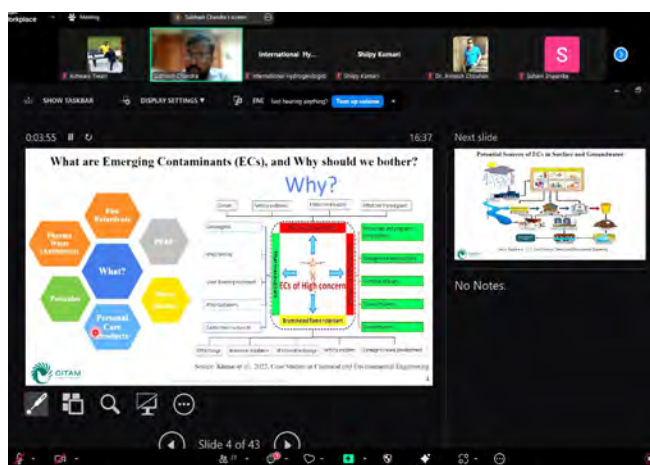


NCR Zone of INYAS conducted a two-day Science Awareness Camp in Agra

Awareness Camp in Manoharpur village engaged over 70 farmers, encouraging them to adopt organic farming practices. Mustard seeds were distributed as part of the initiative, and the program's success was highlighted in local newspapers. The event was well-received by both students and farmers, fostering an appreciation for science and sustainable practices.

33. Emerging Pollutants in Groundwater Resources and Their Treatment Methods:

On November 4, 2024, an online lecture coordinated by Ashwani Kumar Tiwari under the NCR Zone attracted 40 participants. The



Online lecture on Emerging Pollutants in Groundwater Resources and Their Treatment Methods

session discussed emerging contaminants in surface and subsurface waters, their effects on aquatic systems, and methods for their treatment. With 59 registered participants, including students from diverse backgrounds like Geology and Environmental Science, the lecture was highly interactive and concluded with an engaging Q&A session, leaving attendees with valuable insights.

34. Igniting Curiosity: A One-Day Symposium on Advanced Science for Young Researchers:

Held on November 8, 2024, at Goa University's School of Chemical Sciences, this symposium, coordinated by Amit Ashok Vernekar, brought together 135 participants. It featured talks on advanced scientific topics, such as sustainability, sensors, and energy, delivered by emerging scientists. The event served as an excellent platform for interdisciplinary research discussions, sparking curiosity and inspiring attendees to pursue sustainable scientific solutions.

35. Biology Beyond Books: Hands-On Experience with Advanced Zoology Tools and Techniques in Modern Biology:

On November 28, 2024, at the Central University of Jammu, Shweta Yadav coordinated a science camp for 60 participants. The event targeted 12th-grade students from rural areas, providing them with practical exposure to



Igniting Curiosity: A One-Day Symposium on Advanced Science for Young Researchers



Biology Beyond Books: Hands-On Experience with Advanced Zoology Tools and Techniques in Modern Biology

advanced biological tools and techniques. The camp emphasized creativity, curiosity, and problem-solving, leaving students inspired by their interactions with scientists and the hands-on experience they gained.

36. Lab in a Box: On December 1, 2024, at Ranjit Singh Rozi Shiksha Kendra, IIT Kanpur,

Sudhanshu Shekhar Singh led an engaging session for 30 students from classes X and XI. Through practical demonstrations, the session helped students connect theoretical science concepts with real-world applications, enhancing their understanding of science in an enjoyable and interactive manner.

37. World Nuclear Energy Day: A series of events celebrating World Nuclear Energy Day took place on December 2, 9, and 10, 2024, at



A series of events celebrating World Nuclear Energy Day



Lab in a Box

VJTI, SIES, and Sathey College in Mumbai. Coordinated by Neetu Jha, Hitesh Pawar, and Vivek Parkar, these sessions engaged 192 participants. They highlighted the advantages of nuclear energy, its environmental benefits, and its role in sustainable development. Interactive discussions and Q&A sessions sparked a newfound interest in nuclear energy among students.

- 38. Career Opportunities After School Education in India:** On December 7, 2024, at PM Shree School Jawahar Navodaya Vidyalaya, Mirzapur, Sanjay Singh guided 200 participants through an engaging session on career opportunities. The session emphasized the importance of skill development and higher education while inspiring students to explore diverse fields based on their interests. The students expressed interest in visiting IIT (BHU) facilities and gained valuable direction for their future endeavors.



Career Opportunities After School Education in India

- 39. Hands-On Session on Wearable Robotics for School Students:** On December 11, 2024, at the Human-Centered Robotics Lab, IIT Gandhinagar, Vineet Vashista coordinated a session for 15 students. This hands-on experience introduced participants to wearable robotics through live demonstrations of sensors, actuators, and controllers. The session successfully piqued interest in robotics and its applications, inspiring young minds to



Hands-On Session on Wearable Robotics for School Students

innovate and explore this exciting field further.

- 40. Exposure Visit for School Students:** On December 14, 2024, Jai Prakash hosted 350 participants at the Department of Physics, Aligarh Muslim University. The students explored advanced scientific facilities, including the Nuclear Physics Laboratory, and observed the Sun's surface through a telescope. This enriching visit inspired attendees and fostered enthusiasm for pursuing careers in science, showcasing the university's commitment to scientific awareness.

- 41. Communicating Science to Society: From Plastic to Bioplastic:** On December 20, 2024, at IIT Indore, Kiran Bala engaged approximately 400 participants in a session focused on addressing plastic pollution and exploring bioplastic alternatives.



Exposure Visit for School Students



Communicating Science to Society: From Plastic to Bioplastic

The event combined interactive quizzes with informative discussions, motivating participants to adopt sustainable practices and combat environmental challenges through innovative solutions.

42. Lecture Series on Nobel Laureates (January 3, 2025 | CSIR-CSIO, Chandigarh):

The lecture series, "Learning, Leveraging & Linking Traditional Knowledge with Modern Science: Insights from Nobel Laureate Professor Tu Youyou," was a thought-provoking session led by Padma Shri awardee Professor Anil K. Gupta, Founder of the Honey Bee Network, SRISTI, GIAN, and NIF. The event commenced with a traditional lamp-lighting ceremony, followed by a warm welcome from CSIR-CSIO Director Professor Shantanu Bhattacharya, who highlighted Professor Gupta's achievements. The keynote address delved into Professor Tu Youyou's pioneering discovery of Artemisinin, derived from *Artemisia annua*, which revolutionized malaria treatment. Professor Gupta emphasized her innovative approach of combining traditional Chinese medicinal texts with modern scientific validation, showcasing how traditional knowledge can lead to groundbreaking innovations. He also discussed the struggles Professor Tu faced in a resource-limited environment and the ethical importance of preserving indigenous

knowledge. The session concluded with an engaging Q&A, where participants explored



Celebrating 10 Years of INYAS



Lecture Series on Nobel Laureates

Learning, Leveraging & Linking Traditional Knowledge with Modern Science: Insights from the Noble Laureate Prof. Tu Youyou



Speaker
Prof. Anil K. Gupta
Padma Shri & Founder Honey Bee Network

Organizers	Modes of Participation
CSIR-CSIO & INYAS NCZ	Offline/Online and Live Streaming
Venue: ISTC Auditorium, CSIR-CSIO, Chandigarh 2:30 PM January 03, 2025	Scan to Register 

*Lecture Series on Nobel Laureates by
Professor Anil Kumar Gupta*

ways to integrate traditional wisdom with contemporary research. The event left the audience inspired to pursue interdisciplinary approaches to science and innovation.

- 43. Skill Set and Career Development Workshop for Girl Students (January 7, 2025 | Virtual Event, Dr SSN Government College, Malanjkhanda, MP):** This virtual workshop, organized by INYAS-NCR Zone, aimed to provide B.Sc. and M.Sc. students, particularly from rural and tribal backgrounds, with insights into career-building skills and



Virtual workshop, organized by INYAS-NCR Zone

government schemes for scientific career development. Dr Sujit Bhattacharya, Chief Scientist at CSIR-NIScPR, highlighted the importance of reaching out to underprivileged students to bridge the knowledge gap. The workshop covered key topics such as Skill Building for the 21st Century, Fellowships and Funding Opportunities by CSIR in STEM, Achieving Success with Science in India: The Pathway, and Exploring the World of Pharmacy: A Gateway to Science, Health, and Bright Careers. The interactive sessions helped students understand the necessary skill sets for career growth and motivated them toward research-oriented pathways. Participants appreciated the workshop as a first-of-its-kind initiative, gaining valuable exposure to various opportunities in STEM fields.

- 44. One-day Workshop on Scientific Grant Proposal Writing (January 9, 2025 | IISER Thiruvananthapuram):** This one-day workshop at IISER Thiruvananthapuram, supported by INYAS South Zone, provided early-career faculty, postdoctoral fellows, and Ph.D. students with expert guidance on writing scientific grant proposals. Held at the Aryabhatta Auditorium, the event



Participants for One-day Workshop on Scientific Grant Proposal Writing at IISER Thiruvananthapuram

featured distinguished speakers, including Mr. S. K. Varshney (DST), Dr Monika Agarwal (ANRF), and Dr Deo Prakash Chaturvedi (DBT), who shared their insights on grant writing, proposal structures, and funding opportunities. Dr Monika Agarwal discussed the transition from SERB to ANRF and the associated benefits, including the highly competitive NPDF fellowship. Dr Chaturvedi elaborated on various DBT fellowships and grants, while Mr. Varshney provided details on international fellowships, bilateral research collaborations, and the funding agency review process. The event concluded with a dynamic Q&A session, where participants clarified doubts related to grant applications and execution. With nearly 400 online registrations but a final in-person attendance of 170, the event underscored the effectiveness of offline workshops in facilitating deeper engagement and personal interaction with experts. The model was deemed highly successful and recommended for nationwide adoption.

- 45. The International Conference on Trends and Innovations in Science and Engineering: Bridging the Industry-Academia Interface (February 20-22, 2025 | Integral University, Lucknow):** This international conference focused on strengthening collaborations between industry and academia to bridge gaps in scientific research and real-world applications. Experts from diverse fields, including bioengineering, sustainable technology, and material sciences, presented their research. The event was graced by representatives from the National Skill Development Corporation (NSDC), NITI Aayog, and Council of Scientific & Industrial Research (CSIR) institutions. Key discussions revolved around funding mechanisms, technology transfer, and fostering innovation-driven entrepreneurship. The conference provided an invaluable platform for researchers, academicians, and industry professionals to network and explore future collaborations. The event concluded with a vote of thanks, emphasizing the significance of industry-academia synergy in



During the International Conference on Trends and Innovations in Science and Engineering: Bridging the Industry-Academia Interface

driving scientific progress.

- 46. Distinguished Lectures on Nobel Prize Discoveries and International Seminar on Translational Sciences (February 24, 2025 | Shoolini University, Himachal Pradesh):** Organized by INYAS North Zone in collaboration with the School of Agriculture and Biotechnology, this seminar celebrated the 10th anniversary of INYAS with a series of high-impact lectures. Prominent scientists shared groundbreaking discoveries in medicine, biotechnology, and space sciences. Notable sessions included Professor N.G. Prasad's lecture on the evolution of immune responses, Professor Kulinder Pal Singh's insights on India's Astrosat mission, Dr Javed N. Agrewala's presentation on a novel tuberculosis vaccine, and Professor R.C. Sobti's discussion on synthetic biology and mRNA technology. The event witnessed enthusiastic participation from over 200 attendees, including 170 postgraduate and



INIAS North Zone in collaboration with the School of Agriculture and Biotechnology celebrated the 10th anniversary of INIAS

PhD students. Engaging discussions helped young researchers grasp the real-world impact of Nobel-winning research. The seminar concluded with certificate distribution and a networking session, reinforcing the significance of translational science in addressing global healthcare and technological challenges.

47. **Communicating Science (February 10-14, 2025 | IIT Indore):** This five-day initiative was designed to enhance students' ability to communicate scientific concepts effectively. The event included a combination of hands-on



Five-day initiative was designed to enhance students' ability to communicate scientific concepts effectively

training, expert lectures, and interactive lab visits. A major highlight was the session by Dr Parasharam M. Shirage on electron microscopy, where he detailed the applications of Field Emission Scanning Electron Microscopy (FESEM), Transmission Electron Microscopy (TEM), and Scanning Transmission Electron Microscopy (STEM) in biomaterials research. Participants explored advanced research

laboratories at IIT Indore, gaining hands-on experience with high-end scientific instruments. The program successfully instilled an interest in research careers among students while enhancing their ability to present and interpret scientific data effectively.

48. **The North East Genomics Frontiers Summit 2025 (February 6-8, 2025 | Tezpur University, Assam):** This summit was a landmark event in genomic research, bringing together 32 distinguished speakers and 110 research scholars from 27 institutions. Organized by INIAS in collaboration with GATC Mumbai and IASST Guwahati, the summit emphasized genomics, bioinformatics, and computational biology. A key pre-summit workshop trained 105 participants in computational genome analysis, equipping them with essential bioinformatics skills. Discussions spanned topics such as next-generation sequencing, applications of CRISPR technology, and the role of genomics in personalized medicine. The event successfully fostered research collaborations, paving the way for future breakthroughs in genomics research in the Northeastern region of India.



The North East Genomics Frontiers Summit 2025 at Tezpur University, Assam

49. Workshop on Differential Equations (February 4-8, 2025 | IIT Roorkee): This intensive workshop, sponsored by SERB-DST (ANRF) and INYAS, was tailored for mathematics enthusiasts and researchers focusing on differential equations. Renowned mathematicians, including Professor Dwijendra N. Pandey, Professor Arbaz Khan, and Professor Manil T. Mohan, led sessions on theoretical and computational aspects of ordinary and partial differential equations. The event attracted 55 participants from Uttarakhand and neighboring states, providing them with hands-on experience in solving mathematical problems using numerical methods. The



Workshop on Differential Equations by SERB-DST and INYAS

workshop played a crucial role in enhancing participants' analytical and problem-solving skills, contributing to the advancement of mathematical research in India.

50. Scientific Programme on "Skill Enhancement for Innovative Farming" (March 11, 2025 | ICAR-IISWC, Dehradun): With a focus on sustainable agricultural practices, this program brought together 110 participants, including 50 farmers

and 20 students, to educate them on modern farming techniques. Experts delivered insightful sessions on government schemes supporting farmers, efficient utilization of agricultural residue, and water conservation methods. Practical demonstrations were conducted, including hands-on training in fungicide application for ginger cultivation and strategies for managing small-scale farm enterprises. The program significantly contributed to knowledge dissemination in sustainable agriculture and provided farmers with innovative tools to enhance their productivity and income.



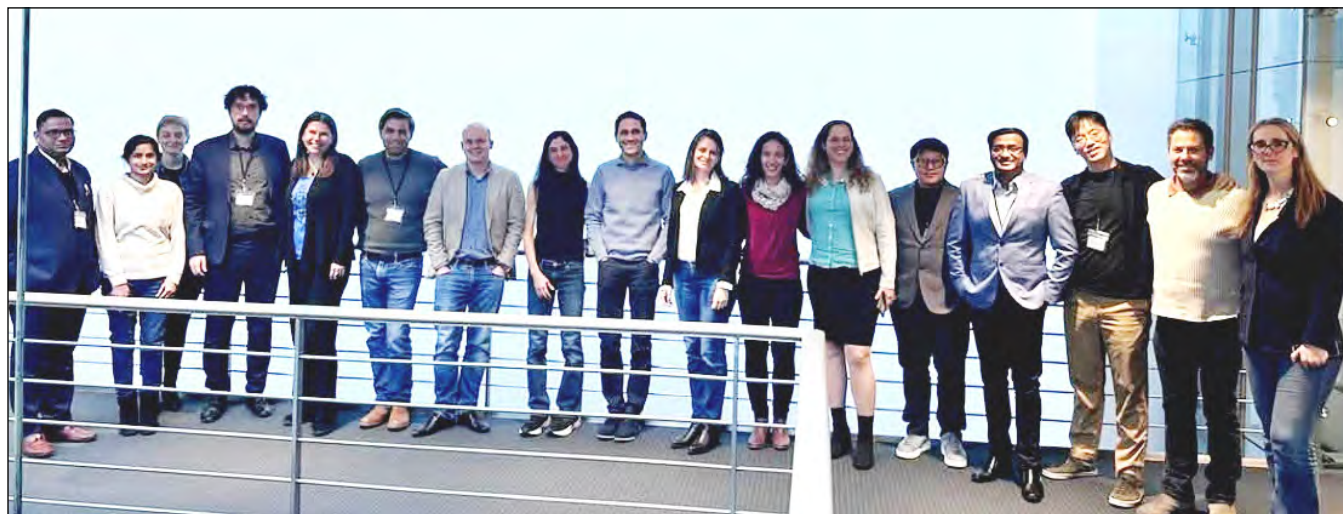
Scientific Programme on "Skill Enhancement for Innovative Farming" (March at ICAR-IISWC, Dehradun)

51. Symposium on the Future Role of Scientific Research and Academic Collaboration in the 21st Century (February 17-20, 2025 | Berlin, Germany): This prestigious international symposium, organized by the Israeli and German Young Academies, brought together representatives from eight young academies worldwide, including INYAS. Discussions centered on improving the engagement of young scientists in policymaking, fostering interdisciplinary collaborations, and addressing global research challenges. INYAS representatives Dr Nishant Chakravorty and Dr Rishemjit Kaur contributed valuable insights into scientific mentorship and cross-border research initiatives. The symposium set the stage for future international research partnerships, reinforcing the role of young scientists in shaping scientific policies and global innovation strategies.

NEET, and KVPY, and addressing student mental health concerns. Interactive sessions provided practical insights into counseling techniques and innovative teaching methods. The event received highly positive feedback from attendees, who highlighted the need for similar workshops to enhance the quality of school education.



One-Day School Teachers Enrichment Workshop at Indian Statistical Institute, New Delhi



INYAS delegated in the Symposium on the Future Role of Scientific Research and Academic Collaboration in Berlin, Germany

52. One-Day School Teachers Enrichment Workshop (March 21, 2025 | Indian Statistical Institute, New Delhi): Designed to empower school teachers with skills in mentoring and student career guidance, this workshop covered key areas such as preparing students for competitive exams like JEE,

53. One-Day Faculty Enrichment Program on Diophantine Equations and Polynomials (March 21, 2025 | Indian Statistical Institute, New Delhi): This specialized faculty development program focused on complex mathematical theories, including Diophantine equations and polynomial



Faculty Enrichment Program on Diophantine Equations and Polynomials

irreducibility. Eminent mathematicians such as Professor Shanta Laishram and Dr Anuj Jakhar led technical sessions, followed by research presentations and discussions on mathematical problem-solving strategies. The program also emphasized the importance of student counseling, highlighting the role of faculty members in guiding students toward academic success.

- 54. Sensitization Program on Organic Backyard Poultry Production for Sustainable Food and Nutritional Security (March 25-27, 2025 | Sakraba Village, Nagaland):** Targeting rural and tribal farmers in Nagaland, this program



Sensitization Program on Organic Backyard Poultry Production for Sustainable Food and Nutritional Security at Sakraba Village, Nagaland

aimed to promote organic poultry farming for improved food security and livelihood generation. Over 55 farmers participated, receiving training in poultry management, vaccination techniques, and organic farming methods. A major initiative of the program was the distribution of 930 chicks, vaccines, and feed supplements to 50 farmers, helping them establish sustainable backyard poultry enterprises. The program effectively empowered local communities by providing them with the resources and knowledge to enhance their agricultural productivity.

- 55. INYAS & INSA National Science Day Celebrations 2025 (February 28, 2025 | INSA, New Delhi):** This grand event brought together leading scientists, policymakers, and young researchers to celebrate India's advancements in science and innovation. Professor Ashutosh Sharma was honored for his outstanding contributions to Indian science. Keynote speakers, including Professor Balram Bhargava and Dr Sanjay Behari, discussed India's progress in scientific research and its future potential. A panel discussion on "Science & Innovation for Viksit Bharat" explored strategies to position India as a global leader in research and development. The event also featured the prestigious INYAS Saransh Awards, recognizing young researchers for their excellence in science.



SARANSH-2024 Award Presentation Ceremony during National Science Day 2025 at INSA, New Delhi

56. SCOPE - Science Communication Outreach and Public Engagement Workshop organised by INYAS, Ministry of Education and IIT Hyderabad (01-05 March, 2025 | IIT Hyderabad): The SCOPE - Science Communication Outreach and Public Engagement Workshop was concluded on a visionary note at Indian Institute of Technology Hyderabad on March 05, 2025. The capacity building workshop under the Malaviya Mission Teacher Training Programme, Ministry of Education aimed to foster the skill of effective science communication in association with IIT Hyderabad and Indian National Young Academy of Science (INYAS), New Delhi. The workshop was initiated on March 01, 2025 by the honourable Professor B.S. Murty, Director, IIT Hyderabad. Following the exemplary tone set by him. The second day of the residential training programme on March 02, 2025 highlighted the fundamentals of press releases and official writings by Dr Meher Wan, Scientist at CSIR-NIScPR. Followed by Shri Hari Pulakkat, renowned scientific writer underlined the significance of consistent writing, diverse media strategic plans and strong PR to propagate science to the common. Moving ahead Dr Manoj Kumar Patariya, NIAB Bangalore shared his expertise over scientific media harnessing

and regional publications. Following the trajectory, Shri Pallava Bagla, renowned science journalist underscored the art of storytelling, timely publications of news material and information transfer. The third day of the workshop experienced the voyage on audiovisual storytelling by Dr Nimish Kapoor Scientist at Birbal Sahni Institute of Palaeosciences. The workshop charted yet another journey through the session of Mrs. Mitalee Agarwal at CCoE, Hyderabad that discussed brand building and social media engagement. Following the same, Ms. TV Padma, renowned scientific writer, discussed ethical challenges including exaggeration and misinformation. The fourth day of the work marked the beginning of yet another domain of importance - academic publishing. The session was handled by Dr Rohini Kitture from Wiley Publications. She discussed the intricacies of academic review processes and the tips for effective journal writing practices. Following the day, Dr Deeksha Gupta from ACS discussed AI and ethics in scientific communication. It's positives and limitations. The concluding day of the workshop started with the talk of Dr Rohini Kitture which discussed briefly about manuscript writing. The session was followed with the much anticipated valedictory session chaired by



Science Communication workshop organised by INYAS, Ministry of Education and IIT Hyderabad from 01-05 March, 2025

Professor Chandra Shekhar Sharma, Professor at IIT-Hyderabad and Co-Chair GYA, Dr Nishant Chakravorty, Associate Professor at IIT Kharagpur and Chair INYAS and Dr Meher Wan. The valedictory session opened the floor for feedback from participants. The participants were also encouraged to share their ideas on science communication course development. Thereafter, the certificates were distributed followed by a group photograph session.

Science Education Programme

The Academy, jointly, in association with IASc, Bangalore and NASI, Allahabad sponsored a variety of activities aimed at strengthening of higher education in science and encouraging the young students to take science as a career. These are:

1. **Summer Research Fellowships for Students and Teachers:** Under this programme, specific proposals are invited from students and teachers for the work they propose to undertake during the two month long Fellowship. 1059 Fellowships were availed in Summer Research Fellowship Program 2024. (*Annexure-XX*)

2. **Focus Area Science Technology - Summer Fellowship 2024 (FAST-SRF)**

Inter Academy has initiated the Focus Area Science Technology Summer Fellowship (FAST-SF) programme with a view to enhance the spread of Science and Technology in the specific regions of the country. 79 fellowships availed. (*Annexure-XXI*)

3. **A 2-week All India Refresher Courses for Teachers:** Two-week Refresher Course is aimed at capacity building of teaching community. The primary focus is to enhance the quality of science education at undergraduate and graduate levels. Refresher Courses are thus, primarily aimed at helping teachers to add value to their teaching. Four refresher courses were held from April 2024-March 2025. (*Annexure-XXII*)

4. **Two Summer School held from April 2024 - March 2025.**
5. **OneASSURE Workshop held from April 2024 - March 2025.**
6. **Lecture/Workshops for Students and Teachers:** Short-duration Lecture/ Workshops programme is an important segment of the activities under the Science Education Panel. These are of 2-3 days' duration, intended for the benefit of students and teachers at the undergraduate, graduate and research levels. Forty six Lecture Workshops held from April 2024-March 2025. (*Annexure-XXIII*)

LOCAL CHAPTERS

Nurturing science and promoting excellence in the country is one of the objectives of the Academy. Towards this end, INSA has established Local Chapters in different regions of the country. These Local Chapters have been established at places where five or more Fellows reside. The primary aim of these chapters is popularizing science among the school and college going students and masses in general, strengthening existing scientific activities, and promoting interaction amongst the local scientific community, local academies and learned bodies and the Indian National Science Academy.

Presently there are 16 local chapters in different regions of the country. The Local Chapters have been charged with the responsibility of organizing INSA award lectures. Besides lectures, chapters are also engaged in other activities of holding meeting of Fellows of the chapter to discuss problems of the respective regions. Activities of some of the local chapters are described below:

Kanpur Local Chapter (Convener- Dr Bushra Ateeq, Indian Institute of Technology Kanpur)

Kanpur local chapter organized workshop titled "Navigating PhD and Beyond" on 30th-31st December 2024.

Delhi Local Chapter (Convener – Dr Pramod Kumar Garg, All India Institute of Medical Sciences, technology Institute, Faridabad)

School of Life Sciences, JNU in association with INSA Local Chapter, Delhi organized the National Conference on “*Vistas in Life Sciences 2025: Cellular Systems, Gene Regulation and Integrative Biology*” on 24th January, 2025 on the occasion of 55th Foundation Day of the school. This conference aimed to bring together leading researchers, scholars, and scientists from leading national institutes and universities to exchange knowledge, discuss modern discoveries, and foster collaborations in the field of Life Sciences.

On this special occasion, **Dr Himanshu Pathak**, Director General, Indian Council of Agricultural Research and Secretary, DARE, Government of India was the Chief Guest for the inaugural session of this conference. **Dr Pramod K. Garg**, Convener, INSA Local Chapter, Delhi has also delivered a special address.

Kharagpur local Chapter (Convener-Professor Suman Chakraborty, Indian Institute of Technology, Kharagpur)

Anveshan: Kindling the Spirit of Scientific Pursuit in Rural School Children

An INYAS East Zone & INSA Kharagpur Chapter Joint Event

Vision

Science and technology are the drivers of innovation and progress, yet many students seem to be losing interest in science owing to its disconnect from real-world applications. Often limited to textbooks and exams, science education lacks engagement and fails to inspire critical thinking. To address this challenge, INSA Kharagpur chapter and INYAS East Zone has launched “Anveshan” - to rekindle scientific curiosity among schoolchildren, particularly in rural areas. As a part of this initiative, a one-day workshop was organized at IIT Kharagpur on 27th March 2025. The event brought together faculty,

researchers, and students from nearby schools to explore science beyond textbooks. Through interactive storytelling, hands-on experiments, and engaging discussions, students experienced a practical and immersive approach to learning. By bridging the gap between theoretical knowledge and real-world problem-solving, the workshop aimed to make science exciting and accessible, empowering young minds to become future innovators and entrepreneurs.

Twenty-nine students (Classes 8 to 11) along with three teachers, from Gopali IM High School, Kharagpur, participated in the event. The diverse group of students had the opportunity to interact with distinguished professors and researchers, gaining invaluable exposure to scientific concepts and applications.

The event commenced with an introductory note by the Coordinators – Professor Suman Chakraborty (Convener, INSA Kharagpur Chapter) and Dr Nishant Chakravorty (Chairperson, INYAS). Their welcome address set the stage for a day filled with inspiring talks and interactive learning sessions.



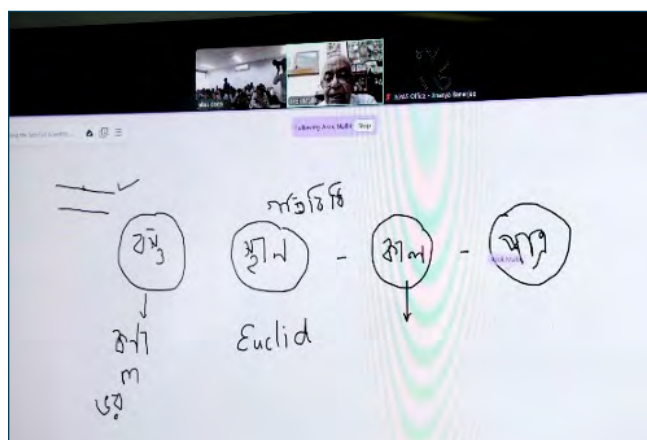
Session Highlights

Inspiring Stories about Pioneers of Indian Science – Delivered by Professor Joy Sen, this session introduced students to the contributions

of legendary Indian scientists, igniting their passion for scientific discovery.



- **How School Level Science Can Foster Disruptive Innovations in Healthcare** – Professor Suman Chakraborty discussed the potential of foundational science in enabling ground-breaking innovations while describing the achievements of his research team in the field of point-of-care diagnostics and their applications that covered COVID-19, diabetes, antibiotic resistance and anaemia detection.
- **Educational Talks on building scientific concepts** – A thought-provoking discussion on how conceptual clarity in school science forms the basis of lifelong learning.
- **The Mechanical Universe** – Professor Ashok Mallick (Former Professor, IIT Kanpur) introduced students to the wonders of mechanics and its real-world implications. He



demonstrated concepts of mechanical through educational toys.

Bonding with Chemistry – Professor Swagata Dasgupta made chemistry engaging by demonstrating the fascinating interactions of molecules using plastic models. The hands-on demonstration of DNA double helix using origami was exciting for everyone.



The Mysteries of Life – Dr Budhaditya Mukherjee and Dr Nishant Chakravorty explored the complexities of biological systems and their relevance in everyday life, using real life examples.

Hands-on Science Activities

- **Do It Yourself – Fun with Learning:** This session focused on hands-on science for the students. In this workshop, they explored basic electronic components like sensors,



resistors, and microcontrollers. The students learnt how to build a simple pulse oximeter using the MAX30100 sensor and Arduino, which reads heart rate and oxygen levels. Data was displayed on an LED screen for easy viewing. We also discussed the use of advanced boards like the Raspberry





Pi for smarter features and connectivity. Concept of sensors was demonstrated using sensors like the BH1750 that help measure



ambient light to adjust display brightness. This session gave a hands-on introduction to building real-world health monitoring devices using electronics.



The event concluded with a valedictory session, where participants shared their experiences and reflections. Certificates were distributed to acknowledge the enthusiastic participation of students and teachers.

Anveshan achieved its objective of inspiring scientific temperament among rural school children by making science engaging, accessible, and practical. Through the collective efforts of INYAS and the INSA Kharagpur Chapter, this initiative successfully



inspired young minds to view science as a tool for innovation and problem-solving. The positive response from students and teachers highlights the impact of such outreach programs in shaping the future of scientific inquiry in India.

Kolkata Local Chapter (Convener – Professor H.K. Majumder, CSIR-Indian Institute of Chemical Biology, Kolkata)

1. **24th September, 2024 (10.00AM -5.00PM):** With the aim to reach out to the young minds, particularly in the schools, colleges and universities, INSA-Kolkata Chapter in collaboration with Department of Life Sciences, Presidency University, Kolkata organized a one-day conference on the Application of Artificial Intelligence in Biological Science which was held at the P C Mahalanobis Auditorium, Presidency University. The objective of this conference was to introduce the students to the basic concepts of Artificial Intelligence, its ethical implications as well as its role in health care research and development. Professor Arun Lahiri Majumder took an active part in this event. Professor Anupam Basu, Raja Ramanna Chair Professor, Jadavpur University, Distinguished Honorary Professor Sister Nivedita University, delivered the Keynote Address - 'An introductory tour of Artificial Intelligence and Machine Learning'. After which, Dr Arpan Pal, Principal Scientist, TCS Innovation Lab, Kolkata spoke on 'Application of Artificial Intelligence in Health Care – screening, monitoring and therapy for non-communicable diseases'. Lastly, Professor Pralay Mitra, Ph.D., Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, delivered a talk on 'Artificial Intelligence – a facilitator in Drug Discovery'. Along with this INSA-Kolkata Chapter also arranged a Poster Competition for the students. Three prizes were given. 40 Students from class X and XII from Hare schools, Garden High School and Jadavpur Sammilita Balika Vidyalaya; 40 students from Vidyasagar college and Bethun college
- and 140 students from Presidency University along with a few faculty members from schools, colleges and Presidency university participated in this conference. All the 220 participants were given certificates. The question answers session which followed the lectures generated great interest when even the school students took part enthusiastically. In short, the program was a great success.
2. **28th Feb, 2025: (10.00-4.30PM):** National Science Day -2025 Celebration & Young Talent Search Programme (YTSP) was Organized in collaboration with PASE-Kolkata, Science Forum at Mrinalini Datta Mahavidyapith, Vidyapith Road, Birati. The program started with competitive Events like poster presentations and debate competitions for school & college students. More than 180 students from seven different schools along with students from Mrinalini Datta Mahavidyapith participated. Following this, two lectures to encourage school students to take up Science were delivered by Dr Chitra Mandal, Secretary, INSA-Kolkata Chapter and Former Scientist, IICB, Kolkata on "ব্রহ্মসংসানে বিজ্ঞান" and Professor Binay K Dutta, IIT Kharagpur on "বিজ্ঞানশিক্ষা ও বৃত্তি". Concluding Remarks were given by Dr Susanta Roychoudhury, E C member of INSA-Kolkata Chapter. Winners of the poster competition and the debate were given awards. Certificate of participation was given to all students. Students showed great enthusiasm and said that they would look forward for more such programmes.
3. **10th March 2025 (1.00-4.30PM):** A seminar together with a programme on "hands on activity" was organized in association with Advanced Research Centre, Lady Brabourne College. The program opened with the welcome address by the principal of the college and the inaugural address by Dr Chitra Mandal. After a brief introduction of the keynote speaker by Dr, Syamal Roy, Dr Gautam Basu, Former Professor Bose Institute, Kolkata delivered a talk on "Art in Science". A very lively interactive session followed the talk where the speaker answered all the

questions put forward to him. After that, a hands-on activity led by Dr Gautam Basu was organized where all the participants were involved in building the double helical structure of DNA. The concluding remarks on the talk was given by Dr Susanta Roy Choudhury. The event concluded with a poster session with 25 posters followed by prize distribution. The event generated great interest among 157 participants from 10 different Institutions. The thoughtful design of the hands-on part of the activity which allowed them to see the demonstration of a concept was much appreciated.

4. **19th March 2025 (1.00PM-4.00PM):** A popular lecture on Genes to Diseases and Open house quiz competition were organized in association with Calcutta consortium on Human Genetics (CCHuGe) at Belgachia Manohar Academy, Kolkata 700037. After the welcome address by Dr Chitra Mandal, Dr Sharmila Sengupta Introduced the speaker, Dr Ankita Chatterjee, Assistant Professor, John C. Martin Center for Liver Research and Innovations, Sonarpur, Kolkata, who delivered the lecture entitled "Unravelling the mystery of life: from genes to diseases". Following the lecture, an open house quiz competition based on the lecture was conducted by Dr Ankita Chatterjee in which, more than 100 students who attended the lecture, participated with great enthusiasm. The program ended with the concluding remarks by Dr Susanta Roychoudhury. Certificates were distributed to all participants.

Hyderabad Local Chapter (Convener-Professor Appa Rao Podile, The University of Hyderabad)

Hyderabad Local Chapter organized Vignana Shala on February 10, 2025.

Chennai local Chapter (Convener-Professor Dr Nitish R. Mahapatra, Indian Institute of Technology, Madras)

Professor Maneesha S. Inamdar, Director, Institute for Stem Cell Science and Regenerative

Medicine (inStem), Bangalore delivered the INSA-IIT Madras Distinguished Lecture on 11th March, 2025 at the Department of Biotechnology, IIT Madras. The title of her talk was: "Unlocking the potential of stem cells: Advances for regenerative medicine" The lecture was attended by a large number of faculty members, research scholars and post-doctoral fellows from various departments of IIT, Madras.

Varanasi local Chapter (Convener: Professor KN Singh, Benaras Hindu University)

A total of 08 lectures have been organized under the banner of INSA Varanasi Local Chapter during the period 01.04.2024 to 31.03.2025. The events are summarized below:

1. **Invited Lecture by Professor Sasanka Deka:** On 26th July 2024, the Department of Chemistry, Institute of Science, hosted an engaging invited lecture by Professor Sasanka Deka from the Department of Chemistry, University of Delhi. The event was held at Professor S.S. Joshi Hall and attended by faculty members, researchers, and students.

Professor Deka delivered a lecture titled "*Nanoarchitectonics of Non-Precious Metal Based Electrocatalysts for High Throughput Overall Water Splitting Reaction.*" He discussed the development and application of non-precious metal-based nanocatalysts for sustainable energy conversion, emphasizing their potential in overall water splitting.

The talk highlighted innovative approaches in synthetic nanochemistry, structural manipulation of interfaces and crystal facets, and advanced nanomaterials for energy storage and catalysis. Professor Deka underlined the role of nanotechnology in addressing global energy challenges through sustainable solutions.

The lecture provided valuable insights into cutting-edge research in nanomaterials and catalysis, inspiring attendees to explore innovative approaches in the field. The

event concluded with an interactive session, fostering academic discussions and potential collaborations.

The lecture was well-received and significantly contributed to the understanding of sustainable energy technologies, aligning with the institute's commitment to advancing scientific research.

2. **"A Special Lecture on Chemistry" by Professor K C Kumara Swamy (J C Bose Fellow) in Dept of Chemistry, Institute of Science, Banaras Hindu University, Varanasi, on 18th Oct. 2024.** A special lecture by Professor K C Kumara Swamy (J C Bose Fellow), School of Chemistry, University of Hyderabad, Hyderabad was delivered on 18th Oct. 2024 at 3.30 pm in S S Joshi Hall, department of Chemistry, Banaras Hindu University, Varanasi. The lecture was organized under INSA Varanasi Local Chapter activities. The title of the lecture was "From Phosphorus Chemistry to Allenoate Chemistry: A Brief Tour". In his hour-long lecture, he presented some of his group's most interesting results. Though he talked about his research work but his aim was to motivate the students to do sincere research which often leads to fascinating results leading to high impact publications. About 150 Master and PhD students were present and have enjoyed his lecture. Professor K N Singh, convener, INSA Varanasi local chapter and Head, department of Chemistry, BHU, has welcomed



the speaker and introduced him to the audience. At the end, Professor D S Pandey extended the vote of thanks. There was small refreshment after the lecture through which students have got opportunities to interact with him individually over the tea session.

3. **22nd Oct. 2024: Student outreach educational program, developing future leaders of science.** The Indian National Science Academy (INSA), Varanasi Local Chapter, organized a special Student Outreach Educational Program titled "*Developing Future Leaders in Science*" on 22nd October 2022. The event was designed to inspire and guide 12th Standard Science students toward leadership roles in scientific fields.

The program was held at the Department of Chemistry, Institute of Science, and the Central Discovery Centre (CDC), Banaras Hindu University (BHU), starting at 8:30 AM. It aimed to provide a platform for young minds to explore the importance of science in societal progress and to motivate them to pursue scientific careers.

Under the convenership of Professor K.N. Singh, the event provided students with an opportunity to interact with experts, understand the significance of science education, and explore potential career paths. The initiative emphasized the critical role of science in sustainable development and leadership, equipping students with



knowledge and inspiration for future scientific endeavors.

The outreach program was a significant step toward nurturing the next generation of scientific leaders, fostering curiosity, and encouraging innovative thinking among young students. It reinforced INSA's commitment to promoting science education and developing future leaders in the field.

4. Special Lecture by Professor Deevi Basavaiah:

On November 26, 2024, the INSA Varanasi Local Chapter organized a special lecture delivered by Professor Deevi Basavaiah, FNA, FASc, and INSA Senior Scientist, from the School of Chemistry, University of Hyderabad. The lecture was held at Professor S.S. Joshi Hall, Department of Chemistry, Institute of Science, Banaras Hindu University, at 3:30 PM.

The lecture, titled "*TMSOTf Mediated Nucleophilic Addition of Nitriles to Aryl Aldehydes Mimicking Benzoin Condensation Reaction*," focused on innovative approaches in synthetic organic chemistry. Professor Basavaiah presented an in-depth exploration of the use of TMSOTf (trimethylsilyl trifluoromethanesulfonate) in facilitating nucleophilic addition reactions of nitriles with aryl aldehydes. He discussed how this reaction mimics the classical benzoin condensation, highlighting its significance in developing novel methodologies for organic synthesis.

The audience, comprising faculty members, researchers, and students, gained valuable



insights into the mechanistic aspects of these reactions, their potential applications in designing complex organic molecules, and their relevance to modern chemistry.

The event concluded with an engaging Q&A session, where Professor Basavaiah addressed queries and shared his perspectives on advancements in the field. The lecture was well-received and contributed to fostering interest and research in synthetic chemistry.

5. **4th December 2024: College Visit (Dr Ghanshyam Singh P G College Soyepur, Lalpur, Varanasi):** On December 4, 2024, at 11:00 AM, the Department of Chemistry, Institute of Science, Banaras Hindu University, hosted a session showcasing its cutting-edge research facilities to about 40 students of MSc 1st and MSc 3rd Semester from Dr Ghanshyam Singh P G College Soyepur, Lalpur, Varanasi. The session aimed to provide an overview of the advanced instrumentation available to researchers and students in the department.

Professor Satyen Saha Highlighted the department's instrumentation facilities included but not limited to: Nuclear Magnetic Resonance (NMR), Single Crystal X-ray Diffraction (XRD), Raman Spectroscopy, Mass Spectrometry, Powder XRD, Fluorescence Spectroscopy, Microscopy and Analysis, Thermal and Elemental Analysis, Electrochemical and Computational Tools.

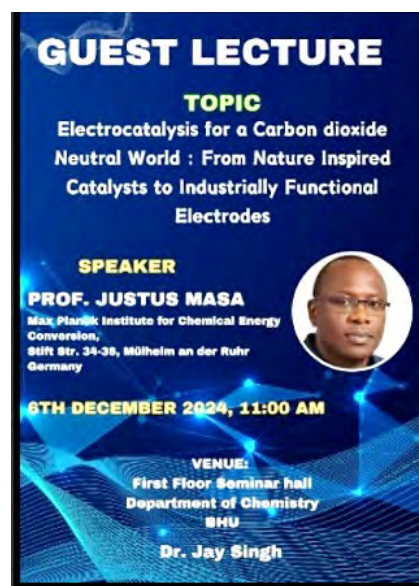
The presentation highlighted the department's commitment to advancing research by providing state-of-the-art tools and infrastructure for diverse fields like synthetic chemistry, catalysis, and material science. Attendees were encouraged to explore and leverage these facilities for innovative scientific discoveries.

The session concluded with a message of collaboration and inspiration, inviting researchers and students to join the department's vibrant research community.

6. **Special invited lecture by Professor Justus Masa:** On December 6, 2024, Professor Justus

Masa from the Max Planck Institute for Chemical Energy Conversion, Stift Str. 34-36, Mülheim an der Ruhr delivered a lecture on nature-inspired industrial electrodes for electrocatalysis. The lecture, "Electrocatalysis for a CO₂ Neutral World" focused on advanced catalysts and industrially functional electrodes, strongly emphasising sustainable energy and CO₂ utilization. The talk provided valuable insights into the mechanisms of electrocatalytic reactions, highlighting factors influencing catalyst activity, selectivity, and durability. Professor Masa emphasized the importance of bioinspired designs, which mimic natural systems to enhance reaction efficiency and stability.

The lecture showcased recent research on novel electrocatalysts, including advances in their design and optimization, along with their applications in industrial processes such as hydrogen evolution and CO₂ reduction. Challenges like catalyst poisoning, scalability, and integration into industrial infrastructure were also addressed. Professor Masa concluded with a discussion of future opportunities in electrocatalysis, emphasizing the need for more selective and stable catalysts, scalable production methods, and seamless integration into existing systems to support sustainability goals.



The event fostered networking among researchers, students, and industry professionals, encouraging collaborations and partnerships. Overall, the lecture highlighted electrocatalysis as a transformative tool for energy conversion and environmental sustainability, paving the way for innovations that support a carbon-neutral future. The knowledge shared is expected to advance research and industrial applications in this critical field



7. **Lecture by Dr Akhila Kumar Sahu:** On December 23, 2024, a lecture was delivered by Dr Akhila Kumar Sahu, Principal Scientist at CSIR Central Electrochemical Research Institute, Madras Unit, Chennai. The event, held at the S.S. Joshi Auditorium, began at 3:30 PM and attracted faculty members, researchers, and students interested in energy technologies.

Dr Sahu's lecture, titled *"PEM Fuel Cells for Stationary and Automotive Power Generation,"* focused on the potential of Proton Exchange Membrane (PEM) fuel cells in providing sustainable power solutions for stationary and automotive applications. He discussed the key advantages of PEM fuel cells, such as high efficiency, low emissions, and their adaptability to various scales of power generation.

The lecture also covered the technological challenges involved, including cost reduction, durability enhancement, and system integration, while presenting recent advancements in PEM fuel cell research. Dr Sahu highlighted real-world applications and ongoing efforts to commercialize this promising technology for energy-efficient and environmentally friendly solutions.

The session concluded with an interactive discussion, where attendees had the opportunity to ask questions and gain deeper insights. The lecture was highly informative and showcased the importance of PEM fuel cells in advancing sustainable energy systems for the future.

8. **On 20th March 2025, INSA-Professor Brahm Prakash Memorial Medal Lecture by Professor Shrikant Lele was organized by the INSA Varanasi Local Chapter in Professor N.P. Gandhi Memorial Hall of the Department of Metallurgical Engineering, IIT (BHU):** Professor Shrikant Lele, FNA, Distinguished Professor of BHU (Formerly, Rector & Actg. Vice-Chancellor of BHU and Director, Institute of Technology-BHU) delivered the INSA-Professor Brahm Prakash Memorial Medal Lecture in the Professor N.P. Gandhi Memorial Hall of the Department of Metallurgical Engineering, IIT (BHU) from 11.00 AM onwards on Thursday, March 20, 2025. The invitation for the lecture was circulated among all the INSA fellows of BHU as well as all the faculty members of the IIT (BHU). Many INSA fellows, faculty colleagues and research scholars from BHU and IIT (BHU) attended the lecture.

The programme started with the auspicious lighting of the ceremonial lamp followed by garlanding of the bust of the visionary founder of the BHU, Mahamana Pandit Madan Mohan Malaviyaji, respectively by the speaker of the day, Professor S. Lele, the presiding officer of the function, Professor N.K. Mukhopadhyay, FNA, Dean of Faculty Affairs, IIT (BHU), Professor K.N. Singh,



FNA, Head, Department of Chemistry, BHU and Convener of the INSA Varanasi Local Chapter, Professor N.C. Santhi Srinivas, Head, Department of Metallurgical Engineering, IIT (BHU), Professor R.K. Mandal, Department of Metallurgical Engineering, IIT (BHU) and Professor Satyen Saha (INSA Teacher awardee), Department of Chemistry, BHU. Professor N.C. Santhi Srinivas, Head, Department of Metallurgical Engineering, IIT (BHU) welcomed the guests. Professor R.K. Mandal, Department of Metallurgical Engineering, IIT (BHU) gave a brief introduction of the speaker. Professor K.N. Singh, FNA, Head, Department of Chemistry, BHU and Convener of the INSA Varanasi Local Chapter read out the Citation of the Medal. This was followed by a lucid presentation of the memorial medal lecture delivered by Professor S. Lele. The lecture

lasted for about an hour. The title of the lecture was "Computational Thermodynamics of Alloys".

After the lecture was delivered, the medal and citation were presented to Professor Lele respectively by Profs. N.K. Mukhopadhyay and K.N. Singh. Profs. K.N. Singh and N.C. Santhi Srinivas also presented shawls and mementoes to the speaker on behalf of the Departments of Chemistry, BHU and Metallurgical Engineering, IIT (BHU) respectively. After the presentations, Professor N.K. Mukhopadhyay made presidential remarks, following which, Professor Satyen Saha, Department of Chemistry, BHU presented a formal vote of thanks.



9. 20th March 2025: School Visit (by Chinmaya Vidyalaya NTPC, Unchahar) at BHU Campus:

The school visit took place on March 20th, 2025. Approximately 24 students from Classes 9 and 10 of Chinmaya Vidyalaya NTPC, Unchahar, visited BHU campus. The students were given the opportunity to explore various departments, including Zoology, Physics, CDC, and Chemistry, to experience a higher education environment firsthand. In the Chemistry department, Professor Satyen Saha

guided the students through demonstrations of chemistry experiments, showcasing state-of-the-art instrumentation, and discussing theoretical chemistry aspects. Additionally, Mr. Chinmaya, a PhD scholar, provided a demonstration on optimizing molecular geometry and obtaining molecular parameters through calculations. The visit was very fruitful for the students. It sparked their curiosity and interest in pursuing higher education in science.





Publications

Publication is one of the prime activities of the Academy. The Academy brings out important and varied publications like the Biographical Memoirs, Status reports of national relevance, Study reports, specialized scientific reports, as well as many books on a variety of scientific topics. In addition to these, three journals covering Physical & Biological Sciences, Mathematical Sciences, and History of Science, are published regularly.

Proceedings of the Indian National Science Academy (PINSA)

Proceedings of the Indian National Science Academy is an interdisciplinary journal devoted to publication of original research papers, review articles, commentaries, lateral thinking/opinion, emerging techniques, award lectures, and book reviews in all areas of sciences and engineering/technology, except Pure and Applied Mathematics, for which the Academy publishes a separate journal. However, in areas of Pure and Applied Mathematics, articles of interest to a broad readership, and manuscripts based on INSA award lectures and reviews/surveys contributed by newly elected INSA fellows and other awardees are also considered for publication in the Proceedings of the Indian National Science Academy. The issues published in this financial year are:

1. Volume 90, issue 3 September 2024 included a special section RAMSACT conference papers with 2 Review Articles & 4 Research Papers, and 02 Review Articles and 11 Research Papers.

2. Volume 90, issue 4 December 2024 included 03 Review Articles and 22 Research Papers.
3. Volume 91, issue 1 March 2025 consisted of an Editorial by Professor Suman Chakraborty, EIC & Dr Abhay Karandikar, Secretary, DST, along with 05 Review Articles and 26 Research Papers.
4. Volume 91, issue 2 June 2025 issue consisted of 06 Review articles, 20 Research papers.

The journal is now being co-published with Springer, and the online processing of papers is done on Springer Editorial Manager.

Beginning with the January 2014 issue, all articles carry a DOI number. All articles are freely accessible at the Academy website <http://www.insa.nic.in/>. The journal is indexed in SCOPUS and ISI Web of Knowledge.

Indian Journal of Pure and Applied Mathematics (IJPAM)

The quarterly journal IJPAM published three issues of Volume 55 for the year 2024 and one issue of Volume 56 for the year 2025. There has been a steady increase in the number of subscriptions for this journal. Its Impact Factor is 0.5 for the year ending in 2024. The journal received 1501 papers from all over the world. The topics covered diverse areas of Mathematical sciences.

Indian Journal of History of Science (IJHS)

The Indian Journal of History of Science (IJHS) is a quarterly journal that published four issues of Volume 59 (59.1-4) containing 414 pages during the year 2024. The [March 2025](#) issue of IJHS (Volume 60.1) is also published. All papers published in IJHS carry DOI numbers, and the journal also has e-ISSN number, i.e., 2454-9991. The impact factor of the journal increased to 0.5 in the year 2024 from 0.024 in the year 2023.

A special publication was released during the year titled *“Women Shaping Scientific Frontiers – From Lab Coats to Leadership,”* authored by Archana Sharma and Harshitha K.S.

The Academy also periodically publishes Biographical Memoirs of Deceased Fellows of the Academy. The Memoirs are written by their close

associates, colleagues, or friends of the deceased fellows, highlighting their lives and scientific achievements. Academy has so far published 43 volumes of these Memoirs, covering 571 of the Academy's Fellows. Additionally, Volume 44 had been finalized and sent for printing. All memoirs are available as searchable PDF files on the Academy's website for easy reference.

The Annual Report (English & Hindi version), Year Book, and INSA News Letter (English & Hindi version) are other important publications of the Academy. Apart from their printed versions, these are also available at the Academy website, www.insaindia.res.in. Back issues of the PINSA (Physical Sciences: Part A), (Biological Sciences: Part B), IJPAM, and IJHS are also available online at <http://www.insa.nic.in/>.



Mission Karmayogi

Mission Karmayogi, launched by the Government of India in September 2020, is a visionary initiative aimed at enhancing the capacity, efficiency, and accountability of the Indian civil services. The mission, under the National Programme for Civil Services Capacity Building (NPCSCB), is designed to create a future-ready, performance-oriented, and citizen-centric workforce through continuous learning and skill development.

In alignment with this mission, all registered staff members of the Indian National Science Academy (INSA) successfully completed the mandatory courses prescribed by the Department of Science and Technology (DST) on the iGOTKarmayogi platform.

National Learning Week (October 19–25, 2024)

As part of the observance of National Learning Week (NLW) from October 19 to 25, 2024,

INSA actively participated in the learning and development activities outlined by DST. All staff members were informed of the requirement to complete at least four hours of digital learning on the iGOTKarmayogi portal, including DST-recommended courses.

To commemorate the occasion, INSA organized a special lecture on October 25, 2024, on the topic of Waste Management. The lecture, titled “Deep Learning Embedded Waste Management,” was delivered by Prof. (Dr.) Deepak Kumar, from the Amity Institute of Information Technology, Amity University, Noida, and Visiting Professor at Fayetteville State University, USA.

While most staff members successfully participated in the activities through the iGOT platform, a few experienced technical difficulties accessing the portal. Nevertheless, the overall response reflected INSA’s strong commitment to continuous professional development and the broader objectives of Mission Karmayogi.



Lecture during National Learning Week



Informatix Centre

The Informatix Centre (IC) maintains the Academy's IT infrastructure and provides a cyberspace ecosystem to the fellowship of the Academy and secretariats. It includes hardware, software, network, wireless communications, web portals, web servers, mail servers, hybrid mode online meetings, webinars, symposiums, online library consortium facilities, cyber security awareness programmes and social media coverages.

The Academy has two web portals to disseminate journal information and general information to society and the scientific community.

Web portals

<https://insa.nic.in>: The journal portal focuses on the three open-access online journals published by INSA. These are three INSA journal publications available:

1. Proceedings of the Indian National Science Academy (Pinsa),
2. Indian Journal of Pure and Applied Mathematics (IJPAM), and
3. Indian Journal of History of Science (IJHS)

The three Journals with the online eISSN numbers are published on the NIC cloud portal. These journals are indexed in SCOPUS, ESCI, Google Scholar and Google Analytics. Unique DOI numbers were assigned for each article for easy access and better reach.

<https://insaindia.res.in>, the website has been published in Hindi and English with a Divyangjan access-friendly module. The Hindi web portal was redesigned and redeveloped this year with enhanced cybersecurity features. New web page modules like INSA-CSTIP web pages, were developed for INSA Policy Cell.

Video Conference

Informatix Centre has conducted online meetings between different government ministries and departments, INSA-DST INSPIRE online interviews, and Distinguished Public lecture series live streaming through online software like Microsoft Teams, Webex, and Zoom platforms with the support of the National Knowledge Network (NKN) high-speed internet. Seven live webinars and 33 lecture videos were uploaded to the scientific community on the social media platform.

Wi-Fi

The well-established Wi-Fi facilities with enhanced security are available for scientific events on the entire INSA campus.

One Nation One Subscription

INSA has also joined the One Nation One Subscription (ONOS) initiative under the Research and Development Institution category. The ONOS scheme aims to provide nationwide access to high-impact international scholarly journals and research articles for students,

faculty, and researchers across Higher Education Institutions (HEIs) managed by both central and state governments, as well as R&D institutions under the central government.

National Digital Library (NDL)

INSA has collaborated with the NDL Project on the Biographical Memoirs publications of Deceased Fellows of the Academy. The total volume of the Biographical Memories has been published in the NDL Portal: <https://ndl.iitkgp.ac.in/>.

Social Media

The Academy has an active social media presence to disseminate the INSA events and happenings to the virtual world. Through popular social media like Facebook, YouTube, Twitter, and LinkedIn, INSA events were made available to the greater masses.



Library and Archives

Library

The library's records are available in electronic format, and several indigenous databases have been created that are accessible to users. The information resource centre focuses on History & Philosophy of Science, Science Planning, Policy Studies, Science Education and Teaching, Science and Society, Works of Eminent Scientists, Nobel Lectures, Reports of National/International Institutions and agencies, etc. The library subscribed to eight online and three print versions of journals during the year 2024-25. In addition, the library received 100 titles of journals & a wide range of annual reports of other academies/institutions through exchange or gratis. To build an electronic resource collection, several databases have been procured on CDs/Online to facilitate electronic access to scientific literatures. More than 10000 online journals (Emerald, IEEE, JCCC, Oxford University Press, Royal Society of Chemistry,

Taylor and Francis, Web of Science, Wiley) can be accessed through the NKRC network within the INSA premises.

INSA Archives

The Archive Unit of the Academy was established during the Platinum Jubilee Celebrations (2009-10) to document and preserve all available information about INSA Fellows. The Fellowship records, such as their bio-data, photographs, list of publications, nomination form, and obligation form, including reprints of Indian, Foreign, and Pravasi Fellows, have been documented and kept in specially designed boxes. All INSA publications brought out since inception have been archived. The Unit also serves as a digital repository of important historical photographs indicating the Academy's landmark events. All the 258 books published by INSA have been digitised & its metadata have prepared.



INSA Teachers Training Program (INSA-TTP)

Academy has entrusted the work of INSA-Teachers Training Program (INSA-TTP) to Scientific Division. In line with this, we have organized one day INSA-TTP Program on 20th December 2024 for the science and math teachers and the programme was held at INSA, New Delhi.

The programme was designed for teachers working in the field of education in various schools. It is a novel initiative of the Indian National Science Academy (INSA) for Science Teachers in the field of Physics, Chemistry, Biology, Mathematics and other relevant areas.

In this program a brainstorming session wherein eminent experts delivered lectures/talks/demo in the area of Physics, Biology, Mathematics and discussed different challenges in teaching profession and how to deal with them and regularly motivate them for good learning experiences.

Twenty-four school teachers from twelve schools from Delhi-NCR region participated in this interactive programme. Participation Certificate issued to each Participants and Schools.



Vigilance Awareness Week (VAW) 2024

The Vigilance Awareness Week was observed in the Academy from 28th October, 2024 to 3rd November, 2024. An awareness programme was organized to mark the occasion in the Multipurpose Hall on the ground floor. Dr. Brajesh Pandey, Executive Director of the Academy administered the “Integrity Pledge” to the staff members. The Employees were also encouraged to take e-pledge by the visiting the CVC website and download

certificates of the same. An essay competition on the topic “राष्ट्र की समृद्धि के लिए अखंडता की संस्कृति” (Culture of Integrity for Nation’s Prosperity) was conducted during the week. Eight employees of the Academy took part in the competition. Shri Atri Mallick, Project Associate (Scientific) won the First prize of Rs.1000/- while the second prize of Rs.700/- was won by the Mrs. Liza Mallick, Project Assistant.



10th International Day of Yoga 2024

The 10th International Day of Yoga was celebrated at the Indian National Science Academy (INSA). The staff members of the Academy took an active interest in the celebrations. A one-hour yoga demonstration involving various *āsānās* falling under the Common Yoga Protocol was performed by Sonu Rani, a yoga guru from Morarji Desai

National Institute of Yoga (MDNIY). Around 50 staff members of the Academy performed various *yogāsānās* under his guidance. Mr Sahu also highlighted the importance and benefits of various *āsānās* and the need to do yoga regularly. Indeed, it was a revealing experience for all of us.



International Yoga Day being celebrated at INSA



Hindi Fortnight 2024

As per the direction of the Department of Official Language, Ministry of Home Affairs, Government of India, Hindi Day and Hindi Fortnight were organized by the Academy during 14-28 September 2024. Which was inaugurated on 14-15 September 2024 by the Honorable Home and Cooperation Minister, Shri Amit Shah ji from Bharat Mandapam, Pragati Maidan, New Delhi, Hindi Day Celebration-2024 and Forth All India Official Language Conference were jointly organized in which Shri Jagdish Kumar, Programme Officer

(Official Language) and Smt. Anubha Mahajan Assistant-I from the Academy participated. Along with this, on 17 September 2024, it was inaugurated in the Academy by Dr. Brajesh Pandey, Executive Director and Shri Shakti Prakash Mishra, Deputy Executive Director-I (Scientific) by inaugurating the exhibition of Hindi books. One competition was organized every day. On 30.09.2024, a Hindi fortnight prize distribution and Hindi poetry recitation Programme was organized at the Indian National Science Academy. In which poet



Shri Sunil Zokarkar, Deputy Executive Director-I (F&A), Dr. Brajesh Pandey, Executive Director, INSA, Shri Upendra Pandey, the Poet, Shri Shakti Prakash Mishra, Deputy Executive Director-I (Scientific) and Shri Jagdish Kumar, Programme Officer (Official Language) during the Hindi Fortnight-2024 (Right to left)

Shri Upendra Pandey was invited as the chief guest. The Programme was presided over by the Executive Director of the Academy, Dr. Brajesh Pandey. Poet Shri Upendra Pandey recited poetry which was very much liked by the audience. After this, prizes were given to the winning staff members by Shri Upendra Pandey, the chief guest, Dr. Brajesh Pandey, Executive Director, Shri Shakti Prakash Mishra, Deputy Executive Director-I (Scientific) and Shri Sunil Zokarkar, Deputy Executive Director-I (F&A). Shri Sunil Zokarkar, Deputy Executive Director-I (F&A) encouraged to staff members for work in Hindi. After this Shri Shakti Prakash Mishra, Deputy Executive

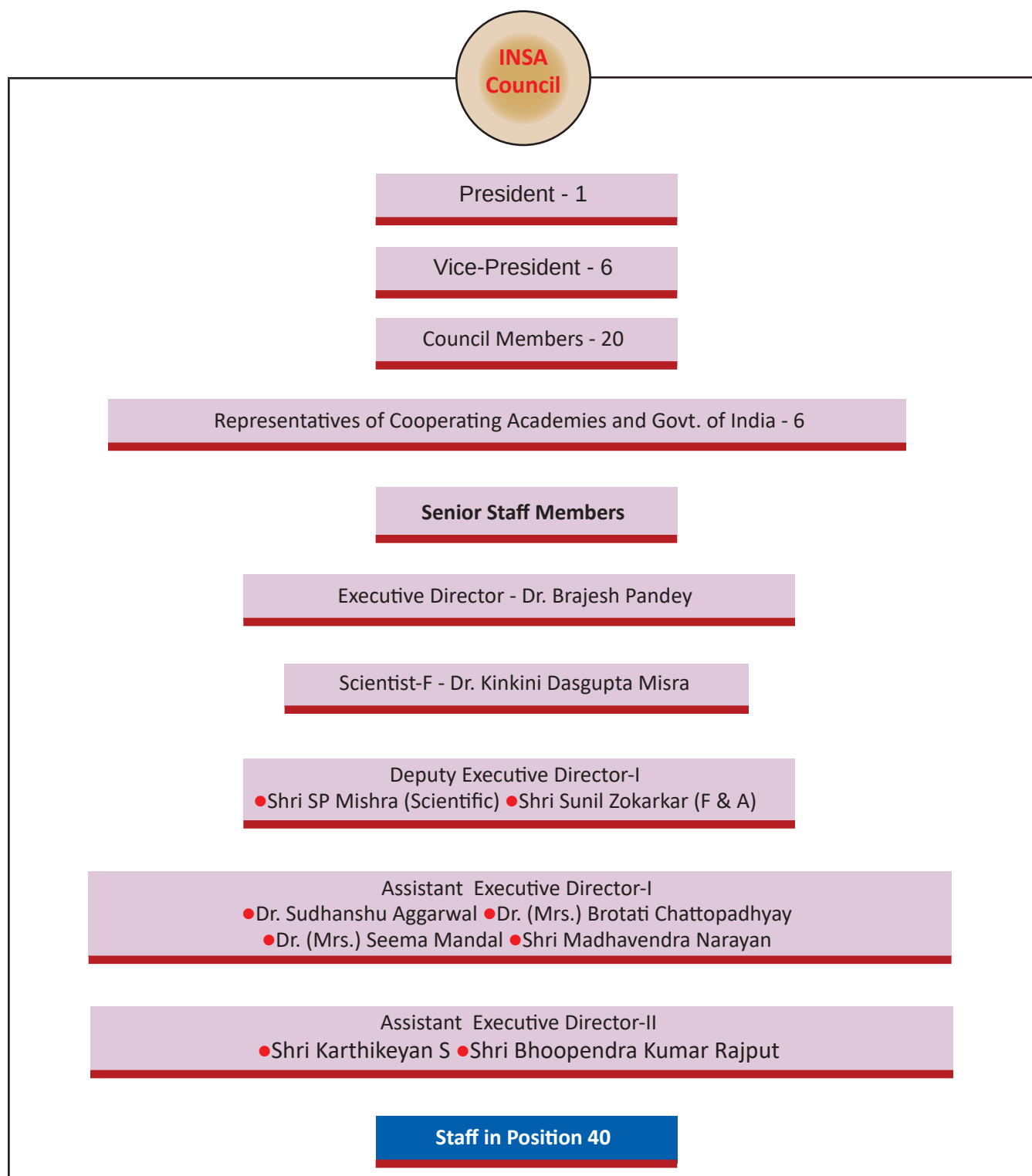
Director-I (Scientific) thanked the guest poet. After this, the Executive Director congratulated all the staff members for the success of the Hindi fortnight and inspired them to work in Hindi. In the end, Programme Officer (Official Language) thanked everyone present in the Multipurpose Hall and announced the end of the Programme.

STATUS OF RESERVATION POLICY FOR SC/ST/OBC/PWD/EWS

Guidelines for reservation of SC/ST/OBC/PWD/EWS are observed.

Organizational Sctucture

(As on 31.03.2025)



**INSA Auditor's Report, Balance Sheet &
Notes on Accounts**



Auditor's Report & Balance Sheet

P K M B & Co.
Chartered Accountants

Suite#4G, Uppal's M6 Plaza,
Jasola District Centre,
New Delhi 110 025, India
Tel: +911140528391-92
pkmb.in

Independent Auditor's Report

To
The Members
Indian National Science Academy
Bahadur Shah Zafar Marg,
New Delhi 110 002

Opinion

We have audited the financial statements of **Indian National Science Academy**, which comprises the balance sheet at March 31st 2025 and also the income and expenditure account for the year ended and notes to the financial statements, including summary of significant accounting policies.

In our opinion and to the best of our information and according to the explanations given to us, the aforesaid financial statements give a true and fair view in conformity with the accounting principles generally accepted in India, of the state of affairs of the Academy as at March 31st 2025, and its expenditure over income for the year ended on that date.

Basis of Opinion

We conducted our audit in accordance with the Standards on Auditing (SAs) issued by ICAI. Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of Financial Statements section of our report. We are independent of the Academy in accordance with the ethical requirements that are relevant to our audit of Financial Statements in [jurisdiction], and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Emphasis of matters

This has reference to note 6 of "Other Notes to Accounts".



There are certain unspent balances of DST and DST-sponsored schemes that the Academy is required to return to the respective organizations. These funds are currently held by the Academy. The interest earned is being credited back to the respective fund accounts.

As per the information provided, the Academy has already initiated communication with the concerned organizations and is in the process of returning the unspent funds. Until such time as the funds are returned, the Academy continues to classify them as liabilities in its account.

Our opinion is not modified in respect of this matter.

Academy's Governing Council Responsibility for the Financial Statements

The Governing Council of Academy is responsible for the preparation of financial statements that give true and fair view of the financial position and Income and Expenditures of the Academy in accordance with the accounting principles generally accepted in India, including the accounting standards, to the extent applicable, issued by the Institute of Chartered Accountant of India including the relevant provision of the Act and Rules. This responsibility also include maintenance of adequate accounting records for safeguarding the assets of the Academy and for preventing and detecting the frauds and other irregularities; selection and application of appropriate accounting policies; making judgements and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal controls that were operating effectively for ensuring the accuracy and completeness of the accounting records, relevant to the preparation and presentation of the financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Governing Council of Academy is responsible for assessing the ability to continue as going concern, disclosing, as applicable, matters related to going concern and using going concern basis of accounting unless the Members either intend to liquidate the Academy or cease operations, or have no realistic alternative, but to do so.

Auditor's Responsibilities for the Audit of Financial Statement

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatements, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with SAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

For **P K M B & Co.**

Chartered Accountants

Firm's Registration No. 005311N



Mayank Gaur

Partner

Membership No. 518183

UDIN: 25518183BMLXTJ8858

Place: New Delhi

Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar

Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey

Executive Director



Indian National Science Academy

Balance Sheet as at 31.03.2025

Amount in INR

Particulars	Schedule	As at 31 st March, 2025	As at 31 st March, 2024
CORPUS/CAPITAL FUND AND LIABILITIES			
Corpus/Capital/Govt. fund	1	581,798,691	569,815,005
Unspent balances of Government grant (INSA Schemes)	2	6,687,813	13,992,175
Earmarked/Endowment funds	3	105,533,690	100,213,881
Unspent balances of DST sponsored schemes	4	26,952,499	28,507,410
Unspent balances of other various schemes	4(A)	918,034	870,948
Current liabilities and provisions	5	27,125,865	26,646,605
Employees provident fund	6	47,521,961	50,213,588
Total		796,538,553	790,259,612
Assets			
G.P.F advance (staff)	7	308,400	166,800
Fixed assets	8	325,377,225	318,669,063
Investments with banks	9	398,189,580	400,303,503
Current assets, loans and advances	10	54,933,090	65,202,805
Overspent balances of INSPIRE, DST, ISRF and G-20/S-20 Programme	4(B)	16,919,935	5,803,736
Overspent balances of Other Govt. Institutions Programmes	4(C)	810,323	113,705
Total		796,538,553	790,259,612
The accompanying notes form integral part of these financial statements.			

As per our report of even date attached.

For **P K M B & Co.**
Chartered Accountants
Firm's Registration No. 005311N

Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

Income And Expenditure Account for the year ending
31.03.2025

Amount in INR

Particulars		For Year ended March 31	
		2025	2024
Income			
Income from sales/services	11	18,534,579	10,573,142
Grants/Subsidies: Plan-General, Salary & ICSU Subs.			
- Government grant	274,100,000		
- Interest on investments (Govt grant)	<u>195,372</u>	274,295,372	277,940,542
Income from royalty and publication	13	4,050,401	2,826,329
Interest earned	14	27,506	10,776
Total income (A)		296,907,858	291,350,789
Expenditure			
Establishment expenses	15	128,540,391	126,550,157
Other administrative expenses	16	47,307,441	46,939,885
Expenditure on grants and subsidies	17	58,113,262	50,926,022
TA/DA	18	7,231,618	8,931,099
Publications	18	3,355,304	3,601,787
Subscriptions to ICSU bodies	18	33,622,423	32,348,014
International scientific delegations/exchange programme	18	6,056,990	8,163,491
Seminars/symposia/popularisation of science activities	18	7,221,885	6,074,260
Other expenditure	18	12,362,090	9,138,916
Interest deposited with Bharat Kosh	18	400,816	289,268
Total expenses (B)		304,212,220	292,962,899
Excess of Expenditure over Income represents overspent balance(A-B)		(7,304,362)	(1,612,110)
The accompanying notes form integral part of these financial statements	19		

As per our report of even date attached.

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N



Mayank Gaur
Partner
Membership No. 518183

Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-1

Corpus/Capital/Govt.Fund

Schedule forming part of Balance Sheet as on 31.03.2025

Particulars	As at March 31			
	2025		2024	
Capital Grant				
Unspent balance of last year	8,020,123		10,243,372	
Add: Grant received during the year in INSA RBI A/c	5,000,000		15,400,000	
Less: Grant taken back by RBI	(5,000,000)		15,400,000	
Add: Interest during the year	698,267		450,000	
Less: Expenditure during the year (<i>Annexure-VII</i>)	8,718,390		10,693,372	
	6,708,162	1,560,228	2,216,447	8,020,123
Less: Interest deposited with Bharat Kosh	450,000		456,802	
Golden Jubilee Fund				
(As per last Balance Sheet)	8,142,893		8,913,723	
Add: Interest during the year	529,170		476,534	
Less: Expenditure during the year	8,672,063	4,999,789	9,390,257	8,142,893
	3,672,274		1,247,364	
Golden Jubilee Building Fund (main building) (As per last Balance Sheet)		157,618,221		157,618,221
Corpus Fund				
(As per last Balance Sheet)	232,950,059		220,146,634	
Add: Interest during the year	14,677,866	247,828,582	12,403,425	232,950,059
Add: Donations during the year	200,657		400,000	
Other Fixed Assets Funds (As per last Balance Sheet)	163,083,709		24,053,688	
Add: Funds transferred from other fund	—		136,813,574	
Add: During the year (<i>Annexure-VII</i>)	+ 6,708,162	169,791,871	2,216,447	163,083,709
Total		581,798,691		569,815,005

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N

Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-2

Unspent Balance of Govt. Grant (INSA Schemes)

Schedule of unspent/overspent balance forming part of Balance Sheet as on 31.03.2025

Particulars	As at March 31	
	2025	2024
Unspent Balance		
Balance as per last Balance Sheet	1,39,92,175	15,604,285
Add: Excess of Expenditure over Income (As per Income & Expenditure Account)	(7,304,362)	(1,612,110)
Total	6,687,813	13,992,175

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N



Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-3

Earmarked/Endowment Funds

Schedule forming part of balance sheet as on 31.03.2025

Particulars	As at March 31,			
	2025		2024	
Fellowship Fund				
(As per last Balance Sheet)	1,569,256	1,681,756	1,456,756	1,569,256
Addition during the year	112,500		112,500	
(Annexure-V)				
General Fund				
(As per last Balance Sheet)	27,492,945	31,234,994	25,360,863	27,492,945
Add: Interest during the year	1,814,197		1,591,296	
Add: Transfers	-		968,793	
Add: Administrative Charges	2,586,077			
Less: Expenditure	31,893,219	72,616,940	27,920,952	71,151,680
	658,225		428,007	
Endowment / Earmarked Funds				
(As per last Balance Sheet)	71,151,680	72,616,940	67,765,937	71,151,680
Add: Interest during the year	4,076,337		3,447,603	
Add: Fellowship (Refund)	-		360,000	
Less: Expenditure	75,228,017		71,573,540	
	2,611,077		421,860	
(Annexure-VIII)				
Total		105,533,690		100,213,881

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N



Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-4

Unspent Balances of DST& DST Sponsored Schemes

Schedule forming part of the Balance Sheet as on 31.03.2025

Particulars	As at March 31,	
	2025	2024
INDO-UK Water Quality research programme*	1,632,446	1,541,770
INDO-UK Energy demand research programme*	5,882,365	5,882,365
India Science Research Fellowship Projects (ISRF)	-	1,424,292
Science & Engineering Research Board Programme (SERB)	16,063,453	15,407,208
DST PAC Meetings	-	877,540
CCSTDS Programme	3,374,235	3,374,235
Total	26,952,499	28,507,410

*Refer note no-6 of schedule-19

SCHEDULE-4(A)

Unspent Balance of other Various Schemes

Schedule Forming part of the Balance Sheet as on 31.03.2025

Particulars	As at March 31,	
	2025	2024
CODATA Conference	477,426	461,774
Emerging Area/Geo Sc Conference (IIT Gandhi Nagar)	155,077	155,077
DBT-TWAS Research Fellowship Program	285,531	-
INSA-NCGG Leads Programme-JULY, 2023	-	254,097
Total	918,034	870,948

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N

Mayank

Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-4B

Overspent Balances of DST, INSPIRE and Other DST Sponsored Meetings

Schedule forming part of the Balance Sheet as on 31.03.2025

Particulars	As at March 31,	
	2025	2024
DST PAC Meetings (Overspent)	4,309,836	-
G20/S-20 Programme (Overspent)	2,273,138	2,241,608
INSPIRE Meetings (overspent)	6,120,269	3,562,128
National Science Day 2025 Celebration (Overspent)	2,185,933	-
ISRF Project 2024-2027 (Overspent)	373,512	-
INSA Centre for Science Policy (DST-CPR)	1,657,247	-
Total	16,919,935	5,803,736

*Overspent, hence shown under the head Assets

SCHEDULE-4C

Overspent Balances of Other Govt. Institutions Programmes

Schedule forming part of the Balance Sheet as on 31.03.2025

Particulars	As at March 31,	
	2025	2024
DBT-TWAS Research Fellowship Program	-	113,705
INDO-US NASEM Biotechnology Workshops	276,489	
AASSA Conference 1-3/9/2024	533,834	
Total	810,323	113,705

*Overspent, hence shown under the head Assets

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N

Mayank

Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey

Dr. Brajesh Pandey
Executive Director

Particulars	As at March 31			
	2025		2024	
Opening balance		10,000		10,000
(13) M/s Thirdwave Services Pvt. Ltd.				
Opening balance		214,160		214,160
(14) M/s Vee Em Traders (Retention)				
Opening Balance		32,031		32,031
(15) M/s VOLTAS Ltd. (GJB AC Plant Maint.) (80TR & 150 TR Screw Chillers)				
Opening balance		262,682		262,682
(16) Unique Pest Control				
Opening balance		3,654		3,654
(17) Earnest Money Deposits (Photographers)				
Opening balance				
a. M/s Ridham Enterprises	10,000		10,000	
b. M/s Anuj Digital Studio	10,000		10,000	
c. M/s Studio Sabharwal	10,000	30,000	10,000	30,000
(18) M/s H N Traders (Fire-Fighting System)				
Opening balance		80,522		80,522
(19) M/s Bharat Elevators (Electricals & DG Set Operation)				
Opening balance		88,294		88,294
(20) M/s Singh Associates (Rain Water Drain Line Repair)				
Opening balance	30,098		5,816	
Less: Paid during the year	30,098	-	24,282	30,098
(21) Ashika Enterprises (False Ceilings GR No. 106 2019-20)				
Opening Balance		4,764		4,764
(22) ECO Soft Solution (Software Sale of Publication)				
Opening balance		4,326		4,326
(23) Brisk Infotech (Computer)				
Opening Balance		947		947
(24) M/s Faisal Book Binding				
Opening Balance		2,000		2,000
(25) M/s J.B. Security (Housekeeping)-(EMD)				
Opening Balance		20,000		20,000
(26) Ashika Enterprises (Painting & Pulishing 2019-20)				

Particulars	As at March 31			
	2025		2024	
Opening Balance		16,500		16,500
(27) M/s Oak Interiors				
Staff quarters- repair work (Opening balance)	1,271		1,271	
ED rooms- renovation work (Opening balance)			3,363	
Add: During the year (ED room renovation)			3,654	
Less: Paid during the year(ED room renovation)		1,271	7,017	1,271
(28) Mass Management Services (Web Developer)				
Opening Balance		22,000		22,000
(29) M/s Softech System (Photocopy)				
Opening Balance		10,000		10,000
(30) M/s Wasim Construction (Painting and Polishing GJB) (2020-21 & 2022-23)				
Opening Balance	48,600		48,600	
Add during the year	-	48,600	-	48,600
(31) M/s Ishaan Surveillance & Security (Security Maintenance)				
Opening Balance		117,130		117,130
(32) M/s MS Power System (Rent- UPS & Batteries)				
Opening Balance		13,169		13,169
(33) Security Deposit M/s Niranjana Constructions				
Opening Balance		109,889		
Security deposit Amt received during the year for work	—			
(1) Paintry & Toilet renovation work 7th floor	—		101,489	
(2) OBD Painting Guest house 2nd & 3rd floor	—		8,400	109,889
(34) M/s MS Rana & Sons (Development of 2 DG Set Area)		4,232		
Total Part-A		2,084,404		2,110,270
(B) Bills Payable				
(1) Sundry Creditors				
Broadcasting Engineering Consultant India Ltd (CCTV) Opening Balance	1,013,652		1,013,652	
Anton Paar India Limited (TDS) (2022-23 and 2023-24)	4,000		4,000	
ICICI Bank	73,854		73,854	
IISC Bangalore : G20/S20 programmes 2023	9,997,743		9,997,743	
Quality Council of India (QCI Mtg. Nov-2023)	2,902		2,902	
Advance Leads A/c	2,501,900		3,717,000	

Mangal

PKMB & Co.
Chartered Accountants
Jaipur-New Delhi

Particulars	As at March 31			
	2025		2024	
Payable to auditors (As per B/S last year) 23,600			23,600	14,832,751.00
Less: Tax Paid during the year (23,600)	-			
Springer Nature India Pvt. Ltd.	22,290			
Ridham Enterprises	26,018			
Royal Chemistry India Pvt. Ltd.	1,000			
Campbell Scientific India Pvt. Ltd.	2,000			
JKJ Biosc. Pvt. Ltd.	2,500			
Indian society International law (28-29/4, 1-3/9 & 8 -11/12/23)	25,000			
Lady Harding Medical College-Mfg. 13-15/12/24	7,500			
NASI Mtg(19/2/25)	2,607			
Round Table Meeting 10/12/24 (Quality Healthcare Pvt. Ltd.)	17,223			
QCI Mtg. (TDS Recov. ITO) Aug-Sep 24 Mtgs.	4,142			
QCI Mtg. Jun/July/ Aug 24 (TDS)	102			
Himedia Laboratories Pvt. Ltd. (TDS Recovery ITO-Oct.24)	1,000			
State Bank of India (TDS Recov. From ITO)	30,327			
ACS International India Pvt. Ltd. (ITO TDS Apr.24 Mtg.)	934			
ACS International India Pvt. Ltd. (ITO TDS July24 Mtg.)	1,000			
ACS International India Pvt. Ltd. (ITO TDS Oct.24 Mtg.)	9,611			
ACS International India Pvt. Ltd. (ITO TDS Nov.24 Mtg.)	808,464			
ACS International India Pvt. Ltd. (ITO TDS Dec.24 Mtg.)	819			
Affordable Quality Health (Meeting 31/3/25)	363,611			
Nexgen Solutions	1,589,200			
Prof. Vimal Katiyar (Leads July' 2024)	11,500	16,520,899		
(2) Sh. Shiv Rana (Gratuity)				
Opening Balance		5,000		5,000
(3) Expenses Payable				
Opening Balance (salary, pension and other expenses Mar'24) Rs. 95,04,627				
Less : Paid during the year Rs. (95,04,627)	-		-	
Young Scientist award (prize money'20) (opening balance)	92,500		92,500	



Particulars	As at March 31			
	2025		2024	
Salary- March 2025	5,554,395		5,303,008	
Pension- March 2025	0		4,157,535	
Voltas Ltd	207,393			
NSD Events organisation Service	381,710			
Science Promotion-Seminar/Symposia	200,000			
SC-Oveseas Chair (Dr. Howard A.Stone, Princeton Unit)	374,736			
Senior Scientist	1,676,637			
Salary (DA arrear of Sh. A.K. Arora)	27,666	8,515,037	44,084	9,597,127
(4) Advance from Debtors				
Opening Balance	86,291			
(FSSAI-Induction Training Program 22/5-7/6/23& 15-16/9/23)			7,237	
(ISMARM-Asean Society Magnetic Resonance Medicine 25-27/8)			37,394	
National Innovation Foundation - NIF (8-10/10/23)			5,000	
(National Science Centre Dt. 6-9/12/23)			36,660	86,291
Less: Paid during the year	86,291	-		
(5) Income tax collection A/c (salary)				
i. TDS of Shri Anil Kumar	7,703		7,703	
ii. Penalty Interest on late payment of TDS	463		463	
iii. TDS on Salary-Nidhi Srivastava	7,000		7,000	15,166
Less: Adjusted during the year	15,166			
Add: TDS on Contractor	525	525		
Total Part - B		25,041,461		24,536,335
Total (A+B)		27,125,865		26,646,605

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N

Mayank


Mayank Gaur
Partner
Membership No. 518183

Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Braj Pandey

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-6**Employees Provident Fund**

Schedule forming part of the Balance sheet as on 31.03.2025

Particulars	As at March 31			
	2025		2024	
Employees General Provident Fund				
(As per last balance sheet)	50,213,588		49,396,388	
Add: Subscription	4,694,300		5,580,500	
Add: Interest to GPF Subscribers	3,246,973		3,384,420	
	58,154,861		58,361,308	
Less: Final withdrawal	(10,632,900)	47,521,961	8,147,720	50,213,588
Total				50,213,588



Indian National Science Academy

SCHEDULE-7**G.P.G. Advance (Staff)**

Schedule forming part of the Balance sheet as on 31.03.2025

Particulars	As at March 31			
	2025		2024	
(VII) Advance-Employees Provident Fund				
(refer annexure-VI)				
Opening balance	166,800		356,750	
Add: Advances paid during the year	290,000		48,000	
	456,800		404,750	
Less: Recovered during the year	(148,400)	308,400	(237,950)	166,800
Total		308,400		166,800

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N



Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-8**Fixed Assets**

Schedule forming part of the Balance sheet as on 31.03.2025

Particulars	As at March 31			
	2025		2024	
(A) Land and Building (Opening balance)				
Building (Main-Old)	935,690		935,690	
Golden Jubilee Building	157,369,721		157,369,721	
Administrative Block	42,957,190		42,957,190	
Library Buildings	14,566,140	215,828,741	14,566,140	215,828,741
(B) Office Equipment, Furniture & Fixture				
Opening balance	51,541,669		49,876,596	
Add: Additions during the year	1,559,372	53,101,041	1,665,073	51,541,669
(C) Plant & Machinery				
Opening balance		19,763,029		19,763,029
(D) Computer				
Opening balance	24,814,191		24,262,817	
Add: Additions during the year	5,148,790	29,962,981	551,374	24,814,191
(E) Library Books		6,721,433		6,721,433
Total		325,377,225		318,669,063

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N

Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-9

Investment with Banks

Schedule forming part of the Balance sheet as on 31.03.2025

Particulars	As at March 31			
	2025		2024	
(A) Employees Provident Fund (Fixed Deposits)				
(1) State Bank of India				
Opening balance	39,950,000		38,450,000	
Add : During the year	-		<u>1,500,000</u>	39,950,000
Less: Redeemed during the Year	<u>(2,000,000)</u>	37,950,000		
(2) Canara Bank				
Opening balance		7,200,000		7,200,000
Total - A		45,150,000		47,150,000
(B) General Fund (Fixed Deposits)				
(1) State Bank of India				
Opening balance	24,930,000		23,430,000	
Add : During the year	25,86,077	27,516,077	1,500,000	24,930,000
(2) Canara Bank				
Opening balance	2,000,000		400,000	
Add : During the year	-	2,000,000	1,600,000	2,000,000
Total - B		29,516,077		26,930,000
(C) (i) Earnmarked/ Endowment (Fixed Deposits)				
Fixed Deposits With SBI: Opening Balance				
Silver Jubilee Commemoration Medal fund		27,000		27,000
Chander Kala Hora Medal fund		2,098,000		2,098,000
Dr. S.S. Bhatnagar Memorial Fund		54,000		54,000
Prof. P. Maheshwari Memorial Fund		40,000		40,000
Prof. R.K. Asundi Memorial Lecture Fund		25,000		25,000
Dr. Vainu Bappu Memorial Award Fund		1,525,000		1,525,000
Dr. B.D. Tilak Lecture Award Fund		709,000		709,000
Dr. L.S.S. Kumar Memorial Award Fund		229,000		229,000

M. S. S. S.

Particulars	As at March 31			
	2025		2024	
Prof. T.R. Seshadri Comm. Med. Fund		20,000		20,000
Dhanwantri Prize Medal Fund		131,000		131,000
Dr. B.N. Chopra Memorial Fund		25,000		25,000
INSA Prize for Material Science Fund		67,000		67,000
Dr. Nitya Nand Endowment Lecture Fund		479,000		479,000
Shri A.K. Bose Memorial Award Fund		41,000		41,000
Dr. T.S. Tirumurti Memorial Lecture Fund		16,000		16,000
Dr. S.B. Saksena Memorial Award Fund		185,000		185,000
Prof. Brahm Prakash Memorial Award Fund		354,000		354,000
Dr. Jagdish Shankar Memorial Fund		137,000		137,000
Prof. M.R.N Prasad Memorial Lecture Fund		77,000		77,000
Prjof. G.N. Ramachandran Comm. Fund		348,000		348,000
Dr. T. S. Sadasivan Lecture Award Fund		57,000		57,000
Dr. H. Swaroop Memorial Lecture Fund		1,486,000		1,486,000
Dr. Sadhan Basu Memorial Fund		504,000		504,000
Prof. K.P. Bhargava Award Fund		416,000		416,000
Dr. Biren Roy Memorial Award Lecture Fund		786,000		786,000
Dr. B.C. Guha Memorial Fund		1,218,000		1,218,000
Dr. K. Rangadhama Rao Lecture Fund		10,000		10,000
Dr. S. Ranganathan Memorial Fund		1,135,000		1,135,000
Dr. S. Swaminathan 60 th Birthday Comm Lecture		439,000		439,000
Dr. K. Naha Memorial Fund		1,240,000		1,240,000
Dr. Vishwa Karma Fund		547,000		547,000
Dr. G.P. Chatterjee Memorial Fund		25,000		25,000
Dr. Shambhu Nath Memorial Fund		238,000		238,000
Dr. K.S. Bilgrami Memorial Fund		839,000		839,000
Dr. V.V. Narlikar Memorial Fund		483,000		483,000
Prof. Vishwa Nath Memorial Lecture Fund		202,000		202,000
Dr. Darshan Ranganathan Memorial Fund		1,789,000		1,789,000
Prof. A.C. Jain Award Fund		1,469,000		1,469,000
Dr. M.R. Das Memorial Fund		584,000		584,000

M. S. G. S.



Particulars	As at March 31			
	2025		2024	
Dr. Y. Subba Rao Memorial Fund.		548,000		548,000
Professor B.S. Trivedi Memorial Fund		1,502,000		1,502,000
Professor T.V. Desikachary Memorial Fund		1,033,000		1,033,000
Professor S.K. Joshi Memorial Fund		1,000,000		1,000,000
Dr. Deepak Gaur Memorial Medal Fund		1,000,000		1,000,000
IUPAB -GN Ramachandran Mem. Fund				
Opening balances				
(1) State Bank of India	4,051,000		4,051,000	
(2) Canara Bank	3,000,000	7,051,000	3,000,000	7,051,000
Mihir Chowdhury Mem. Medal Fund				
Opening Balance		1,115,000		1,115,000
Total - C		33,303,000		33,303,000
(D) Golden Jubilee Building (Fixed Deposit)				
Fixed deposits with SBI (opening balance)	7,900,000		9,100,000	
Less: Redeemed during the year	2,000,000	5,900,000	1,200,000	7,900,000
Total - D		5,900,000		7,900,000
(E) Corpus Fund (Fixed Deposits)				
I. State Bank Of India				
Opening balance	184,184,449		166,184,449	
Add: Investment made during the year	4,200,000	188,384,449	18,000,000	184,184,449
II. Canara Bank				
Opening balance		35,871,054		35,871,054
III. Syndicate Bank / Canara Bank				
Opening balance	11,700,000		8,500,000	
Add: Invest during the year	-	11,700,000	3,200,000	11,700,000
Total - E		235,955,503		231,755,503
(F) SJRD TATA Fund (Fixed Deposit)				
(1) (Fixed Deposit With SBI)				
Opening balance	14,500,000			14,500,000
Add: Invest during the year	1,900,000	16,400,000		
(2) (Fixed Deposit With Canara Bank)				
Opening balance	12,000,000		10,000,000	

Mayank



Particulars	As at March 31			
	2025		2024	
Add: Investment during the year	-	12,000,000	2,000,000	12,000,000
Total - F		28,400,000		26,500,000
(G) IGBP (Fixed Deposit With SBI)				
Opening balance	2,700,000			2,700,000
Add: Investment during the year	700,000	3,400,000		
Total - G		3,400,000		2,700,000
(H) Indo-UK Water Quality Research Project Fund (SBI)				
Opening Balance		1,500,000		1,500,000
Total - H		1,500,000		1,500,000
(I) 1. Library Membership & Printers Security Deposit (SBI)				
Opening balance		65,000		65,000
Total - I		65,000		65,000
(J) Capital Fund (SBI)				
Opening Balance	10,000,000		10,000,000	
Less : Redeemed during the year	7,500,000	2,500,000	-	10,000,000
Total- J		2,500,000		10,000,000
(K) SERB Fund (SBI)				
Opening Balance		12,500,000		12,500,000
Total- K		12,500,000		12,500,000
Total : A+B+C+D+E+F+G+H+I+J+K+L		398,189,580		400,303,503

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N

Mayank


Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Braj Pandey

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-10

Current assets, loans & advances etc.

Schedule forming part of the Balance sheet as on 31.03.2025

Part- A Cash and Bank Balances

Particulars	As at March 31			
	2025		2024	
Postage Advances				
(1) Franking machine (publication)	53,472		98,537	
(2) Postage cash (main office)	1,619		3,277	101,814
(3) Postage cash (Publication)	8,129	63,220		
Cash At Bank				
Current Accounts				
State Bank of India , Current A/c. 10310541068 (DST Programmes)	1,377,467		3,347,070	
Canara Bank - Current A/c 1850201000367 (Pension & Salary A/c)	5,494,026		2,772,083	
Canara/Syndicate Bank C/A No.) 132 90171010000110 (Salary & ICSU Subscription)	10,331,549	17,203,042	331,550	6,450,703
Savings Bank Accounts: (SBI)				
INSA Schemes Bank A/c No. 38427276430	492,721		29,715,316	
General Fund A/c No.103105 43702 (old 17509)	8,724,430		8,638,829	
Provident Fund A/c No.103105 43713 (old 17510)	2,063,561		2,896,788	
Building Fund A/c No.103105 43940 (old 17576)	171,210		242,893	
Corpus Fund A/c No.103105 44263 (old 17641)	14,374,979		3,849,556	
IGBP Fund A/c No.103105 44354 (old 17652)	158,036		671,906	
TATA Fund A/c No.103105 44922 (old 80106)	591,393		675,467	

M. S. Bhatnagar

Particulars	As at March 31			
	2025		2024	
ICSU SBI Saving A/c.38050127914	891,836		818,887	
		27,468,166		47,509,642
Savings Bank A/c : (Syndicate Bank/Canara Bank)				
Saving Bank A/c No .90172010044878 (Codata)		477,426		461,774
Saving Bank A/c: (ICICI Bank)				
Saving Bank A/cNo. 38601002680		245,408		245,408
Debit Card (SBI)				
Dr. Sudhanshu Agarwal (Debit Card)	10,000		10,000	
Sh. B.K. Rajput (Debit Card)	47,685		47,685	
DED-I (Debit Card)	10,000		10,000	
Sh. Karthikeyan (Debit Card)	10,000	77,685	10,000	77,685
Total part - A		45,534,947		54,847,026
Part-B Loans and Advances				
(I) Departmental Advances				
(a.) LTC Advance				
Shri Sarjoo Prajapati (opening balance)		-	9,300	
Shri Amit Jain (opening balance)		-	82,000	
Less: Recovered during the year		-	(91,300)	
Shri Adarsh Arora	26,000		26,000	
Less: Recovered during the year	(26,000)			26,000
(b) Computer Advance				
(1) Sh. Rakesh Negi (opening balance) Rs. 2,000			2,000	
Less: Recovered during the year Rs. (2,000)	-	-		
(2) Sh. Suresh Chand (opening balance) Rs.1,150	-		1,150	
Less: Recovered during the year Rs (1,150)		-		
(3) Sh. Mangal Singh (paid during the year) Rs.2,000			2,000	
Less: Recovered during the year Rs. (2,000)	-	-		
(4) Sh. Sarjoo Prajapati (paid during the year) Rs. 1,950			1,950	



Particulars	As at March 31			
	2025		2024	
Less: Recovered during the year Rs. (1,950)		-	-	7,100
(c.) Staff Advance				
1. Shri Mangal Sing (opening balance) Rs. 2,500				
Less: Recovered during the year Rs.(2,500)	-		-	
2. Shri Madhvendra Narayan (opening balance)	1,000		1,000	
3. Shri Balwant (Canteen)	46,000		173,449	
4. Shri Anil Kumar Rs. 8,166			8,166	182,615
Less: Recovered during the year Rs. (8,166)	-			
5. Sh. Rakesh Negi	16,700	63,700		
(d) Medical Advance				
Dr. A.N. Thakur (Special Disease)		8,360		
(III) Local Chapter And Popularisation Of Science				
1. Dr. Amit Basak (Khargput)			245,051	
2. Dr. Pankaj S. Joshi (Ahmedabad)	141,311		141,311	
3. Dr. Maneesha Inamdar (Bangaluru)	153,099		203,099	
4. Dr. Saman Habib (Lucknow)	65,555		100,000	
5. Dr. B.K. Aggarwal (Allahabad & Varanasi)	21,637		21,637	
6. Dr. G.Ravindra Kumar (Mumbai)	133,054		133,054	
7. Dr. Maya Shankar Singh (Varanasi & Allahabad)	47,254		159,417	
8. Dr. J. N. Moorthy (Thiruvananthapuram)	10,000		10,000	
9. Dr. H.K.Majumder (Kolkata)	200,000		250,258	
10. Dr. Gopal Kundu (Bhubaneshwar)	10,000		10,000	
11. Dr. J.K. Bera (Kanpur)	201,277		189,463	
12. Dr. Pramod Garg (Delhi)	200,000		-	
13. Dr. N.R. Mahapatra (Chennai)	200,000			
14. Dr. M. Palaniandavan (Madurai)	200,000	1,583,187	-	1,463,290
Total - B		1,655,247		1,679,005

M. S. Chaudhary



Particulars	As at March 31			
	2025		2024	
Part-C Security Deposit- Advances				
Opening balances:				
S.D.-BSES Staff Quaters (For ground floor)	1,200		1,200	
Delhi Vidyut Board Delhi (For Golden Jubilee Bldg)	248,500		248,500	
PCOs (Two)	4,000		4,000	
Security Deposit (For Blackberry Airtel Mob. No.8527770640)	5,000		5,000	
Security deposit to BSES (for Qtr. Number 5)	1,661		1,661	
Security deposit to BSES (for Qtr no. 6)	1,200		1,200	
Dish TV India (For Set Top Box)	500		500	
Security Deposit (Qr. No. 3)	2,700		2,700	
Staff Quarter ED	4,500	269,261		264,761
Total - C		269,261		264,761
Part-D : Sundry Debtors/Bills Recoverable				
ALPCORD -Network Advance A/C	11,164		-	
ACS -Prof. Georg John	2,500		-	
CSIR-NEERI (Meeting 6.11.2019) opening balance			781	
IASc Bangalore (Guest room charges opening balance)	3,000		3,000	
NABCA (Sh Sunil Jha)	6,864		6,864	
DAE Meeting (17/9/22 - Dr. Deep Prakash) (Facilities & Food)	-		156,390	
NCSM (Ministry of Ayush meeting) (9/2/2023)	-		13,525	
Indian Society of International Law (1-5/3/2022 Canteen)	-		32,500	
Delhi Knowledge Cluster NEP 24-8-022 (Canteen3041JV1786)	420		420	
Dr. Ruchi Verma 24-25/7/22 (Canteen3020-JV1785)	504		504	
Dr Rashmi Sharma DST Shri 15-17/12/24	12,500		-	
Dr Veda Krishna (Leads-Apr-2nd Batch)	1,770		-	
Dr Yogesh Kamat-GH-1205	2,500		-	
IASc Bangalore Mgt. 16-17/9/234	8,500		-	

M. Nayak



Particulars	As at March 31			
	2025		2024	
Indian Instt of sustainable Development	1,071		-	
INQUA Field Committee Meeting 22-24/03/24(Gh288)	158,084		-	
INST Mohali (GH287) MGT 8/3/25	10,000		-	
Mr Vikash Singh Baghel GH-1179	5,000		-	
National Innovation Foundation - NIF MGT-08-10-24	10,000		-	
National Science Center (NSC)	1,386		-	
NIPGR Meeting 30/07/2024	1,000		-	
Office of PSA 18/02/25	10,414		-	
Rajendra Singh Yadav IIT Kanpur	3,067		-	
UGC Dr RS Dubey & Mrs. Neelima Gupta	7,500		-	
ACS Staff Mtg. 26/6,4/7,6/7,18/7 & 25/7/24	8,983		-	
INSA ACS Faculty Leadership Programme 24-26/10/24	115,424		-	
Indira Gandhi National Centre 18-19/3/2023 (Jv1757GH125)			15,000	
Women Teachers Training Prog. 27/12/24- 2/1/25	33,514		-	
Oxford university press			74,106	
Kamala Print-n-Publish	32		-	
American Chemical Society ACS	979		-	
Institute of Educational Development	751		-	
Joras Art Studio	40		-	
MPCST, Bhopal (Mtg. on 19/03/2025)	51,535		-	
AIU Conference on 26/03/25	18,920		-	
MOSAI Instt. Japanese Language (Mtg. on 1/3/25)	44,020		-	
IIT Kanpur (Mtg. on 21/3/25)	9,858			
Dr. Umesh V. Waghmare (IASc- JV 1769)	1,000		1,000	
Indian Inst. of Materials Management (1/4/23 & 26/8/23)	-		3,904	
(Dr. Brajesh Pandey, ED INSA (7/7/23))	1,000		1,000	
National Innovation Foundation - NIF (23-24/6/23)	-		3,965	



Particulars	As at March 31			
	2025		2024	
(Nine T Alloy Management Pvt. Ltd. (17/8/23))	-		10,142	
(Vijnana Bharti (7/7/23-Dr. Rajgopal & 31/7-1/8/23))	-		54,653	
(Quality Council India (QCI)- NCIIPC Mtg. 27/9/23)	13,195		13,195	
(Quality Council India (QCI)- NABCB (21-23/9/23-))	21,716		21,716	
(Quality Council India (QCI)(NABCB)(28-30/9/23))	7,216		7,216	
(Vijnana Bharti Mtg. 14/10/2023)	-		65,416	
(FSSAI-Induction Training Program 8-28/10/23)	-		301,033	
(Vijnana Bharti Mtg. 15/9/2023)	-		20,370	
(9 T Alloy Management (ACS Prg.-5/10 & 3-9/11/23))	1,774		1,774	
(Quality Council of India (QCI) 12/9/23)	71,908		71,908	
(Sikkim University Mtg. Dt. 23/11/2023)	-		6,100	
(Quality Council of India (QCI) 04-06/12/23)	39,785		39,785	
(National Biodiversity Authority Mtg. 01-02/12/23)	-		109,804	
(Advance - Eagle Taxi)	-		1,050	
(Indian Chemical Society (Mtg. 21-22/12/23))	-		95,000	
(Sikkin University Mtg. Dt. 04/01/2024)	-		28,041	
(University Grant Commission Mtg. 09/01/2024(Facili))	-		84,975	
(Quality Council of India NCIIPC Mtg. 16/1/24) (Cantn)	36,866		36,866	
(Quality Council of India NCIIPC Mtg. 19/1/24) (Cantn)	34,622		34,622	
(Quality Council of India Mtg. 29/1/24)	27,005		27,005	
(PDUNIPPD-DHR-ICMR Dt. 09-11/02/2024)	-		186,245	
(SWATI Portal Launch Prg. (NASI) 11-02-2024)	496,723		496,544	
(Quality Council of India Mtg. Dt. 29-31/1/2024)	187,349		187,349	
(ACS International India Pvt. Ltd. Mtg. Dt. 12/02/2024)	-		15,457	
(University Grant Commission (UGC) Mtg. 26-27/2/2024)	-		35,215	
(University Grant Commission (UGC) Mtg. 7-8/3/2024)	-		85,261	
(Quality Council of India (QCI) Mtg. 27/02/2024)	65,415		65,415	

M. Sanyal



Particulars	As at March 31			
	2025		2024	
Indira Gandhi National Centre for the Art 20-23/3/2024	-		50,735	
(QCI-DST-NGCMA Training Prog. Dt. 18-20/03/24)	360,464		364,535	
(Quality Council of India Mtg. Dt. 20/03/2024)	11,309		18,809	
(School of Planning and Architecture Delhi)	-		12,500	
Dr. Amit Mehndiratta IITD	32,000		-	
Advance Institute of Town Planners Leads April'25	50,000	2,000,647	-	2,861,695
Total - D		2,000,647		2,861,695
Part-E: TDS Recoverable From ITO				
TDS Recoverable from ITO (ACS Internatl. (22-23))	-		34,802	
TDS Recoverable from ITO (Ashoka Univ)Dr. Shashidhara (22-23))	-		580	
TDS Recoverable from ITO (Anton Paar Pvt. Ltd. (22-23))	-		2,000	
TDS Recoverable from ITO (Oxford Univ Press) (22-23))	-		3,327	
TDS Recoverable from ITO (SRM) (22-23))	-		3,298	
TDS Recoverable from ITO (Istt. Of Eminence DU) (22-23))	-		2,381	
TDS Recoverable from ITO (QCI 14-17/6/23- (23-24))	-		1,607	
TDS Recoverable from ITO NIF 23-24/6 & 8/10/23-2023-24	-		1,312	
TDS Recoverable from ITO (NIF)8-10/10/23-2023-24	-		49	
TDS Recoverable from ITO (FSSAI-15-16/9/23 -2023-24)	-		95,209	
TDS Recoverable from ITO (ISMIRM- 25-27/8/23 -2023-24)	-		37,394	
TDS Recv. from ITO(QCI 10-13/11,23-25/11&5-8/12/22 (23-24))	-		15,602	
TDS Recoverable from ITO (Anton Paar (P) Ltd. (23-24))	-		2,000	
TDS Recoverable from ITO (NIF - 10/10/23) -2023-24	-		1,200	
TDS Recoverable from ITO (ACS Mtg. 3-9/11/23)	-		169,513	
TDS Recoverable from ITO(QCI Nov.23) 2023-24	-		4,233	
TDS Recoverable from ITO (QCI 7-9/2/24)	-		500	

M. S. Bhatnagar

Chartered Accountant
New Delhi

Particulars	As at March 31			
	2025		2024	
TDS Recoverable from ITO (QCI-21-23/9/23)	-		5,513	
TDS Recoverable from ITO (QCI-28-30/9/23)	-		7,216	
TDS Recoverable from ITO Canara Bank	1,194		-	
TDS Recoverable from ITO for Leads April 2024	1,770		-	
TDS Recoverable from ITO for Leads July 2024	7,080			
TDS Recoverable from ITO QCI (Ramnath Suryavanshi)	100		-	
TDS Recoverable from ITO (ACS Int. 24-26/10/24)	10,000		-	
TDS Recoverable from ITO- SCTIMST Mtg. 9/8/24	905		-	
TDS Recoverable from ITO Tech Dev Board Mtg. 11/5/24	907		-	
TDS Recoverable from NIF (9/7, 6/8 & 8/10/24)	1,485		-	
TDS Recoverable from ITO- QCI Dt. 20/03/2024	150		-	
TDS Recoverable from ITO (Springer Nature I Pvt. 24-25)	22,920		-	
TDS Recoverable from ITO (Royal Chemistry I Pvt. Ltd. July.24)	1,000		-	
TDS Recoverable from ITO Campbell Scientific I Pvt. Ltd. Sep.24	2,000		-	
TDS Recoverable from ITO JKG Biosc. P Ltd. July 24	2,500		-	
TDS Recoverable from ITO QCI Aug/Sep 24 Mtgs.	4,142		-	
TDS Recoverable from ITO QCI May/Jun/July 24 Mtgs.	102		-	
TDS Recoverable from ITO (Quality Healthcare Access) Pvt. Ltd.	2,698		-	
TDS Recoverable from ITO Himedia Laboratories Oct. mtg.	1,000		-	
TDS Recoverable from ITO- SBI	30,327		-	
TDS Recoverable from ITO (ACS Intrn. April 24 Mtg.)	934		-	
TDS Recoverable from ITO Affordable Quality (31/25)	13,359		-	
TDS Recoverable from ITO INAE Mtg 19-21/12/24	2,400		-	
TDS Recoverable from ITO (ACS Intrn. July 24 Mtg.)	1,000		-	
TDS Recoverable from ITO (ACS Intrn. Oct. 24 Mtg.)	9,611		-	

M. Sanyal



Particulars	As at March 31			
	2025		2024	
TDS Recoverable from ITO (ACS Intrn. Nov. 24 Mtg.)	16,169		-	
TDS Recoverable from ITO (ACS Intrn. Dec. 24 Mtg.)	819		-	
TDS Recoverable from ITO Natnl. Ctr. For Earth Sc. Studies -Jun 24	15,000	148,942	-	387,736
Total - E		148,942		387,736
Part-F: Good & Services Tax				
(1). Input CGST (opening balance)	2,487,399		3,245,178	
Add: transfer from GST credit ledger	1,219,189		1,468,452	
Less: reversed during the year			(1,200,173)	
	3,706,588		3,513,457	
Add: adjusted with Output CGST	(1,435,858)		(1,023,387)	
Add: RCM-CGST			(2,671)	
Add: Tr. From output CGST		2,270,730		2,487,399
(2). Input SGST (opening balance)	2,390,715		1,520,995	
Add: transfer from GST credit ledger	1,219,189		3,023,349	
Less: reversed during the year			(1,200,173)	
	3,609,904		3,344,171	
Add: adjusted with Output SGST	(1,339,293)		(950,785)	
Add: RCM-SGST			(2,671)	
		2,270,611		2,390,715
(3). Input IGST (opening balance)	-		(1,599,234)	
Add: transfer from GST credit ledger	72,636		1,615,090	
Less: reversed during the year			(5,734)	
	72,636		10,122	
Add: adjusted with Output IGST	(404,598)	(331,962)	(10,122)	-
(4) GST Credit ledger (Opening Balance)			6,236,396	
Add: transfer from output CGST			61	
Add: transfer from output SGST			61	
			6,236,518	
Less: transfer to input CGST			(1,468,452)	
Less: transfer to input SGST			(3,023,349)	
Less: transfer to input IGST			(1,615,090)	



Particulars	As at March 31,			
	2025		2024	
Less: ITC reversal			(129,627)	-
(5) GST Cash Ledger (Opening Balance)			10,697	
Less: ITC reversal			(10,697)	
(6) GST Pre-deposit for FY-2017-18	266,304	266,304	266,304	266,304
GST Pre-deposit for FY-2018-19	88,824			
GST Pre-deposit for FY-2020-21	365,073			
Input CGST Receivable A/C	183,886			
Input SGST Receivable A/C	183,886			
TDS on GST Recoverable CGST	30,421			
TDS on GST Recoverable CGST	30,421	882,511		
(7) Output tax liability				
Output CGST	(17,074)			
Output SGST	(17,074)			
	(34,148)	(34,148)		
Total - F		5,324,046		5,144,418
Part G: Advances and others				
Opening Balance	18,164		11,164	
Less: Transferred to Sundry Debtor (Alpcord)	11,164			
Less: Opening Balance Adjusted	7,000			
Excess TDS paid on professional	-	-	7,000	18,164
Total (A+B+C+D+E+F+G)		54,933,090		65,202,805

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N



Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-11

Schedule forming part of Income & Expenditure Account for the year ending 31.03.2025

Income from Sales/Services

Particulars	Year ended March 31,			
	2025		2024	
Income From INSA Transit House				
(1) Guest Rooms/committee rooms/ conference hall auditorium	7,406,912		8,680,094	
(2) INSA canteen-food charges	1,686,012	9,092,924	979,973	9,660,067
Meetings Receipts/Income				
Administrative charges	594,681		585,038	
Other misc. meetings	106,845	701,526	12,710	597,748
Leads Program				
Leads program July 2023	254,097			
Leads program April-24	4,714,593			
Leads program July-24	3,433,019	8,401,709		
House rent recovered		47,520		29,879
Medical contribution		290,900		285,448
Total		18,534,579		10,573,142

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N

Mayank

Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-12

Schedule forming part of Income & Expenditure Account for the year ending 31.03.2025 Income from Sales/Services

Grants/Subsidies (General, Salaries and ICSU Sub.)

Particulars	Year ended March 31,			
	2025		2024	
Govt. Grant in aid from DST				
(1) ICSU Subscription	33,500,000		32,700,000	
(2) Plan-general	113,600,000		117,500,000	
(3) Plan-salary	127,000,000	274,100,000	127,347,166	277,547,166
Interest on Investments (Govt. Grant)				
(1) ICU Subscription	195,372		61,537	
(2) Plan general	-	195,372	331,839	393,376
Total		274,295,372		277,940,542

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N



Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-13

Schedule forming part of Income & Expenditure Account for the year ending 31.03.2025

Income From Royalty & Publications

Particulars	Year ended March 31,	
	2,025	2024
(1) Income from royalty	2,495,526	1,937,671
(2) Income from sale of publications	1,458,165	647,713
(3) Misc. Receipts	96,710	240,945
Total	4,050,401	2,826,329



Indian National Science Academy

SCHEDULE-14

Schedule forming part of Income & Expenditure Account for the year ending 31.03.2025

Interest Earned

Particulars	Year ended March 31,	
	2,025	2024
(1) Interest on security of library mem. & printers investment	4,762	3,336
(2) Interest on loans / advances	760	-
(HBA, computer & conveyance)	21,984	7,440
(3) Interest on ITR refunds from I.T.O.		
Total	27,506	10,776

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N



Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-15

Schedule forming part of Income & Expenditure Account for the year ending 31.03.2025

Establishment Expenses

Particulars	Year ended March 31			
	2025		2024	
a) Staff Salaries				
INSA staff		65,749,427		60,719,049
b) Pensionary Benefits				
(1) Pension	43,863,812		44,677,138	
(2) Commuted pension	3,763,996		30,13,152	
(3) Leave salary encashment	28,51,735		4,353,464	
(4) Gratuity	4,675,426		5,121,040	
(5) Misc. Suprannuation expenses	-	55,154,969	150,886	57,315,680
c) Other Benefits				
(1) L.T.C	844,860		566,298	
(2) Medical.	5,566,076		6,863,407	
(3) Tution fees	609,189		621,000	
(4) Leave encashment (staff)	299,088		202,026	
(5) Newspapers	114,000		152,500	
(6) Other facilities (tel.)	202,782	7,635,995	110,197	8,515,428
Total		128,540,391		126,550,157

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N

Mayank Gaur
Chartered Accountants
New Delhi

Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-16

Schedule forming part of Income & Expenditure Account for the year ending 31.03.2025

Other Administrative Expenses

Particulars	Year ended March 31			
	2025		2024	
Telephone Expenses	194,053		149,750	
Postage	14,909		7,736	
Printing & Stationery	237,458		404,326	
Documentation & Publication	38,060	484,480	42,459	604,271
Advertisement Charges		55,697		36,777
Repairs and Maintenance:				
Maintenance of lawn & garden	1,405,342		1,624,472	
Maintenance of office equipment	90,483		123,675	
Maintenance of generator set (DG)	205,734		4,395	
Maintenance of AC system	3,188,413		3,474,408	
Maintenance of electrical operation	2,597,381		2,933,572	
Maintenance of computer system	3,467,694		2,280,178	
Maintenance of fire fighting system	2,595,279		3,231,684	
Maintenance of INSA building	1,148,214		2,169,036	
Maintenance of security services	4,064,840		4,260,681	
Maintenance of lift	701,862		385,700	
Maintenance of EPABX system	2,753,414		1,837,377	
Maintenance of office furniture	108,468		140,781	
Maintenance of UPS system	364,240		410,640	
Office maintenance expenses	3,409,323	26,100,687	4,009,378	26,885,977
Meeting expenses	833,323		702,041	
Professional fees	763,684		661,510	
Bank charges	80,275		41,200	
Other administrative expenses	62,360		87,035	
Consultancy charges	321,495		68,000	
Legal charges	59,240		37,100	
Hindi promotion expenses	135,147		158,962	



Particulars	Year ended March 31,			
	2025		2024	
ITC reversal	110,240		2,285,442	
Property tax	924,173		924,173	
Sanitary goods	224,592		182,036	
Electrical goods	399,138		271,562	
Water & electricity charges	14,824,115		13,291,391	
Subscription to IIC	163,000		372,408	
Foundation day Celebration	457,733			
Audit Fee	50,000			
Payment to Daily Wages Staff (Contractuals)	1,258,062	20,666,577	330,000	19,412,860
Total		47,307,441		46,939,885

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N

Mayank


Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-17

Schedule forming part of Income & Expenditure Account for the year ending 31.03.2025

Expenditure on Grants / Subsidies

Particulars	Year ended March 31,			
	2025		2024	
Grants to Institutions				
Science Promotion Scheme				
Research Projects				
(Refer annexure - I)	48,886,626		39,524,079	
Visiting fellowship	1,014,875	49,901,501	1,947,230	41,471,309
History Of Science Projects				
(Refer annexure - II)		4,652,937		7,054,840
Associate fellows Projects (Young Scientist)				
Research projects (refer annexure - III)		3,538,824		2,340,000
Teachers Awards				
Books grant	20,000	20,000	59,873	59,873
Total		58,113,262		50,926,022

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N

Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-18

Schedule forming part of Income & Expenditure Account for the year ending 31.03.2025

Particulars	Year ended March 31					
	2025			2024		
(I) Travelling (TA/DA)						
(1) Council & others	5,695,941			6,866,789		
(2) ICSU meeting	109,138			111,936		
(3) History of science meeting	547,181			444,110		
(4) Associate fellows (Young Scientists)	280,321			157,810		
(5) Inter academy	26,300			7,839		
(6) Publication	1,368			39,135		
(7) Science promotion				15,850		
(8) Science & society	48,024			32,663		
(9) INYAS	523,345			992,129		
(10) Teachers Awardees			7,231,618	262,838	8,931,099	8,931,099
(II) Publications						
History of sciences	235,579			292,151		
Publications of INSA	3,019,725			3,253,636		
Science & society	50,000			56,000	3,601,787	3,601,787
INYAS	50,000	3,355,304	3,355,304			
(III) Subscription to ICSU bodies		33,622,423	33,622,423		32,348,014	32,348,014
(IV) International scientific delegations/ Exchange programmes						
ICSU	1,194,306			1,477,798		
Non - ICSU	933,664			1,598,471		
Inter-academy (Exchange Programme)	3,929,020			5,087,222		
G20/S-20		6,056,990	6,056,990		8,163,491	8,163,491



Particulars	Year ended March 31					
	2025			2024		
(V) Seminars /Symposia /Conferences/Workshops Popularisation Of Science Activities						
Symposia / seminars (ICSU)	199,425					
Symposia / seminars (science promotion)	2,308,789			3,045,391		
Science awareness/ Amrit call (IISF22) (Science promotion)				272,428		
Local chapters & Popularisation of sciences	1,270,211			690,619		
IN-YAS seminar/ symposium	3,429,045			2,065,822		
Seminars/Symposia (History of Science)	14,415	7,221,885	7,221,885	—	6,074,260	6,074,260
(VI) Other Expenditure						
A. Meeting Expenditure						
IN-YAS	48,765			405,292		
Meeting exp (Science Promotion)	98,200			-		
IA Meetings/ Advertise-ments & other expenses	2,360			386,890		
Associate Fellows Meeting	-			-		
H/S meeting exp	175,792	325,117		210,070		
LEADS program meeting Ex- penditure						
Leads Program April-2024	1,938,946					
Leads Program July-2024	1,722,285	3,661,231			1,002,252	
B. Transit House Expenditure						
Guest rooms/ Conf. rooms/ auditorium	2,216,785			2,380,566		
Canteen (food etc.)	5,181,928	7,398,713		4,967,627	7,348,193	
C. Subscription For Journals & Library Exp		404,818			415,000	
D. IN-YAS (Office Expenses)		572,211			373,471	9,138,916
E. SCIENCE POLICY STUDY			12,362,090			

M. S. Bhatnagar



Particulars	Year ended March 31					
	2025			2024		
(VII) Interest On Govt. Grant Investments Deposited with Bharat Kosh						
(1) General (FY-2021-22) (on refund of ITR)				20,524		
(FY- 2023-24) (on Govt. grant)		331,839		146,062	166,586	
(2) ICSU subcription						
For FY- 2023-2024 (on Govt. grant)		61,537		84,623	84,623	
(3) Salary						
For Fyr - 2023-2024 (on Salary Advances)		7,440	400,816			
For Fyr - 2022-2023 (on advances)				38,059	38,059	289,268
Total (I+II+III+IV+V+VI+VII)			70,251,126			68,546,835

For P K M B & Co.
Chartered Accountants
Firm's Registration No. 005311N

Mayank


Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY

Sunil

Sunil Zokarkar
Deputy Executive Director-I (F&A)

Dr. Brajesh Pandey

Dr. Brajesh Pandey
Executive Director



Indian National Science Academy

SCHEDULE-19

**Significant accounting policy and notes to accounts
for the year ending 31st March 2025**

1. Significant Accounting Policies

- a) These financial statements are prepared under the historical cost convention and compliance in accordance with Generally Accepted Accounting Principles (GAAP) in India on accrual basis. Accounting policies have been consistently applied except where a newly issued accounting standard is initially adopted or a revision to an existing accounting standard requires a change in the accounting policy hitherto in use.
- b) Grants/subsidies are accounted for on realization basis.
- c) Long-term investments are stated at cost of investments. Interest earned on fixed deposits being accounted for on maturity, renewal or encashment.
- d) Funds/grants include interest of respective fixed deposits/investments and related expenses are also adjusted.
- e) Gratuity and other retirement benefits are accounted on cash basis.
- f) Provident fund is managed and administered by the Academy as per the guidelines of Government of India.

Other notes to accounts

1. Capital expenditure aggregating to Rs. 67,08,162/-pertains to fixed assets and have been booked against 'Other Fixed Assets Fund Account'.
2. Interest earned Rs. 1,46,77,866/-out of corpus fund investments has been included in Schedule-1 of 'Corpus Fund'.
3. Stock of publications of the Academy as on 31st March 2025 has not been included in the Balance Sheet whereas the same is the property of the Academy.
4. Grants-in-aids released to various institutions under various schemes are subject to their audit/ utilization certificate.
5. Expenses are booked in the books of accounts after their due approval from the respective departments in the Academy.
6. There are certain unspent balances of DST and DST-sponsored schemes that the Academy is required to return to the respective organizations. These funds are currently held by the Academy. The interest earned is being credited back to the respective fund accounts.

Mayank

The Academy has already initiated communication with the concerned organizations and is in the process of returning the unspent funds. Until such time as the funds are returned, the Academy continues to classify them as liabilities in its accounts.

7. "Grants to other institutions are being booked on payment basis under the head "Expenditure on Grants/Subsidies" (refer schedule 17) considering the claim bills provided by the respective institutions. However, the utilization certificates are being submitted with the Academy later on."
8. Previous year's figures have been re-grouped/ re-arranged in order to confirm to current year classification.

For **P K M B & Co.**
Chartered Accountants
Firm's Registration No. 005311N




Mayank Gaur
Partner
Membership No. 518183
Place: New Delhi
Date: 25-08-2025

For and on behalf of
INDIAN NATIONAL SCIENCE ACADEMY



Sunil Zokarkar
Deputy Executive Director-I (F&A)



Dr. Brajesh Pandey
Executive Director



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Annexures

Annexure-I

INSA COUNCIL - 2025

PRESIDENT

Professor Ashutosh Sharma, FNA, Institute Chair Professor, Department of Chemical Engineering, Indian Institute of Technology, Kanpur

VICE-PRESIDENTS

Professor Madhu Dikshit, FNA, JC Bose National Fellow, CSIR-Central Drug Research Institute, Lucknow

Professor Indranil Manna, FNA, Vice Chancellor, Birla Institute of Technology (BIT), Ranchi

Dr Debashis Mitra, FNA, JC Bose National Fellow, National Centre for Cell Science, Pune

Professor Sanjay Puri, FNA, School of Physical Sciences, Jawaharlal Nehru University, New Delhi

Dr V M Tiwari, FNA, Director and JC Bose National Fellow, CSIR-North East Institute of Science & Technology (CSIR- NEIST), Jorhat

Professor Anil Kumar Tripathi, FNA, Director, Indian Institute of Science Education and Research (IISER) Mohali

MEMBERS

Professor A Ajayaghosh, FNA, S. S. Bhatnagar Chair Professor, SRM Institute of Science and Technology, Chennai

Professor Sanghamitra Bandyopadhyay, FNA, Director, Indian Statistical Institute, Kolkata

Dr Anirban Basu, FNA, Scientist VII, National Brain Research Centre, Haryana

Professor Arup Bose, FNA, Statistics & Mathematics Unit, Indian Statistical Institute, Kolkata

Professor Dipshikha Chakravorty, FNA, Department of Microbiology and Cell Biology, Indian Institute of Science, Bengaluru

Professor Srubabati Goswami, FNA, Theoretical Physics Division, Physical Research Laboratory, Ahmedabad.

Professor Anil Kumar Gupta, FNA, JC Bose National Fellow and Professor (HAG), Department of Geology & Geophysics, Indian Institute of Technology, Kharagpur

Professor Maneesha Shreedhar Inamdar, FNA, Director, Institute for Stem Cell Science and Regenerative Medicine, Bengaluru

Dr Navin Chandra Khanna, FNA, Former Scientist, International Centre for Genetic Engineering & Biotechnology, New Delhi

Professor Sanjay Mittal, FNA, Department of Aerospace Engineering, Indian Institute of Technology Kanpur, Kanpur

Professor J N Moorthy, FNA, Director, Indian Institute of Science Education and Research, Thiruvananthapuram

Professor Dipendra Prasad, FNA, Department of Mathematics, Indian Institute of Technology Bombay, Mumbai

Professor Manoj Prasad, FNA, JC Bose National Fellow, Department of Genetics, University of Delhi, South Campus, New Delhi

Professor Uma Ramakrishnan, FNA, National Centre for Biological Sciences, Tata Institute of Fundamental Research, Bengaluru

Professor Sriram R Ramaswamy, FNA, Department of Physics, Indian Institute of Science, Bengaluru.

Dr Manjula N Reddy, FNA, Scientist, CSIR- Centre for Cellular and Molecular Biology, Hyderabad

Professor Sunil Kumar Singh, FNA, Director, CSIR-National Institute of Oceanography, Goa.

Dr Soumya Swaminathan, FNA, Chairperson, M.S. Swaminathan Research Foundation, Chennai

Professor Qudsia Tahseen, FNA, Department of Zoology, Aligarh Muslim University, Aligarh.

Professor Prabodh Kumar Trivedi, FNA, Director, CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow.

REPRESENTATIVES OF CO-OPERATING ACADEMIES

Government of India (DST)

Professor Kaustuv Sanyal, FNA, Director, Bose Institute, Kolkata, West Bengal

The Indian Academy of Sciences, Bengaluru

Professor Arup Kumar Pal, Theoretical Statistics & Mathematics Unit, Indian Statistical Institute, New Delhi

National Academy of Sciences (India)

Professor Nikhil Tandon, FNA, Professor and Head, Department of Endocrinology and Metabolism, All India Institute of Medical Sciences (AIIMS), New Delhi.

The Indian National Academy of Engineering, New Delhi

Professor U B Desai, FNA, Indian Institute of Technology, Hyderabad

National Academy of Medical Sciences, New Delhi

Dr SP Thyagarajan, Distinguished Professor & Advisor to Chancellor, Vellore Institute of Technology, Chennai

National Academy of Agricultural Sciences, New Delhi

Dr Ashok Kumar Singh, FNA, Former Director, Indian Agricultural Research Institute, Pusa Campus, New Delhi.

Annexure-II

PRESIDENTIAL ADDRESS

Structure and Processes of S&T together with that Vexing Question of Sustainability

PROFESSOR ASHUTOSH SHARMA

*President, Indian National Science Academy & Institute Chair Professor
Indian Institute of Technology, Kanpur*



What are the factors that make quality S&T and innovation ecosystems work (or not)? In my talk, I will discuss some of the major foundational aspects of being successful in invention, translation and innovation activities with special reference to sustainability.

For example, it is generally not well understood that new, more efficient technologies, while certainly desirable, are not sufficient for sustainable development.

(00) S&T based products with nexus and lifecycle; (0) efficient procedures and processes for S&T to work; (1) Sustainability of knowledge by balancing inventions with relevance, direction and purpose with innovations that consume that knowledge to create new socio-economic opportunities, especially at the grass-roots; (2) Socio-psychological-cultural dimensions of sustainability; (3) cultural determinants of Aatamnirbharta in the triad of Aatam-Viswas, Samman, Chintan; (4) Diversity, inclusion and equity; (5) policy and regulatory dimensions as basic enablers; (6) Structure and processes of seamless integration of invention and innovation ecosystems; (7) overarching techno-societal challenges of the future and the new mind required to meet them; (8) the balance and deployment of the triad of Dhandha (business as usual)- Juggad-Panga (disruptive) for problem-solving; (9) compelling roles of humanities and social sciences; (10) Connect of S&T with society; (11) Replacing for profit ecosystem with for benefit ecosystem; from extractive economy to LiFE economy (Lifestyle for Environment); (12) From ownership to trusteeship; (13) Lifestyle choices; (14) Strong global cooperation in the spirit of one earth, one family, one future; (15) Remastering of Maslow's

hierarchy of needs by balancing of the outer and inner engineering.

I will illustrate the Policy Dimension with a recent example of the DST, GoI policy on Liberalisation and Democratization of Surveying, Mapping and Geospatial Data which among other things is driving high-resolution digital mapping of India at 10 cm resolution. The SVAMITVA Scheme launched by the Hon'ble Prime Minister of India on National Panchayat Day (24th April 2020) will now allow digital and ownership certificates for rural India through drone and land-based surveys. This is an unprecedented instrument of rural empowerment allowing bank loans (rather than local money lender loans!) and resolution of infinite litigations!

Profile

Ashutosh Sharma is Institute Chair Professor at IIT Kanpur, President of the Indian National Science Academy (2023-25), and a former Secretary to the Government of India heading its Department of Science and Technology (January 2015-2021). He was a Professor (1997-), and the Head (2003-05) of Chemical Engineering, and the founding Coordinator of Nanosciences. Center and Advanced Imaging Center at the Indian Institute of Technology at Kanpur. Ashutosh received his PhD from the State University of New York at Buffalo (SUNYAB; 1988) working with Professor Eli Ruckenstein – a recipient of the US Medal of Science, his MS from the Pennsylvania State University (1984) and B.Tech. from IIT Kanpur (1982). Ashutosh has had a broad international experience as a research faculty at SUNY Buffalo School of Medicine (1988-90), visiting faculty at University of Texas at Austin, University of

Western Ontario, University of Erlangen-Nuremberg and the World Class University Program of South Korea and as a Member of the European Research Commission. Ashutosh's research contributions are highly interdisciplinary, spanning a wide range in nanotechnology; thin polymer films; nanocomposites and devices in energy, health and environment; functional interfaces; micro/nano-mechanics of soft matter; nano- patterning and nanofabrication; colloid and interfacial engineering; biomaterials & biosurfaces; wetting and adhesion. He has published over 350 peer reviewed papers, filed over 15 patents, given over 100 invited or key note conference presentations and mentored a nanotechnology startup. Ashutosh is a recipient of numerous honors and awards including the inaugural Infosys Prize in Engineering and Computer Science, TWAS Science Prize of the World Academy of Sciences, Bessel Research Award of the Humboldt Foundation, J. C. Bose Fellowship, Bhatnagar Prize, Homi J. Bhabha Award of UGC, The Syed Husain Zaheer Medal of INSA, Distinguished Alumni Awards of IIT Kanpur and SUNY Buffalo, Life-time Achievement Award of the Indian Science Congress, UNESCO Medal

for "Contribution to Development of Nanoscience and Nanotechnology", H.K. Firodia Award for Excellence in Science & Technology and Meghnad Saha Medal of INSA. He has also received six D. Sc. honoris causa from universities in the USA and India. Ashutosh is an elected Fellow of The Indian National Science Academy, The Indian Academy of Sciences, The National Academy of Sciences, India and Indian National Academy of Engineering, The World Academy of Sciences (TWAS) and the Asia-Pacific Academy of Materials. He has also served on the Councils of the first two. He has been an associate editor of ACS Applied Materials and Interfaces, Proceedings of Indian National Science Academy and ASME Journal of Micro- and Nano-Manufacturing and has been on the editorial boards of several journals: Carbon; ACS Industrial and Engineering Chemistry Research; Current Science; Nanomaterials and Energy; Chemical Engineering Science; Journal of Colloid and Interface Science; Canadian Journal of Chemical Engineering and Indian Chemical Engineer. Ashutosh's other interests are in ancient history and philosophy, poetry, and art.

Annexure-III

SCIENCE IN TRANSLATION

Inevitability of Thorium for energy security of developed India

Dr ANIL KAKODKAR

Chancellor, Homi Bhabha National Institute
Chairman, Rajiv Gandhi Science & Technology Commission

India, a rapidly developing economy, has twin critical challenges in front of it. One, to decarbonise its energy supply before the year 2070 and two, to enhance its per capita energy consumption to support a quality of life of average Indian to be comparable with the best in the world for it to be counted as a

developed country. This goal has been set to be achieved by 2047 when independent India would turn 100 years old.

There is now a global recognition that nuclear energy would need to play a significantly increasing role for realisation of global net zero and to support economic growth. Among all countries of the world, this challenge is the biggest in case of India. Given the modest economically minable uranium resources in India and its

large thorium endowment, it should be obvious that India's energy security is tightly linked to thorium utilization at scale.

The lecture will elaborate on this and related issues.

Speaker Profile

Kakodkar worked in Department of Atomic Energy throughout his active professional career. His work is mostly cantered around meeting development needs of national atomic energy programme. Work involved developments at component level, system level, analysis to diagnose problems or verify solutions, developing repair methodologies and tools, actual rehabilitation of nuclear reactors, development of new reactor systems and design of programme and its implementation.

Post superannuation, Kakodkar devotes his time to issues related to energy, education and rural development.

India's Technological Revolution: Driving Sustainable Economic Growth

Dr VIJAY KUMAR SARASWAT

Member, NITI Aayog, Government of India



India is experiencing a transformative technological revolution that is reshaping its economic landscape and driving sustainable growth. The nation's commitment to scientific advancement is evident through achievements in space exploration, nuclear energy, defense technology,

and biotechnology, exemplified by ISRO's successful Chandrayaan-3 mission and SSLV-D3/EOS-08 mission. The country is evolving from a technology services hub to a product nation, developing indigenous solutions and world-class software products for international markets.

The integration of new-age technologies, including artificial intelligence, block chain, and IoT, is revolutionizing various sectors through initiatives like Digital India. This technological convergence is projected to generate annual economic benefits of \$550-

1000 billion, improve healthcare access for 400 million people, and enhance agricultural yields for 22 million farmers. Science and technology are driving India's sustainable development through innovations in water treatment, renewable energy, and climate-resilient agriculture.

Key pathways, including the "Make in India" initiative, digital infrastructure development, and skill enhancement programs, are strengthening the economy. The vibrant startup ecosystem and entrepreneurship landscape are catalyzing progress across sectors. With continued strategic focus and investment, India is positioned to emerge as a technological powerhouse while addressing its developmental challenges.

Speaker Profile

Dr Vijay Kumar Saraswat is a highly esteemed scientist and Member of NITI Aayog, renowned for his extensive experience in defense research encompassing both fundamental and applied sciences. Having served as the Secretary of the Defense Research and Development Organization (DRDO), he has made remarkable contributions to the indigenous development of missiles like Prithvi, Dhanush, Prahar and Agni-5 as well as the two-tiered Ballistic Missile Defence system. Dr Saraswat played a pivotal role in establishing infrastructure to support the Nuclear Doctrine,

developing cyber security technologies, and enhancing the nation's defense capabilities against ballistic missile threats.

Furthermore, he has been actively involved in the development of alternative energy systems, such as clean coal technologies, bioenergy, hydrogen based economies. He has been pursuing major initiatives in the Sustainable and Resilient transportation system viz. E-vehicles, FCV, Hybrid Vehicles and Hydrogen powered long haul transport system.

Dr Saraswat has also made significant contributions to the advancement of technology, including the development of silicon photonics, the configuration of the μ -Processor for ICT applications and the roadmap for the Indian Railway Research Institute.

As a Member of NITI Aayog, Dr Saraswat has initiated the "Methanol Economy" program, aiming to utilize methanol for transportation, energy generation and chemical production. Additionally, he has chaired committees on technical textiles and body armor, contributing to the futuristic growth of these sectors in India. Dr Saraswat's outstanding achievements have been recognized through numerous awards, including the Padma Shri and Padma Bhushan, as well as honorary doctorates from over 25 universities.

Space Exploration in Amrut Kaal

Dr S. SOMANATH

Secretary, Department of Space (DoS)
Chairman, Space Commission and Chairman, ISRO



The journey of ISRO in creating a successful end-to-end space technology ecosystem in the country under tight budgets is considered as a success story. The vision of Hon. PM for Space in the Amrut Kaal is to develop a vibrant space economy in India using the strength in ISRO,

industries and academia to make us into a formidable force. Honorable Prime Minister has announced building of Bharatiya Antariksha Station by 2035, expanding the Gaganyaan program, sending an Indian to the Moon by 2040 and inter planetary missions to Moon and Venus.

To achieve the vision, we need to work in many areas. The operational systems of ISRO should move over to industries for production and commercialization. A strong industrial eco-system for space technology

should develop. Manufacturing of space systems for global customers must happen in India at competitive costs. The research and development of technologies should happen in ISRO tied up with academia and industries. The start-up ecosystem should develop and we should create some unicorns out of these companies.

To achieve all these, the space domain has now been opened up with the announcement of a new space policy, geospatial policy, creation of INSPACe as a regulator and promoter, FDI in space sector has been all owed up to 100%. We have witnessed substantial growth in the start-ups which are more than 250 nos. The NSIL is now taking up production of launch vehicles and satellites through industries as well as for matation of PPP models of future developments in this area.

Venturing into space exploration is important to create a next wave of research, technology development, space economy, strategic capability, capacity building and inspiration for the generations. The human space flight capability is crucial for the future to build and operate space stations for conducting microgravity experiments and commercial research in many domains. Missions to planets and other moons are also important for human race to find out materials and resources for the future. As a specific case, missions to moon with human access is critical for the strategic capability of our nation. The exploration mission requires advanced research in many domains such as sensors, materials, propulsion and mission design. The major constituents of the capability building of exploratory missions are: identification of scientific and exploratory milestones, identification of enabling technologies to meet the milestones, human capacity building, international cooperation with well-defined roles and responsibilities, inter-departmental collaboration with national-level synergy and collaboration with academia; enabling them for science data analysis and model development. The exploration missions have a multiplier effect in the development of technologies and can feed into regular missions leading to miniaturization, building autonomy, cost effectiveness and novel solutions.

Some of the exploration missions identified are, Solar system exploration and Helio-physics, Chandrayaan series of missions, Mars and Venus and Asteroid missions and then to the Outer Solar System, Space Weather, Astronomy and Astrophysics, High resolution space-

based telescopes, Astronaut-in-loop experiment for science from BAS etc.

To develop the enabling technologies, mission such as lunar sample return mission is planned. It calls for meticulous planning and readiness for sample handling, curation facility and analysis. The process of building the scientific community has been initiated through the mission-specific support cells, workshops, data analysis trainings, offering course works on space science etc. Efforts are also going into writing high-school level books on space science exploration to promote space science in the country. This effort needs to be strengthened with an integrated approach, with quantified indices for assessing the progress of human resource generation.

To sum up, when we speak about our plan for exploration missions in Amrut Kaal, what we need is an integrated approach to synergize each effort across other science institutions and academia to create an ecosystem, which will foster the sustainable process including identification of science goals, R&D in related domains, instrument building and data utilization. A national roadmap for space science exploration has to be made and declared in due course, and the process that I have spoken about will drive the journey of India's space science exploration to aid further growth in the space journey of India.

Speaker Profile

Dr S. Somanath is a Distinguished Scientist (Apex Grade) and Secretary, Department of Space (DoS), Chairman, Space Commission and Chairman, ISRO since 14 January 2022. Dr S. Somanath having a career spanning nearly 38 years, is an expert in the field of space technology and systems engineering of launch vehicles and has made significant contributions in many areas.

As Secretary of DoS, he piloted the National Space Policy, facilitated IN-SPACe activation, engagement of ISRO with NGPE and start-ups in space sector and enabled NSIL to aggregate user demands, take up commercial activities including Launch vehicle production and space craft operations. Chandrayaan-3 landing near the south pole of Moon was a great success under his leadership. The Aditya-L1, XpoS at, INSAT-3DS, NVS-01, Oceans at, GSAT-24 and commercial

PSLV & LVM3-OneWeb missions are some of the recent successes. Under his leadership Small Satellite Launch Vehicle (SSLV) and Test Vehicle (TV) were developed and landing experiments of the Re-usable Launch Vehicle (RLV-LEX) was accomplished. He plays a crucial role in the architecture of Gaganyaan program for sending Indians to Space and achieved the first Test Vehicle flight for mission abort demonstration. Currently he is focussed on the Space Vision-2047 missions including Gaganyaan, Chandrayaan-C and other exploration missions, Bharatiya Antariksha Station development and human mission to Moon.

As Director of Vikram Sarabhai Space Centre (VSSC) during 2018-21, he was responsible for Launch vehicle technology development where, LVM3-M1/ Chandrayaan-2 mission was a major accomplishment. He spear headed the development of critical systems for the Gaganyaan programme, development of Small Satellite Launch Vehicle, Re-usable Launch Vehicle & Air-Breathing technology programs. He was the Director of Liquid Propulsion Systems Centre (LPSC) during 2015-18 where, the development and qualification of C25 stage was completed and successfully flown in LVM3-D1 flight. He was the Project Director when the Experimental flight of LVM3-X/CARE mission was successfully accomplished on 18th December, 2014.

Dr S Somanath took his B. Tech in Mechanical Engineering from TKM College of Engineering, Kollam, Masters in Aerospace Engineering from Indian

Institute of Science, Bangalore and PhD from IITM Chennai. He has been bestowed with many Honorary Doctorates from universities including, Centurion, Karunya, Satyabhama, SRM, Uttarakhand, Sarada Birla, Bangalore, JNTU, KUHS, Amity & DY Patil Vidyapeeth.

He is a Fellow of Indian National Academy of Engineering (INAE), Fellow of Indian National Academy of Science (INSA), Fellow of Aeronautical Society of India (AeSI), Astronautical Society of India (ASI) and a member of International Academy of Astronautics (IAA). He is the President (Elect) of AeSI and President of Society of Aerospace Quality and Reliability (SAQR). National Aeronautics Prize from AeSI, Space gold medal from ASI, Gold medal from Aerospace Engineering Department, Platinum Jubilee award and Distinguished alumni award of IISc, Bangalore, Distinguished fellow award from IIT Kanpur and Karnataka Rajyotsava award were presented to him.

He has published papers in journals and conferences in the area of structural dynamics and control, materials modelling, dynamic analysis of separation mechanisms, vibration and acoustic testing, launch vehicle design and launch services management. Dr S Somanath has been a delegate to UN-COPUOS, vice President of International Astronautical Federation (IAF) and participated in International Astronautical Congress (IAC) held at different countries.

Defence R&D the Road Ahead

Dr SAMIR V KAMAT

Secretary, Department of Defence R&D and Chairman, DRDO



The talk will highlight the changing nature of warfare and the role of emerging & disruptive technologies in Future warfare.

Speaker Profile

Dr Samir V Kamat has taken over as Secretary DDR&D and Chairman Defence Research

and Development Organisation (DRDO) on 26th Aug 2022. Dr Kamat completed his B.Tech (Hons) in Metallurgical Engineering from IIT Kharagpur in 1985 and PhD in Materials Science and Engineering from The Ohio State University, USA in 1988 and joined DRDO in 1989.

Dr Kamat has provided leadership and direction to several critical materials programmes in DRDO

such as development of high strength steels for naval ship hulls, development of high temperature titanium alloys and nickel base superalloy based components for aeroengines, development of tungsten heavy alloys for kinetic energy penetrators, development of fused silica radomes for missile seekers, development of armour solutions for personnel as well as combat vehicles and stealth materials for airborne and naval applications. These have found use in various systems being developed by DRDO laboratories.

In addition, he has spearheaded the development of naval systems such as advanced light weight torpedo, anti-torpedo decoy systems, autonomous underwater

vehicles, advanced hull mounted and towed array sonars for ships and fuel cells based air independent propulsion systems for submarines.

Dr Kamat is a Fellow of the Indian National Academy of Engineering (INAE) and Institution of Engineers India (IEI). He is a recipient of Distinguished Alumni Award from IIT Kharagpur, Metallurgist of the Year Award from Ministry of Steel and Scientist of the Year Award from DRDO.

He has published more than 180 papers in International peer-reviewed journals.

Innovation & Entrepreneurship

Dr KRISHNA MELLA

Executive Chairman, Bharat Biotech



Speaker Profile

Dr Krishna Ella is a leading scientist and entrepreneur in the field of vaccines and food. Born in Tamil Nadu, he moved to the US for his Ph.D., from the University of Wisconsin-Madison and spent over 14 years in teaching and research.

Dr Ella returned to India in 1996 to establish Bharat Biotech with a vision to lead innovation in public health in India.

Dr Ella's work spans three main verticals: Human Vaccines (Bharat Biotech, Chiron Behring Vaccines), Veterinary Vaccines (Biovet in Bangalore and Pune), and Food (Ella Foods, Innova Agri Bio Park). He is currently focussed on establishing one of the India's largest vaccine manufacturing facilities in Bhubaneswar, Odisha, with an investment of over INR 1,500 crore. Today, Bharat Biotech, with 433 patents filed and over 220 granted patents, has successfully developed 20 life saving vaccines while delivering over 9 billion vaccines in more than 125 developing countries.

Dr Ella spear headed the development of several

innovative vaccines, including ROTAVAC® for Rotavirus, Typbar TCV® – the world's first Typhoid Conjugate Vaccine and India's first new molecule, COVAXIN® – India's first indigenous COVID-19 vaccine, and iNCOVACC®, the world's first intranasal COVID-19 vaccine. In August 2024, Dr Ella launched HILLCHOL®, a novel single strain oral cholera vaccine. Dr Ella is the first one to develop Zika & Chikungunya vaccines in the world which are currently in the clinical trial phase.

Bharat Biotech houses the world's first BSL-3 production facility, while Biovet operates three BSL-3 +Ag facilities and three large animal challenge facilities. Dr Ella contributes to shaping India's policies on science, research and innovation in various capacities through more than 15 Government of India committees and university bodies. Dr Ella is a recipient of numerous national & international awards and six honorary degrees, including one from the University of Wisconsin-Madison, USA. Dr Ella, this year, was honoured with the Dean's medal from the Johns Hopkins Bloomberg School of Public Health. In 2022, he received the Padma Bhushan, the Republic of India's third-highest civilian award, for his incomparable contributions to society and industry.

Technology Innovation in the Oil & Gas Sector: Path to Sustainability

Ms VARTIKA SHUKLA

Chairman & Managing Director, Engineers India Limited
New Delhi



India registered a robust GDP growth rate of around 8% in the third quarter of fiscal year 2024 with a projection of a sustained growth rate ranging from 6-7% in the upcoming fiscal years. The country surpassed China to become the most populous country in the world growing roughly around 1% indicating

the continued growth of the consumer market in the country during 2023-2030. The country's Crude oil consumption is anticipated to rally with an upward slope vis-à-vis the GDP growth rate during this period making India the largest source of global oil demand growth in this decade as per the Indian Oil Market Outlook 2030 published by the International Energy Agency (IEA).

In the year 2023-24, the country's crude oil processing stood at 256 Million Metric Ton (MMT) to become the fourth largest refiner in the world which is expected to reach around 450 MMTPA by the year 2030. Most of the new capacity additions in the state-owned refineries are slated to be commissioned by the year 2027.

However, Oil & Gas sector contributes around 30% of India's energy mix emitting around 700 million tons of CO₂eq GHG emissions in the atmosphere. This sector faces increasing pressure to decarbonize and contribute to the global efforts to achieve net zero emissions by mid of the century. Hence, a comprehensive strategy that integrates technological innovation, operational efficiency, investment in renewable energy and sustainable business practices is required for transitioning to a sustainable future.

Ms Shukla's talk will give a comprehensive view of the technologies and innovations that have been setting the course for the oil and gas sector to achieve their energy transition journey fully aligned with the Govt. of India's vision to achieve Net Zero carbon emissions by 2070. The

talk will cover certain key technological interventions such as 2G Ethanol & Sustainable Aviation Fuels (SAF), solar energy for process heating which are already at a higher technology readiness level and other innovative practices such as the application of AI in the optimization of oil & gas as sets as potential pathways to achieve the sustainability objectives of the sector.

Speaker Profile

Ms Vartika Shukla, a Chemical engineering graduate from IIT Kanpur is serving as the Chairman & Managing Director of Engineers India Limited (EIL), one of Asia's leading Energy consultancies under the Ministry of Petroleum and Natural Gas (MoPNG), Govt. of India. She has a strong track record of mega project implementation both in India and the international market. She has been contributing to various national-level policies and initiatives as part of several committees and task forces.

Constituted by both the Govt. of India and professional bodies. She is also a member of the Oil Industry Development Board (OIDB), Chairperson of the Research Council of Central Scientific Instruments Organisation (CSIO), a constituent laboratory of CSIR, an invitee to the boards of Numaligarh Refinery Limited (NRL) and Indian Strategic Petroleum Reserves Limited (ISPRL) among other professional engagements.

She served EIL in diverse roles and steered the organization in forging strategic collaborations with both the industries and academia of international repute to enhance the company's business portfolio in emerging green energy business segments such as Bioethanol, Sustainable Aviation Fuels (SAF), Green Hydrogen, etc. She has made an immense contribution to the development of National Policies especially in the area of Auto Fuel vision & policy, National Bio Fuel Policy and future road map for the refining and petrochemical sector for the Govt. of India. She has co-

authored more than 30 patents suggesting significant engineering and technological interventions. She is steering EIL's resolve to become a Net Zero carbon emitting corporation by the year 2035 spear heading the organization's new vision statement "To be a Global Leader Offering Total Energy Solutions for a Sustainable Future".

She has received various prestigious awards and accolades for her contributions in shaping the country's energy infrastructure. She is a recipient of PETROFED

Woman Executive Award, SCOPE Excellence Award, Sustainability Award for Best Green Process in Petrochemicals for team (FICCI), Innovation Award for Leadership in Indigenizing Environmentally friendly Sulfur Treating Technology, MoPNG (2017), INAE Women Engineer of the year award (2021) and Distinguished Alumnus Award by IIT-Kanpur in recognition of her stellar contributions in the field of Chemical Engineering and Technology. She was also featured in the 'India Today' SHE list of top 100 women achievers in India.

Challenges in Next-Gen Telecommunication Networks

Dr KUMAR SIVARAJAN

Chief Technology Officer, Tejas Networks



Broadband access together with the smart phone has revolutionized our lives. We will provide an overview of further advances being explored in 6G mobile and related networks and the technical challenges.

Speaker Profile

Kumar Sivarajan received his B.Tech. degree in Electrical Engineering from IIT Madras in 1987 and the

M.S. and Ph.D. degree from Caltech in 1988 and 1990. He worked at IBM T. J. Watson Research Center, New York, and was on the faculty of the Indian Institute of Science, Bangalore, before co-founding Tejas Networks in 2000 as the Chief Technology Officer.

Kumar co-authored the bestselling book, "Optical Networks: A Practical Perspective" which is currently in its third edition. He received the IEEE W.R.G. Baker Prize Paper Award in 1997, is a distinguished alumnus of IIT Madras, a Fellow of the IEEE, a Fellow of the Indian National Academy of Engineering, received the Swarnajayanti Fellowship in 2000, and the 'CTO of the Year' award from ET Telecom in 2022.

SCIENCE FOR SOCIETY

Research with the People

Dr ABHAY BANG

Founder Director,
Society for Education, Action and Research in Community Health (SEARCH)
Gadchiroli, Maharashtra



Dr Bang will share the story of how he and his team realised the limitations of the prevalent model of research in the field health which he calls, 'Research on the People'. Through a series of examples, he will put forward an alternative model – Research with the People.

Speaker Profile

Dr Abhay Bang was brought up in Mahatma Gandhi's Sevagram ashram. He completed his medical education with three gold medals, post-graduation in internal medicine and then MPH from The Johns Hopkins University School of Public Health. For the past 35 years he is the Director of the Society for Education, Action and Research in Community Health (SEARCH), which he co-founded in 1985 with his wife, Dr Rani Bang, in a remote district, Gadchiroli, in India where they live, provide medical care and conduct research in 150 villages. Dr Bang and his organisation have conducted several path-breaking studies which have shaped national and global policies. They have developed a new approach, 'Home-based New born and Child Care,

'which has reduced the infant mortality rate from a baseline of 121 to as low as 30. This research has been selected as one of the milestone papers published in the *Lancet* in the past 180 years to be included in the *Vintage Papers Lancet*. This approach has been replicated in ten countries and is being scaled up nationally by the Govt. of India. He and his organisation have received nearly 70 awards, including the Mahatma Gandhi award, Maharashtra Bhushan – the highest honour of the Maharashtra state, the national award from the Indian Council of Medical Research, have been honoured by Save the Children, and by the Mac Arthur Foundation. Abhay and Rani have been honored by TIME magazine as 'Global Health Heroes' in 2005 and by the WHO as the Public Health Champion.

He was Chairman, of the Expert Committee on Tribal Health, Govt. of India, a member of India's National Commission on Population, and of the National Commission on Macro- economics and Health, High-Level Expert Group on Universal Health Coverage, Govt of India, and the High Level Committee on Tribal People. He also was a member of the Central Health Council, Govt. of India. Dr Abhay and Dr Rani Bang were honoured by the President of India with Padmashri.

Role of R&D and Innovation in economic development

Mr SENAPATHY “KRIS” GOPALAKRISHNAN

Chairman, Axilor Ventures



The lecture emphasizes the need to foster translational research in our academic and research institutions and explores ways to cultivate a culture that supports such research.

Speaker Profile

Mr Senapathy “Kris” Gopalakrishnan is the Chairman of Axilor Ventures, an accelerator that helps start-ups during the early stage of their business journey. Kris served as the vice chairman of Infosys from 2011 to 2014 and the chief executive officer and managing director of Infosys from 2007 to 2011. Kris is one of the co-founders of Infosys. Recognized as a global business and technology thought leader, he was voted the top CEO (IT Services category) in Institutional Investor’s inaugural ranking of Asia’s Top Executives and selected as one of the winners of the second Asian Corporate Director Recognition Awards by Corporate Governance Asia in 2011. He was elected president of India’s apex industry chamber Confederation of Indian Industry (CII) for 2013-14 and served as one of the co-chairs of the World Economic Forum in Davos in January 2014.

In January 2011, the Government of India awarded Mr Gopalakrishnan the Padma Bhushan, The country’s third-highest civilian honor.

Mr Gopalakrishnan serves on the Board of Governors of Okinawa Institute of Science and Technology (OIST), is the Chairman, The Council, IISc Bangalore, and is the Chairman, Board of Governors of IIIT, Bangalore. He is the Chairman of the Vision Group on Information Technology of Karnataka Government, the Chairman of RBIH (Reserve Bank of India Innovation Hub) and the Chairman of CII Centre of Excellence in Innovation, Entrepreneurship and Start-ups (CIES).

Mr Gopalakrishnan is the chairman of Itihaasa Research and Digital which publishes history of Indian IT industry as “**itihasa**” (<http://www.itihaasa.com/>) microsite as well as reports on industrial and academic research in India. He is the Co-author of “Against All Odds – The IT Story of India”.

Mr Gopalakrishnan invests in promoting research on Brain sciences, aging related disorders as well as investing in start-ups and start-up ecosystem. His family philanthropy is Pratiksha Trust and investment arm is Pratithi.

Mr. Gopalakrishnan, also known as Kris, holds master’s degrees in physics and computer science from the Indian Institute of Technology, Madras. He is a Fellow of the Indian National Academy of Engineers (INAE) and an Honorary Fellow of the Institution of Electronics and Telecommunication Engineers (IETE) of India. He has received honorary doctorates from IIT Kanpur and Kerala University and is a Lifetime Fellow of IIT Kharagpur.

Demonstration-LITTLE TOYS, BIG SCIENCE

Mr ARVIND GUPTA

Science writer & Toy maker



Children can have a lot of fun making things using throwaway stuff. In the process they can also learn a few principles of science. This lecture demonstration will show possibilities of using ordinary things for make dynamic toys to learn science.

Arvind Gupta Wiki https://en.wikipedia.org/wiki/Arvind_Gupta

Arvind Gupta TED Talk http://www.ted.com/talks/arvind_gupta_turning_trash_into_toys_for_learning?language=en

Speaker Profile

Arvind Gupta did a B. Tech from IIT, Kanpur (1975). In 1980 he left Tata Motors to pursue his passion of making science fun for children. He has written 24 books on science activities, translated over 1000 books into Hindi and presented 125 films on science activities on Doordarshan.

He worked at the Children's Science Center at IUCAA, Pune for 11 years. The Centre produced 8700 short (2-minute) videos on simple experiments and science toys in 20 different languages. The videos have been viewed by over 100-million children worldwide. Every day thousands of books are downloaded from his popular website <http://arvindguptatoys.com>

He has received many honors including the Inaugural Award for Science Popularisation (1988) Distinguished Alumnus Award of IIT/Kanpur (2001) and the Padam Shri (2018).

Solving the Climate Crisis through Indigenous Knowledge:

Insights from Tarun Bharat Sangh

Dr RAJENDRA SINGH

Founder, Tarun Bharat Sangh (TBS)



The world faces an escalating climate emergency marked by water scarcity, forced migration, and ecological degradation. In this context, the experiences of Tarun Bharat Sangh (TBS) in Rajasthan, India, offer invaluable lessons on the role of indigenous

knowledge in climate adaptation and mitigation. Local communities, deeply connected to their environment, have revived dying rivers, halted soil erosion, and adapted agricultural practices to rainfall patterns. These grassroots efforts not only restore ecosystems but also enhance community resilience and well-being.

Water, central to life and climate, is celebrated as sacred by these communities, who advocate for ethical water use through reverence for natural

resources. Their prayers to Mother Earth symbolize a commitment to sustainability, highlighting the need for decentralized water management and community-driven conservation. In contrast, global inaction on environmental governance has led to social tensions, mass migrations, and an urban crisis fueled by ecological neglect.

To address these challenges, TBS calls for a water ethics movement rooted in justice, peace, and collaborative stewardship. By integrating traditional water-harvesting techniques with modern science, India and the world can achieve sustainable water management. The TBS model exemplifies how local solutions—grounded in respect for nature—can offer global pathways to climate resilience, ecological balance, and collective happiness.

Speaker Profile

Dr Rajendra Singh, affectionately known as the “Waterman of India” or “Jal Purush,” is a globally recognized environmentalist and river rejuvenation expert. Born on August 6, 1959, in Dola village, Baghpat, Uttar Pradesh, Dr Singh pursued Ayurveda and later earned a postgraduate degree in Hindi literature. His dedication to water conservation and environmental sustainability has earned him numerous honorary doctorates and prestigious awards worldwide.

He is the recipient of the Ramon Magsaysay Award (2001) for community leadership and the Stockholm Water Prize (2015), often referred to as the “Nobel Prize for Water.” His achievements have also been recognized with the Jamnalal Bajaj Award for rural development (2005), the Ahimsa Award from the UK House of Commons (2018), and the Lifetime Achievement Award from Zee Digital (2022), among many others.

As the founder of Tarun Bharat Sangh (TBS), established in 1975, Dr Singh has played a pivotal role in constructing over 14,800 water structures across India, transforming more than 1,500 previously water-

deprived villages into water-secure communities. His work has led to the revival of 14 rivers, including the Arvari, Ruparel, and Maheshwara in Rajasthan and the Mahakali in Maharashtra, covering a combined area of 10,600 square kilometers. These efforts have become exemplary models for climate change adaptation and resilience. Dr Singh’s mission extends beyond India. His Water Ethics, Justice, and World Peace Tour (2015) has taken him to over 120 countries in Africa, Asia, and Europe, where he has shared his expertise on water conservation and climate resilience. His advocacy emphasizes the integration of traditional knowledge and community participation in managing natural resources. His work has inspired countless individuals to engage in environmental preservation and sustainable development. He chairs the People’s Commission on Drought and Flood, conducting over 540 programs in the past year to address rising climate challenges. Under his leadership, many young people have shifted their focus from exploitative development to initiatives centered on nature regeneration. Dr Singh believes that water and climate are inseparable. He champions community-driven solutions, emphasizing that local involvement, rather than solely technological advancements, is key to resolving water crises. His efforts have even led to groundbreaking legal victories, such as the Public Interest Litigation (PIL) in the Supreme Court, which protected the Aravalli hills from destructive mining practices. Beyond water conservation, Dr Singh advocates for peace through environmental stewardship. He holds that non-violence and respect for nature are essential for global prosperity. His work is deeply influenced by the teachings of Mahatma Gandhi, and he regards water, women, and rivers as sacred. His numerous books and publications further underscore his philosophy and provide practical solutions to environmental challenges. Dr Rajendra Singh’s life is a testament to the power of grassroots activism, environmental conservation, and the belief that sustainable development can bring about peace and dignity for all.

Annexure-IV

SECTIONAL COMMITTEES

SECTIONAL COMMITTEE I

Chair: Professor Kapil Paranjape

Indian Institute of Science Education and Research (IISER) Mohali



Kapil Hari Paranjape is a distinguished mathematician specializing in algebraic geometry and its intersections with algebraic topology, differential geometry, and number theory. He currently serves as a Professor of Mathematics at the Indian

Institute of Science Education and Research (IISER) Mohali. Dr Paranjape earned his PhD from the University of Mumbai, conducting research under the guidance of S. Ramanan at the School of Mathematics, Tata Institute of Fundamental Research (TIFR).

Throughout his academic career, he has held regular faculty positions at esteemed institutions such as TIFR Mumbai, the Indian Statistical Institute (ISI) Bangalore Centre, the Institute of Mathematical Sciences (IMSc) Chennai, and IISER Mohali. His notable contributions to mathematics, often in collaboration with others, include the resolution of the Hodge Conjecture in special cases, the study of varieties dominated by compact homogeneous varieties of rational type, and the resolution of Bloch-type conjectures for certain cycles on specific classes of hypersurfaces and complete intersections. He has also explored Calabi-Yau varieties linked to modular forms and extended Belyi's theorem to higher dimensions.

In addition to his research, Dr Paranjape has authored expositions on various mathematical topics, including Donaldson's work on Seiberg-

Witten theory, an introduction to modern geometry from an elementary perspective, and the weak resolution of singularities as proved by Bogomolov-Pantev. His scholarly contributions have earned him numerous accolades, including the BM Birla Award for Young Scientists in 1999, the Shanti Swarup Bhatnagar Prize in 2005, and fellowships from prestigious academies such as the Indian Academy of Sciences (1997), the National Academy of Sciences, Allahabad (1999), the Indian National Science Academy (2009), and The World Academy of Sciences (TWAS) in 2019.

LECTURE NEW FELLOW

PROFESSOR MAHESH KAKDE

Professor of Mathematics, Indian Institute of Science, Bengaluru

Thermal topo chemical polymerization reactions: challenges and opportunities



One of the main goals of number theory is finding integer solutions of polynomials with integer coefficients. This turns out to be an extremely hard problem. We study such polynomial equations by attaching various invariants to it. These invariants are broadly of two kind - algebraic invariants and analytic invariants. Analytic

invariants are complex analytic functions known as L-functions. Riemann zeta function is the most well-known and the first example of this kind. Algebraic invariants are more complicated to define but may be more directly related to solutions of the polynomial equations being studied. There is a deep and mysterious relation between values of L-functions at integers (special values) and algebraic invariants. The study of such relations goes back at least to the middle of 19th century. However, most such statements are conjectural. I will present a general overview of these statements, why they are important, and what is known about.

Speaker Profile

Mahesh Kakde is a Professor of mathematics at the department of mathematics in Indian Institute of Science since 2019. Before moving to IISc he was a faculty at King's College London for 8 years. Mahesh Kakde finished his PhD from University of Cambridge under the supervision of Professor John Coates. Mahesh Kakde specialises in algebraic number theory. His work involves proving conjectures on special values of L -functions.

PROFESSOR NEELA NATARAJ

Dean (Faculty Affairs), Department of Mathematics, Indian Institute of Technology, Bombay

A unified framework for lowest-order FEM for fourth-order elliptic problems



A unified framework for fourth-order linear and nonlinear elliptic problems with general sources allows for quasi-best approximation with lowest-order finite element methods (FEMs). The talk discusses the stability and error control in the piecewise energy and weaker Sobolev norms under minimal

hypotheses. Applications include the biharmonic problem, stream function vorticity formulation of the incompressible 2D Navier-Stokes equations, and the von Kármán equations with Morley, discontinuous Galerkin, and the $C0$ interior penalty schemes.

Speaker Profile

Professor Neela Nataraj works as a Professor in the Department of Mathematics, IIT Bombay and is currently serving as Dean (Faculty Affairs) of the institute. Her research interests are in the broad area of numerical analysis and scientific computing with emphasis on theory and applications. She has been actively involved in popularization of Computational PDE, and has contributed profoundly by serving on a number of national as well as international bodies governing conduct of workshops, conferences, symposia, women empowerment in mathematics, etc. and is a recipient of INSA Teachers Award.

LECTURE INSA YOUNG ASSOCIATE

PROFESSOR RATNA PAL

Department of Mathematics, Indian Institutes of Science Education and Research, Mohali

Relation between Hénon maps with biholomorphic escaping sets. Abstract



The broad research area of my talk is Complex Dynamics in Several Variables. Classically complex dynamics was studied for rational endomorphisms of the Riemann sphere. In the past three decades, this field of research has flourished to a great extent, and holomorphic dynamics in higher dimensions

has attracted a lot of attention. In particular, the dynamics of the polynomial automorphisms in higher dimensions mushroomed as one of the central themes of the study. In the two-dimensional complex space, the most important polynomial automorphisms are the Hénon maps. In this talk, we shall discuss an important rigidity property of Hénon maps: Suppose H and F are a pair of Hénon maps with biholomorphic escaping sets. Then $F = A \circ H \circ B$, where A and B are affine automorphisms determined by H and F .

Speaker Profile

I am an assistant professor in the Department of Mathematics of IISER Mohali. My research interest is Several Complex Variables. Before joining IISER Mohali I worked as an assistant professor at IISER Berhampur briefly. Prior to that, I was a National Post Doctoral Fellow at IISER Pune and an NBHM post-doctoral fellow I completed my PhD from the Indian Institute of Science (IISc) under the supervision of Professor Kaushal Verma.

LECTURE INSA ASSOCIATE FELLOW

DR MANAS RANJAN SAHOO

School of Mathematical Sciences, National Institute of Science Education and Research, Bhubaneswar

Initial boundary value problem for the 1D pressureless gas dynamics



In this talk, we address the solvability of the initial boundary value problem for the one-dimensional pressureless gas dynamics equations. Using the method of generalized potentials and characteristic triangles, we obtain a Hopf-lax type formula that satisfies the

Lax-entropy condition and a weak form of boundary condition. Further, we show that the constructed solution conserves mass and the conservation of momentum depends on the behavior of the generalized boundary potential.

Speaker Profile

Currently I am an associate professor at School of Mathematical Sciences, NISER, Bhubaneswar. I completed my Ph.D. from TIFR CAM-Bangalore and did my Postdoctoral research at the University of Innsbruck (Austria) with an Ernst-Mach stipend. My research area is Partial Differential Equations, particularly conservation laws and delta waves. I have been selected for the Inspire Faculty award in 2015 and INSA Associates in 2024.

LECTURE PREVIOUS INSA ASSOCIATE FELLOW

DR HARIPADA SAU

Department of Mathematics, Indian Institutes of Science Education and Research, Pune

Affine varieties as a complete spectral set



A polynomial in two variables is said to be a toral polynomial if it defines a distinguished variety, i.e., if its zero locus intersects the open bidisk and exits through its distinguished boundary. Say that a commutative contractive pair is toral/algebraic if it is annihilated by a toral/nonzero polynomial. Ando's Dilation

Theorem inspires the following natural questions. Does a toral/algebraic commutative contractive pair dilate to a toral/algebraic commutative isometric pair? The existence of such dilation for a commutative contractive pair is equivalent to the pair having a non-trivial affine variety as a complete spectral set. We shall see that the answer depends on the dimension of the defect spaces of the contractive operators. This is a joint work with Dr Bata Krishan Das.

Speaker Profile

Dr Sau is currently an assistant professor in the mathematics department of IISER Pune. He completed his PhD in 2016 from IISc under the supervision of Professor Tirthankar Bhattacharyya. He has done his postdoctoral research at IIT Bombay, Virginia Tech, IIT Guwahati, and TIFR CAM Bangalore. His area of expertise lies in Hilbert space operator theory, function theory, Pick interpolation problems, and certain affine varieties.

SECTIONAL COMMITTEE II

Chair: Professor Kalobaran Maiti

Senior Professor, Tata Institute of Fundamental Research, Mumbai



Professor Kalobaran Maiti completed his undergraduate studies in Physics at Presidency College and Calcutta University, Ph.D. at IISc Bangalore and post-doctoral work as an Alexander von Humboldt Fellow at Forschungszentrum-Juelich,

Germany. He is working at TIFR Mumbai since February 2001. He is a leading scientist in the field of quantum materials studied by high-resolution (energy, momentum, spin, and time-resolved) electron spectroscopy. He built a high-resolution electron spectroscopy laboratory, a unique one in the country and comparable to the best few in the world. He is well known for his contributions in the field of correlated electron systems, magnetic materials, Fe-based superconductors, and topological materials. He has discovered novel methods to study complex materials and found several unusual phenomena that led to many publications in reputed International journals. He received many awards and recognitions throughout his career including the most prestigious Shanti Swarup Bhatnagar Prize in Physics and fellowship of all the three major science Academy in India. He played a key role in promoting various bilateral programs such as Indo-German, Indo-Japan, Indo-Italian, etc. He was awarded 'The Title of Honorary DAAD Advisor (2006 – 2009)' by the President of the Federal Republic of Germany for outstanding commitment and leadership in promoting Indo-German relations in Education.

Lecture of INSA Distinguished Lecture-2 Fellow

PROFESSOR RAJESH GOPAKUMAR

Distinguished Professor, TIFR and Centre Director, International Centre of Theoretical Sciences (ICTS-TIFR)

Deriving Gauge-String Duality



Gauge theories are the building blocks of our current physical understanding of the universe. In parallel, string theory is a framework for a consistent quantum description of gravity. Gauge-String duality a.k.a. the AdS/CFT correspondence proposes a remarkable connection between these

two very different classes of theories. I will discuss why it is fundamental to arrive at a first principles understanding of the underlying mechanism of this duality relating quantum field theories and string theories (or other theories of gravity). I will then proceed to discuss a very general approach which aims to relate large N QFTs and string theories, starting from free field theories and its successes thus far.

Speaker Profile

Rajesh Gopakumar is currently Distinguished Professor of TIFR and Centre Director of the International Centre of Theoretical Sciences (ICTS-TIFR). His broad interests are in theoretical physics but with a particular focus on Quantum Field Theories and String theory. In particular, he has been developing a program to understand why string theories are not arbitrary theoretical constructs, but rather arise naturally from quantum field theories.

LECTURE NEW FELLOW

PROFESSOR DIPANKAR BHATTACHARYA

Sunanda and Santimay Basu, Chair Professor of Astrophysics and Head, Department of Physics, Ashoka University, Sonipat

The exotic world of extreme magnetism in the universe



The strongest known magnetic fields in the universe are harboured by ultra-dense Neutron Stars, with field strengths ranging to over a petagauss. Such extreme fields lead to exotic phenomena around these stars, including magnetospheric pair generation, vacuum polarisation, plasma

collimation and polarised, beamed emission from radio to gamma rays. Energy release via the magnetic field can power energetic explosions like hyperflares, supernovae and gamma ray bursts. The life history of a neutron star is intimately connected to its magnetic field. The origin of these strong magnetic fields, their distribution within the star and how they evolve with time have remained enduring open questions that are being actively addressed. This talk will provide an introduction to the observed phenomena related to these strong fields and present the current state of theoretical understanding of the same.

Speaker Profile

Dipankar Bhattacharya is an Indian Astrophysicist working in the area of High Energy strophysics. His work encompasses both theoretical and observational investigation of phenomena related to compact stars and cosmic explosions. He has been a member of faculty at the Raman Research Institute, Bengaluru and the Inter-University Centre for Astronomy and Astrophysics, Pune. At present he is the Sunanda and Santimay Basu Chair Professor in Astrophysics at Ashoka University, Sonipat.

PROFESSOR SANJAY KUMAR

Department of Physics, Banaras Hindu University

Statistical Mechanics of Periodically Driven DNA



We propose a generic model to study the unzipping dynamics of DNA under periodic force. By applying an oscillatory force with amplitude F and frequency ν , we observe a dynamical transition in DNA chains of finite length. Our analysis reveals that the area of

the hysteresis loop A_{loop} , scales with exponents similar to those observed in magnetic systems. As we approach the thermodynamic limit, the high-frequency scaling regime extends to lower frequencies for larger chain lengths, L . Ultimately, the system demonstrates a single scaling behavior, $A_{loop} \sim \nu^{-1} F^2$, in the true thermodynamic limit.

Speaker Profile

Professor Sanjay Kumar is a distinguished physicist with over 33 years of teaching & research experience and extensive international exposure. He completed his graduation from Bhagalpur University, post graduation from Kumaun University, and Ph.D. from Banaras Hindu University. His expertise in soft condensed matter and biological physics, using advanced statistical mechanics and computational techniques, has led to over 80 publications in the journals of international repute. Professor Kumar is an elected Fellow of the Indian Academy of Sciences, Bangalore, a recipient of the INSA Young Scientist Medal, and a Simon Associate at ICTP. He began his career at Tripura University and now serves as Senior Professor, Director of the Institute of Science, and Rector of the Banaras Hindu University.

Lecture of INSA Distinguished Lecture-1 Fellow

DR VEERENDRA K. SHARMA

Scientific Officer (G), Solid State Physics Division,
Bhabha Atomic Research Centre, Mumbai

Unveiling the Nanoscale Dynamics of Soft Matter



The macroscopic properties of soft matter, such as viscoelasticity, are intricately linked to molecular motions occurring on the nanoscale. Neutron scattering serves as a powerful tool for probing these dynamics, uniquely capturing both temporal and spatial details. In this talk, I will

share recent advancements from our group [1-13], illuminating the nanoscale dynamical behavior of soft materials using neutron scattering and molecular dynamics simulations.

First, I will explore dynamic processes within self-assembled systems like bicontinuous microemulsions (B μ E) [1-3], illustrating how peptides can distinctly influence B μ E dynamics across spatial and temporal scales [2]. Following this, I will discuss the multiscale dynamics of lipid membranes, essential to their viscoelastic properties [4,5]. These findings provide insight into novel action mechanisms of antimicrobial agents, including peptides and ionic liquids, which hold promise for tackling drug-resistant bacteria [6-8].

Next, I will delve into the reorientational dynamics of organic cations in hybrid organic-inorganic perovskites, highlighting their vital role in boosting photovoltaic performance [9-11].

Finally, I will conclude with two significant findings: the non-canonical relationship between Stokes-Einstein breakdown and dynamical heterogeneity

in lithium-salt-based deep eutectic solvents, which could serve as eco-friendly electrolytes for lithium-ion batteries, and a new non-Gaussian fractional Brownian motion model [12,13]. This model elegantly captures the crossover from non-Gaussian to Gaussian sub-diffusion in glassy systems, opening new avenues in the understanding of disordered materials [13].

References

1. V. K. Sharma et al., *Soft Matter* 13 (2017) 4871.
2. V.K. Sharma et al., *J. Colloid Int. Sci.* 590 (2021) 94.
3. V.K. Sharma et al., *J. Phys. Chem. C* 123 (2019) 11197.
4. V.K. Sharma et al *Progress in Lipid Research* 87 (2022) 101179.
5. V. K. Sharma et al., *Soft Matter* 20 (2024) 7763.
6. V. K. Sharma et al., *J. Phys. Chem. Lett.* 15 (2024) 7075.
7. V. K. Sharma et al., *J. Phys. Chem. Lett.* 7 (2016) 2394.
8. V. K. Sharma et al., *Langmuir* 35 (2019) 4152.
9. V. K. Sharma et al., *J. Phys. Chem. Lett.* 11 (2020) 9669.
10. V. K. Sharma et al., *J. Phys. Chem. C* 125 (2021) 13666.
11. V. K. Sharma et al., *J. Phys. Chem. C* 126 (2022) 7158.
12. H. Srinivasan et al., *J. Phys. Chem. Lett.* 14 (2023) 9766.
13. H. Srinivasan et al., *Phys. Rev. Lett.* 132 (2024) 058202.

Speaker Profile

Dr Veerendra K. Sharma is currently serving as a Scientific Officer (G) in the Solid State Physics Division at the Bhabha Atomic Research Centre, Mumbai, and as an Associate Professor at the Homi Bhabha National Institute (HBNI), Mumbai, India. His research interests include soft condensed matter, membrane biophysics, complex fluids, and energy materials. Dr Sharma earned his doctoral degree from the HBNI, followed by postdoctoral research at Oak Ridge National Laboratory, USA. His expertise spans Neutron Scattering and Molecular Dynamics Simulations.

LECTURE INSA YOUNG ASSOCIATES

DR SOURAV DUTTA

Associate Professor, Tata Institute of Fundamental Research, Mumbai

Cooling of trapped ions by collisions with ultracold atoms



Ultracold gases, with temperatures below 1 mK achieved through laser-cooling, are excellent model systems for experimental studies of interactions. Such studies improve our understanding of collisions, few-body physics as well as many-body interactions. Several choices

of ultracold systems exist based on neutral atoms, neutral molecules or trapped ions. The key difference between them is in the way they interact: neutral atoms interact via the long-range ($1/r^6$) Van der Waals potential, polar neutral molecules via the long-range ($1/r^3$) dipole-dipole interaction potential, ions via the $1/r$ Coulomb potential etc. Barring a few recent experiments, work on neutral atomic systems and charged ionic systems have evolved independently. Our work combines the two fields. Our hybrid trap apparatus consists of a magneto-optical trap for atoms and a Paul trap for ions. Atoms and ions interact via the $1/r^4$ polarizability interaction, distinct from those mentioned above. We study low energy atom-ion collisions in the hybrid system. I will discuss some of our interesting findings: we demonstrated a new method of cooling ions based on resonant charge exchange with atoms and, in contrast to popular belief, we demonstrated cooling of low-mass ions by atoms of higher mass. In our new apparatus, we plan to extend the study to ion-molecule interaction which is challenging and minimally explored.

Speaker Profile

Dr Sourav Dutta is currently an Associate Professor in TIFR Mumbai. He obtained his PhD degree from Purdue University (USA) in the year 2013 working on ultracold molecules. He then returned to India and worked as a DST INSPIRE Faculty at the Raman

Research Institute, Bangalore. He joined the faculty of TIFR Mumbai in 2018 where he has set up an experimental research group focused on ultracold atoms, trapped ions, ultracold molecules, quantum optics and high-resolution laser spectroscopy. His significant contributions include the demonstration of a new cooling mechanism for trapped ions and the detection of ions using atom-cavity collective strong coupling. His work has been recognized through various awards such as the Bilsland Dissertation Fellowship and the Karl Lark-Horovitz Award of Purdue University, and the 2020 Young Scientist Award of the Indian Society of Atomic and Molecular Physics.

LECTURE INSA ASSOCIATE FELLOW

PROFESSOR KAMAL P. SINGH

Indian Institute of Science Education and Research (IISER), Mohali

Attosecond Lasers and its Metrology Applications.



Attosecond laser science and technology is the state-of-the-art ultrafast research theme with capability to probe fundamental electron dynamics at their natural time scale and development of ultrafast electronic devices. I will describe our decade long experimental effort to successfully develop

attosecond laser system at IISER Mohali and highlight innovative ultrafast delay lines offering a few attosecond delay resolution in pump-probe measurements. I will also show examples of recent attosecond control of non-adiabatic electron dynamics in high harmonics generation process. I will end this talk by elaborating our future plans to gain novel insight into attosecond dynamics of electrons of finite quantum systems.

Speaker Profile

Professor Kamal Priya Singh, born 1979 in Rohtak Haryana, studied physics at the Jawahar Lal Nehru University New Delhi and finished

his PhD in 2005 from University of Rennes France. He accepted a postdoctoral position at Max Planck Institute Germany from 2005 to 2007 and was promoted to staff scientist. He also worked as Research Associate in Kansas State University, USA. From 2009, he has been working at IISER Mohali and rose to the rank of Professor in 2022. He was awarded the Max-Planck Partners group and Indo-French CEFIPRA project among other national and international funded projects. His research interests include light-matter interaction, precision interferometry, femtosecond and attosecond physics, development of new laser sources, radiation pressure effects and development of precision metrology instruments. He is a leading researcher in physics and applications of silk materials worldwide. He has guided 10 PhD students, 25 MS students and 7 postdocs. He has delivered 100+ talks in national and international conferences.

PROFESSOR RAGHUNATH SAHOO

Department of Physics, Indian Institute of Technology, Indore

Measurement of Charm hadrons in proton collisions at the Large Hadron Collider using Machine Learning

Charmonia (J/ψ) suppression is an important signature of quark-gluon plasma (QGP), the primordial matter believed to have been produced in the infancy of our Universe before 13.8 billion years ago. Charmonia production in proton collisions is used as a baseline measurement to analyze the possible formation of QGP in heavy-ion collisions at ultra-relativistic energies. However, recent observations of heavy-ion-like signals in high-multiplicity proton collisions at the TeV energies, have mandated a closer look at multihadron production dynamics in such collisions.



We measure J/ψ as a function of final state charged particle multiplicity in proton-proton collisions at 5.02 and 13 TeV center-of-mass energies using the ALICE detector at the Large Hadron Collider. J/ψ is measured at the forward rapidity in the dimuon channel with the charged particle multiplicity at the midrapidity. This measurement is compared with the midrapidity J/ψ measurement in the dielectron channel. None of the existing theoretical models are successful in explaining the multiplicity-dependent J/ψ yield and mean transverse momentum. As these measurements are with inclusive J/ψ in the absence of a detector for secondary vertexing, we have tried using the track properties of decay daughters and the decay topology of J/ψ (D^0) to distinguish prompt and nonprompt J/ψ (D^0) using machine learning. Successful augmentation of ML techniques in the data analysis framework may be highly successful in the study of J/ψ (D^0) production dynamics.

Speaker Profile

Professor Raghunath Sahoo is a professor of experimental high-energy nuclear physics at the Indian Institute of Technology Indore. He has worked at the Relativistic Heavy-Ion Collider (RHIC), Brookhaven National Laboratory, USA, the Large Hadron Collider, CERN, Geneva, Switzerland, and FAIR, GSI, Darmstadt, Germany, in the creation and characterization of quark-gluon plasma, the primordial matter, in the laboratory. His research interest is to study the QCD phase diagram, the deconfinement transition, multihadron production dynamics, and the application of statistical mechanics and machine learning in high-energy nuclear physics. He has guided 12 PhD students and 12 postdoctoral fellows, along with more than 50 masters and BTech students. He is an elected fellow of NASI, Prayagraj, the Institute of Physics, United Kingdom, and an Associate Fellow of INSA, New Delhi. Professor Sahoo was a CERN Scientific Associate during 2021-22 and received the Excellence in Research award - 2024 of IIT Indore.

LECTURE PREVIOUS INSA ASSOCIATE FELLOW

DR KASTURI SAHA

Associate Professor, Department of Electrical Engineering, Indian Institute of Technology, Bombay

Quantum sensing with Nitrogen Vacancy Centers in Diamond



Diamond color centers, especially nitrogen-vacancy (NV) centers, show promise for quantum computing and sensing applications. Among these, NV centers stand out for their potential in precision magnetometry, enabling nanoscale magnetic imaging with diverse

applications, including brain imaging, studying magnetotactic bacteria, analyzing quantum materials, and geomagnetic field sensing. In this presentation, I will provide an overview of our research focused on developing NV center based magnetometers. Additionally, I will discuss our ongoing work on a magnetic field microscope. Although NV centers are commonly used to measure static magnetic fields over wide areas with diffraction-limited resolution, achieving dynamic widefield magnetometry has posed significant challenges. I will present our pioneering demonstration of dynamic widefield magnetometry using NV centers in diamond and explore its applications, showing how this advancement pushes the boundaries of NV center capabilities in real-time magnetic field measurement.

Speaker Profile

Kasturi Saha is an associate professor in the Department of Electrical Engineering at IIT Bombay. She was a postdoctoral fellow in Professor Paola Cappellaro's group in the Research Laboratory of Electronics at Massachusetts Institute of Technology. She obtained her PhD from Professor Alexander Gaeta's group in the School of Applied and Engineering Physics in Cornell University. Prior to that she did her MSc from IIT-Delhi and BSc (Hons.) from St. Stephen's

College, Delhi. Her research interests include quantum sensing, nano-photonics, precision metrology, and quantum information with solid state color defects. She is a recipient of the Department of Science and Technology-INSPIRE faculty fellowship, IIT Bombay Young Faculty Award, Venus International Young Faculty Award, Young Applied Physicists' Award and IITB C1973 Research Excellence Award 2024.

SECTIONAL COMMITTEE III

Chair: Professor M Lakshmi Kantam

Dr B.P. Godrej Distinguished Professor, Department of Chemical Engineering, Institute of Chemical Technology, Mumbai



Professor Lakshmi Kantam is Dr B.P. Godrej Distinguished Professor of Green Chemistry and Sustainability Engineering at Department of Chemical Engineering, Institute of Chemical Technology, Matunga, Mumbai-400019, India. She has 40 years of

experience in the design and development of catalysts for innovative green and economical processes for chemical industry. Earlier, she served as Director at CSIR-IICT, Hyderabad. She has authored more than 365 publications, 52 patents and five book chapters. She is an Adjunct Professor at RMIT University, Melbourne, Australia and Honorary Professor at The University of Newcastle, Australia.

Lecture of INSA Distinguished Lecture-2 Fellow

DR SRINIVASAN NATARAJAN

Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore

Designing new white light emitting materials for low-cost LEDs

In recent years, much effort has been expended to develop new hosts for solid-state devices. There are many advantages in developing solid-state light-emitting devices (WLEDs) due to the energy efficiency as well as environmentally benign nature. Two approaches have been adopted towards the development of white LEDs.



In the first approach, blue-emitting LEDs such as InGaN, (450–480 nm) in combination with near UV-emitting LEDs and a suitable phosphor can be attempted. In the second approach, the use of UV-LED with tricolor (Red, Green, Blue; RGB) phosphors. [1] Controlling the photoluminescence behavior in the material would require the following considerations: (i) crystal structure needs to be flexible (adaptable) to accommodate different substitutions and (ii) good coupling of activators to host lattice along with efficient energy transfer. Single-phase white-light-emitting phosphors have attracted much attention recently to develop white LEDs. The advantages of this approach are many: (i) good luminescence efficiency and color rendering index; (ii) reproducibility of the luminescence and (iii) easier synthesis, which reduces the manufacturing costs. It may be noted that it is important to realize good energy transfer between the sensitizer and activator in a single-phase phosphor.

Over the years, we have explored many mineral structures towards developing new and interesting compounds. Our studies also indicate that we could successfully develop white-light emission using minimal

use of rare-earth ions. We have also been successful in creating white light emission by combining Bi³⁺ ions and rare earths.[2]

References

1. M.L.P. Reddy et al, J. Photochem. Photobiol. C: Reviews: 33, 109-131 (2017)
2. S. Natarajan et al, Chemistry – An Asian J, 2017, 12, 2734; European. J. Inorg. Chem., 2018, 2277; Inorg. Chem., 2019, 58, 8560; Dalton Trans., 2020, 49, 17649; Chem. Asian J., 2020,15, 3104; Chemistry A European J. 2021, 27, 1995; Eur. J. Inorg. Chem., 2023, 26, e2023004; Eur. J. Inorg. Chem., 2023, 26, e202300305. Chem. Asian J. 2024, 19, e202301113; Chem. Mater., 2024, 36, 5356–5369.

Speaker Profile

Dr S. Natarajan completed his Ph.D. from Indian Institute of Technology, Madras (Professor G.V. Subba Rao, 1990). He carried out his post-doctoral research at the Davy-Faraday Research Laboratory, The Royal Institution of Great Britain, London, UK (Professor Sir J.M. Thomas, FRS) and at Materials Research Laboratory, UC Santa Barbara, USA (Professor Sir A.K. Cheetham, FRS) (1990–97). He returned to India and joined the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore (1997–2004). He moved to the Indian Institute of Science, Bangalore in 2004, where he is a Senior Professor. He has published about 350 original research publications. He is the elected fellow of all the three science academies of India. He holds a J.C. Bose National Fellowship. He is a recipient of Professor Balakrishnan endowment lecturer award (University of Madras), Professor S. Swaminathan 60th birthday commemoration medal (INSA), Dr Ramana Award (Karnataka State), CNR Rao-Sastra Award (SATRA) and INSA Distinguished lecturer award (INSA). Presently, he is the Editor for Journal of Chemical Sciences and Inorganic Chemistry Communications.

LECTURE NEW FELLOW

PROFESSOR RAHUL BANERJEE

Department of Chemical Sciences, Indian Institute of Science Education and Research (IISER), Kolkata, Mohanpur

Reticular Chemistry and Porous Framework Materials



Covalent Organic Frameworks (COFs) represent a novel class of highly porous, crystalline polymers with uniformly ordered pore channels. Despite their extensive use for storing various molecular species such as gases, nanoparticles, enzymes, and drugs, the potential of their ordered pore channels

for molecular separation still needs to be utilized. In this context, we have successfully addressed the chemical stability issue by synthesizing β -ketamine-based frameworks. We have also developed a simple, scalable, and innovative methodology that allows for the synthesis of COFs by merely mixing and heating the reactants. This method enables the processing of COFs into self-standing Covalent Organic Framework Membranes (COMs). These self-standing membranes are flexible, continuous, free from internal defects or cracks, and demonstrate long-term durability. They maintain structural integrity in water, organic solvents, and mineral acids (3 N HCl). We have applied these COMs in separation applications, such as wastewater treatment and recovering valuable Active Pharmaceutical Ingredients (APIs) from organic solvents. Our findings highlight that COFs have significant potential to address some of the world's most challenging separation problems, including wastewater treatment and drug recovery in the pharmaceutical industry.

Speaker Profile

Professor Rahul Banerjee received his PhD from the University of Hyderabad, in 2006. Professor Rahul Banerjee is a Professor at the Indian Institute of Science Education and Research (IISER) in Kolkata. His research interests include the study of structural

chemistry with the flavor of chemical synthesis to design new porous materials. Rahul Banerjee's research group is working with TATA Steel to develop a process to make porous covalent organic frameworks with exceptional chemical stability for CO₂ capture. Professor Banerjee is an editorial board member and associate editor of the Journal of the American Chemical Society.

PROFESSOR SWAGATA DASGUPTA

Department of Chemistry, Indian Institute of Technology, Kharagpur

The Many Facets of Protein Chemistry



Proteins are involved in biochemical events in which molecular recognition is known to play a major role. A knowledge of protein interactions is crucial to help elucidate functions of individual proteins. Any change can affect the structural and biochemical properties of a protein and alter its ability to bind other molecules, called ligands, that span a range

from small molecules to large macromolecules. Protein - ligand interactions are influenced by several factors from binding site sequence information, to local biochemical properties of binding sites. Modifications in proteins account for structural and functional changes that can have an impact on several disease processes. Carrier proteins such as human serum albumin to enzymatic proteins such as ribonuclease A and angiogenin as well as structural proteins such as crystallin are the proteins of interest. Methods to combat oxidative stress in proteins are based on interaction studies of polyphenols and encapsulated polyphenols with proteins. The effects of glycation on several proteins have shown that reducing sugars are responsible for oligomer formation in proteins. Our studies have provided important insights on the consequences of oxidative stress and glycation in proteins and through biophysical studies notable structural and functional changes are observed.

Speaker Profile

Swagata Dasgupta is a Professor in the Department of Chemistry, IIT Kharagpur. Her research

involves protein-small molecule and protein-protein interactions and protein aggregation studies. Her current interests include effects of oxidative stress and glycation in proteins, nanoparticle-protein interactions and the utilization of discarded protein for diverse applications. She has contributed to teaching and research at IIT Kharagpur for ~30 years with ~170 publications to her credit and supervised ~30 doctoral students under sole and joint supervision with 10 more in progress. Her online courses, especially the course on Biochemistry, available through NPTEL have received many accolades. She is a Fellow of the Indian Academy of Sciences (2018) and the West Bengal Academy of Science and Technology, India (2014). She is a recipient of the Bronze medal of the Chemical Research Society of India (CRSI) in 2016 is currently one of the Vice-Presidents of CRSI.

PROFESSOR ABHISHEK DEY

School of Chemical Sciences, Indian Association for the Cultivation of Science, Kolkata

Exploring Chemistry with Electrons and Protons



The objective of this lecture is to introduce the chemistry being developed in the lab of the presenter at IACS, Kolkata. Multiproton and multielectron reactions are abundant in nature and drive respiration, fixation, assimilation and dissimilation in carbon, sulfur, nitrogen and oxygen cycles in

nature. Chemically speaking these include reactions like $4e^-/4H^+$ reduction of O_2 to H_2O in O_2 reducing eukaryotes, $6e^-/8H^+$ reduction of NO_2^- to NH_4^+ in nitrate reducing bacteria, $6e^-/6H^+$ reduction of SO_2 to H_2S in sulfate reducing bacteria. These reactions are responsible for storing electrical energy in the form of high energy bonds as well as releasing this energy to drive biological and chemical processes in nature which drive the different energy cycles and maintain the ecology of the biosphere. These reactions are catalyzed by metalloenzymes which has evolved to orchestrate the transfer of protons and electrons to result in the

desired reduced product without the release of partially reduced products like H_2O_2 during O_2 reduction, NO/N_2O during NO_2^- reduction etc. This requires precise control of proton and electron delivery to the active site which is achieved by proton transfer residues and electron transfer partners. The research in our lab is focussed on understanding this balance achieved by metalloenzymes using small molecule analogues. This talk will detail the approach taken by us and how that has enabled understanding of these effects and produce catalysts which can facilitate these reactions and other reactions of relevance to energy and environment.

Speaker Profile

Abhishek obtained his undergraduate degree from the Presidency College, Calcutta and his PhD from Stanford University, CA, USA. He joined IACS in June 2009 as an Assistant Professor and is currently serving as a senior Professor at the school of chemistry. He is the recipient of the American Chemical Society Division of Inorganic Chemistry Young Investigator Award, Society of Porphyrin and Pthalocyanine Young Investigator Award, James Hoeschele award from the Asian Biological Inorganic Chemistry, and Society of Biological Inorganic Chemistry Emerging Investigator Award, India. He has been a Young Associate of the Indian Academy of Science, a CRSI Bronze medal awardee and a SERB-STAR fellow. He is an elected fellow of Indian Academy of Science (FASc), Bangalore, National Academy of Sciences (FNASc), India and the National Academy of Sciences (FNA). His current area of research involves development of homogeneous and heterogeneous catalysts for sustainable energy and clean environment. A combination of synthesis, self-assembly, spectroscopy, electrochemistry and electronic structure calculations are used to attain these research goals. He has served the international editorial advisory boards of Chemical Reviews, Chemical Communications, Inorganic Chemistry, Journal of Biological Inorganic Chemistry and ACS Catalysis. Currently he is an associate editor of ACS Catalysis. He is serving as the elected president of Asian Biological Inorganic Chemistry (AsBIC).

PROFESSOR JAYANTA HALDAR

Antimicrobial Research Laboratory, School of Advanced Materials, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore

Outwitting antibiotic resistance: A perpetual battle



Antimicrobial resistance (AMR) currently claims around seven hundred thousand lives annually and this is expected to rise to ten million by 2050 if not tackled immediately. As arsenal of effective antibiotics dwindle, more and more efforts are being focussed on the development of

novel strategies to tackle drug resistant bacteria. This talk involves our efforts towards mitigation of problems created due to antimicrobial resistance and complex infections. The development of synthetic small molecular and macromolecular mimics of antimicrobial peptides targeting bacterial membrane as an alternative class of antibacterial agents will be discussed.¹ The novel approaches to overcome acquired, intrinsic and adoptive bacterial resistance towards glycopeptides, via semisynthetic modifications of vancomycin will also be discussed.²⁻⁴ With the view of rehabilitation of the shelved out, inactive antibiotics, our lab is working on developing antibiotic adjuvants, i.e. agents which, when used in combination with the obsolete or ineffective antibiotic, will repurpose or reactivate the antibiotic against clinically relevant Gram-negative superbugs.⁵⁻⁶ Unlike the conventionally used antibiotics, our pre-clinical leads tackle acquired and adaptive forms of phenotypic resistance as well as biofilm with negligible propensity for resistance development. We have also contributed towards the development of multi-functional smart antimicrobial biomaterials, which can address the myriad of problems associated with complicated infections and deep-tissue injuries.⁷

References:

1. Barman, S.; Dhanda, G.; Naik, P.; Mukherjee, R.; Joseph, J.; Halder, J.* *Adv. Therap.* **2022**, 2100234, 1-14.
2. Acharya, Y.; Dhanda, G.; Sarkar, P.; Halder, J.* *Chem. Comm.* **2022**, 58, 1881-1897.
3. Sarkar, P.; De, K.; Modi, M.; Dhanda, G.; Priyadarshani, R.; Bandow, J. E.; Halder, J.* *Chem. Sci.* **2023**, 14, 2386-2398.
4. Sarkar, P.; Samaddar, S.; Ammanathan, V.; Yarlagaadda, V.; Ghosh, C.; Shukla, M.; Kaul, G.; Manjithaya, R.; Chopra, S.; Halder, J.* *ACS Chem. Biol.* **2020**, 15, 884-889.
5. Dhanda, G.; Mukherjee, R.; Basak, D.; Halder, J.* *ACS Infect. Dis.* **2022**, 8, 10861097.
6. Dey, R.; Mukherjee, S.; Mukherjee, R.; Halder, J.* *Chem. Sci.* **2024**, 15, 259-270.
7. Dey, R.; Mukherjee, R.; Halder, J.* *Adv. Healthc. Mater.* **2022**, 11, 2200536.

Speaker Profile

Dr Jayanta Halder is a Professor at the Antimicrobial Research Laboratory in the New Chemistry Unit (NCU) and School of Advanced Materials (SAMat), Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru, India. He joined New Chemistry Unit at JNCASR as an Assistant Professor in 2009, and subsequently became an Associate Professor in 2015. He completed his undergraduate training at the Presidency College, University of Calcutta and he received his Master of Science and PhD from the Indian Institute of Science, Bangalore in 2005. He then pursued his Postdoctoral Research at the Department of Chemistry, Massachusetts Institute of Technology, USA till 2009. He is the Editor-in-Chief of *ACS Infectious Diseases* and has served as a member of editorial boards of various international journals in the field of infectious diseases and medicinal chemistry, such as *RSC Medicinal Chemistry* (till July 2023), *ACS Infectious Diseases* (till July 2023), *Biomacromolecules*, *Microbial Pathogenesis*, etc. He has received several awards and honours such as the Ramanujan Fellowship (Govt. of India), Sheik Saqr Career Award Fellowship, 8th National Award for Technology Innovation from Ministry of Chemicals & Fertilizers (Govt. of India), CDRI Excellence in Drug Research Award in Chemistry, Chemical Research Society of India (CRSI) Bronze Medal, Material Research Society of India (MRSI) Medal etc. He is an elected Fellow of Indian Academy of Sciences (IASc) Bangalore, Fellow of Royal Society of Chemistry (FRSC) UK, and Fellow of Indian National Science Academy (INSA) Delhi.

Professor Halder's research integrates an interdisciplinary Medicinal Chemistry and Chemical

Biology-based approach for understanding and countering Antimicrobial Resistance (AMR), development of novel therapeutics and newer strategies for tackling infections caused by pathogenic bacteria, fungi and viruses. His laboratory works towards developing smart biomaterials which aid in preventing the spread of infectious diseases, as well as cure infection and enhance wound healing. His multifaceted research has been published in high-impact international journals and has led to many national and international patents. His research has been highlighted in National Science Museums, and media such as BBC News, ACS Chemical Engineering News, Atlas of Science, Scientific American, The Telegraph, etc.

PROFESSOR SP RATH

Lalit Mohan Kapoor Chair, Department of Chemistry, Indian Institute of Technology, Kanpur

Multi-Heme Proteins & Enzymes: Our Understanding towards Nature's Design and Application



The family of multiheme proteins and enzymes constitutes one of the most fascinating molecular machineries designed by Nature and have emerged as a new and very important budding area of research today, which awaits an eventual blossom for its potential application towards sustainable development.

Interaction between heme centers has been smartly implemented to perform a wide variety of functions in biology. Rath's group is pioneer in investigating structure-activity correlation of this new and important class of proteins using synthetic models and contributed significantly to unfold mysteries of Nature's sophisticated design. Such investigations have also paved the way for new important discoveries that includes unusual stabilization of high-valent $M(IV)=O$ species, easy modulation of spin and oxidation states, heme-heme interactions as a powerful tool for controlling electronic structure and reactivity, highly efficient biocatalyst

for sustainable development, hitherto unknown metallophilic $Ag(III) \cdots Ag(III)$ interaction and so on. I will highlight some of these aspects in my talk.¹⁻³

References

1. a) S. Sarkar, R.K. Tiwari, G. Ragaraman, S P Rath, *Angew. Chem. Int. Ed.* **2024**, 63, e202402344. b) S. Sarkar, D. Samanta, P.P. Y. Chen, S. P. Rath, *Chem. Sci.*, **2024**, 15, 0000. c) A. Dhamija, S. P. Rath, *Chem. Sci.*, **2023**, 14, 6032. d) S. Sarkar, P. Sarkar, S. K. Pati, S P Rath, *ACS Catal.* **2022**, 12, 9589. e) A. Singh, S P Rath, *Angew. Chem. Int. Ed.* **2017**, 56, 8849. f) S. Dey, S P Rath, *Angew. Chem. Int. Ed.* **2016**, 55, 996. g) D. Sil, S P Rath, *Chem. Sci.*, **2016**, 7, 1212. h) D. Sahoo, S P Rath, *Angew. Chem. Int. Ed.* **2015**, 54, 4796.
2. a) P. Chakraborty, S P Rath, *Chem. Eur. J.* **2024**, 30, e202400266. b) D. Chandel, S P Rath, *Chem. Eur. J.* **2024**, 30, 00000. c) B. Saha, C. Pal, S P Rath, *Chem. Eur. J.* **2024**, 30, 00000. d) S. J. Shah, S P Rath, *Chem. Eur. J.* **2023**, 29, e202301963. e) B Saha, S P Rath, *Inorg. Chem.* **2022**, 61, 2154. f) Y. A. Pandit, S P Rath, *Inorg. Chem.* **2022**, 61, 5270. g) A K Singh, S P Rath, *Inorg. Chem.* **2021**, 60, 16492. h) A Kumar, S P Rath, *Chem. Eur. J.* **2021**, 27, 11428. i) A K Singh, S P Rath, *Chem. Eur. J.* **2020**, 26, 14405. j) A Kumar, S P Rath, *Chem. Eur. J.* **2020**, 26, 7869.
3. a) S. Sanfui, S P Rath, *Inorg. Chem.* **2024**, 63, 0000; b) S. Sanfui, S P Rath, *Inorg. Chem.* **2024**, 63, 5423. c) S Sanfui, S P Rath, *J. Inorg. Biochem.* **2023**, 240, 112109. d) S. Sanfui, S. P. Rath, *Inorg. Chem.* **2022**, 61, 8419. e) FST Khan, S P Rath, *Inorg. Chem.* **2021**, 60.

Speaker Profile

SP Rath received his B.Sc and M.Sc from the Calcutta University in 1992 and 1994, respectively, and completed his Ph.D in 1999 in Chemistry from Indian Association for the Cultivation of Science (IACS), Kolkata. He then worked as a NIH Post-doctoral Fellow at the University of California, Davis (USA) and joined the Department of Chemistry at IIT Kanpur in 2004 where he has been a full professor since 2014. He has received several awards and honours including P. K. Kelkar Research Fellowship for young faculty (2009-12), Alexander von Humboldt Fellowship for Experienced Researcher (2012), Chemical Research Society of India (CRSI) Bronze medal (2015), C. N. R. Rao National Prize in Chemical Sciences (2019), Professor R S Varma

Memorial Award by Indian Chemical Society (2020), Japan Society for the Promotion of Science (JSPS) Invitational Fellowship (2020), SERB-Science and Technology Award for Research (SERB-STAR) (2020), J. N. Gupta & M. Gupta Chair (2017- 20) and Lalit Mohan Kapoor Chair (2022-25) at IIT Kanpur. He has been elected fellows of all major Indian academics such as National Academy of Sciences (2017), West Bengal Academy of Science & Technology (2017), Indian Academy of Sciences, Bangalore (2020) and Indian National Science Academy (2024). He has taught a variety of UG and PG courses and also has received "Excellence-in-Teaching" award from IIT Kanpur in 2021. He has guided around 25 PhD students and has over 150 research publications in high-impact international journals. His research is in the fields of Physical-Inorganic and Bioinorganic Chemistry with special emphasis on the structure-function correlation utilizing a wide variety of synthetic and spectroscopic methods combined with DFT calculations.

PROFESSOR AKHILA K. SAHOO

Goverdhan Mehta Chair Professor, School of Chemistry, University of Hyderabad

Sustainable Synthetic Organic Chemistry on Pharmaceutical Innovation



Tetrasubstituted olefins and heterocycles are fundamental building blocks present in many natural products, pharmaceuticals, agrochemicals, and electron-transport materials. Tamoxifen, a tricyclicethylene moieties, is an important drug candidate. The regioselective difunctionalization of unsymmetrical

alkynes provides facile access to highly substituted olefins, like Tamoxifen. The cyclization and annulation reactions of alkynes offer an attractive means to access various heterocyclic compounds. This multi-component one pot synthetic protocol could be sustainable and cost effective when compared with the multi-step methods. This presentation will feature strategies to design synthetic route

enabling tetrasubstituted olefins and cyclic heterocycles.

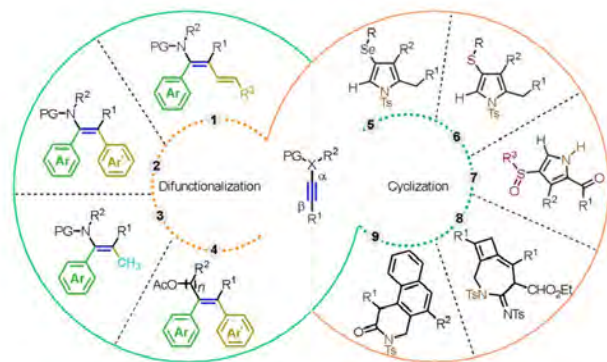


Figure 1. Regioselective difunctionalization and cyclization of internal alkynes

References

- 1) Vanjari, R.; Dutta, S.; Yang, S.; Gandon, V.; Sahoo, A. K. *Org. Lett.* **2022**, 24, 1524.
- 2) Dutta, S.; Yang, S.; Mallick, R. K.; Gandon, V.; Sahoo, A. K. *Angew. Chem. Int. Ed.* **2020**, 59, 10785.
- 3) Dutta, S.; Sahoo, A. K. *Angew. Chem. Int. Ed.* **2023**, 62, e2023006.
- 4) Dutta, S.; Shandilya, S.; Yang, S.; Gogoi, M. P.; Gandon, V.; Sahoo, A. K. *Nat. Commun.* **2022**, 13, 1360.
- 5) Dutta, S.; Prabagar, B.; Vanjari, R.; Gandon, V.; Sahoo, A. K. *Green Chem.* **2020**, 22, 1113.
- 6) DDutta, S.; Mallick, R. K.; Prasad, R.; Gandon, V.; Sahoo, A. K. *Angew. Chem. Int. Ed.* **2019**, 58, 2289.
- 7) Prabagar, B.; Mallick, R. K.; Prasad, R.; Gandon, V.; Sahoo, A. K. *Angew. Chem. Int. Ed.* **2019**, 58, 2365.
- 8) Nayak, S.; Ghosh, N.; Sahoo, A. K. *Org. Lett.* **2014**, 16, 2996
- 9) Nayak, S.; Ghosh, N.; Prabagar, B.; Sahoo, A. K. *Org. Lett.* **2015**, 17, 5662.

Speaker Profile

Akhila was born in Bhubaneswar (Odisha), India. He completed doctoral study at the CSIR-National Chemical Laboratory, Pune under the supervision of Professor Ganesh Pandey in 2001. He worked as a postdoc researcher with Professor Hans-Joachim Gais (RWTHAachen-Germany, 2002), Professor Tamejiro Hiyama

(Kyoto-University-Japan; JSPS; 2002–2005), and finally with Professor Atsuhiko Osuka (Kyoto-University; 2005–2006). Currently, he is working as full Professor at the School of Chemistry, University of Hyderabad. He serves as an Associate Editor for the New Journal of Chemistry (NJC) of Royal Society of Chemistry [January 2017 onwards]. He is a Fellow of Indian Academy of Sciences (FASc)-2021, Fellow of Royal Society of Chemistry (FRSC)-2020, and Fellow of National Academy of Sciences (FNASc)-2019. He holds the first Professor Goverdhan Mehta Chair Professor position in the School of Chemistry, University of Hyderabad from April 2024 onwards.

PROFESSOR BALASUBRAMANIAN SUNDARAM

Materials Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore

Learning Materials Science through Machine-Learned Potentials



Molecular simulations use a force field that is presumed to capture intermolecular interactions effectively and is transferable across substances and thermodynamic conditions. Notwithstanding the immense success it had, it was not entirely satisfactory, given the myriad interactions and

particularly their many-body moorings in any material. Machine learning and, in particular, artificial neural networks trained on quantum mechanically obtained total energies of atomic configurations and forces have redressed these issues to a great extent. Coupled with the fact that it is increasingly becoming possible to perform calculations on higher rungs of the Jacob's ladder to treat exchange-correlation interactions, molecular simulations of most materials at a given thermodynamic state point with quantum accuracy is a reality. In the lecture, I shall outline the operational scheme of machine-learned potentials and illustrate the

same with applications of our recent work on anomalous diffusion of water in aqueous salt solutions, the structure and transport of conducting species in aqueous zinc chloride solutions, and borate glasses under extreme conditions.

Speaker Profile

Balasubramanian Sundaram is a Professor at the Chemistry and Physics of Materials Unit at JNCASR, Bangalore, which he joined in 1998. He employs advanced atomistic computer simulations to realistically model substances and materials and obtains deep insights into experimental observations. His other interests include strategic affairs, Central Asian archaeology, and the history of India in the 1750-1850 period.

PROFESSOR KANA M. SURESHAN

School of Chemistry, Indian Institutes of Science Education and Research, Thiruvananthapuram

Thermal topochemical polymerization reactions: challenges and opportunities



Topochemical reactions, the reaction between pre-organized reacting motifs in the crystal lattice, are attractive as they do not require solvents, catalysts and other special reaction conditions for the reaction and provide products in pure form. Also

such reactions provide basic understanding about mechanistic and geometrical details about a reaction.¹ We have employed thermal Topochemical Azide-Alkyne Cycloaddition (TAAC), Topochemical Ene-Azide Cycloaddition (TEAC) and Topochemical Diels-Alder Cycloaddition (TDAC) reactions to synthesize various biopolymer mimics. We have exploited hydrogen bonding for the self-assembly of monomers in solid to pre-organize the reacting motifs. Lattice controlled polymerization/oligomerization reaction of such self-assembled (pre-organized) monomers gave various biopolymer mimics. By applying this methodology, we have topochemically synthesized monodisperse

glycopolymers, oligosaccharide mimics, DNA analogs and polypeptides.²⁻¹⁴ In this talk, the design and execution of such topochemical syntheses and their possible applications will be discussed.

Keywords: TAAC; TEAC; Topochemistry; Polymer; SCSC

References

1. Photochemistry in Organized and Constrained Media, ed. Ramamurthy, V. VCH Publishers, New York, 1991.
2. J. R. Pathan, H. Balan, P. Commins, A. Ravi, M. B. Al-Handawi, I. C.-Y. Hou, P. Naumov, K. M. Sureshan. *J. Am. Chem. Soc.* **2024**, 146, DOI:10.1021/jacs.4c09334
3. H. Balan, K. M. Sureshan. *Nat. Commun.* **2024**, 15, 6638.
4. R. Khazeber, S. Pathak, K. M. Sureshan. *Nat. Commun.* **2024**, 15, 6639.
5. A. Lal, M. C. Madhusudhanan, K. M. Sureshan. *Angew. Chem. Int. Ed.*, **2024**, 63, e202411165
6. R. Khazeber, G. S. Kana, K. M. Sureshan. *Angew. Chem. Int. Ed.*, **2024**, 63, e202316513.
7. T. Pramod, R. Khazeber, V. Athiyarath, K. M. Sureshan. *J. Am. Chem. Soc.* **2024**, 146, 7257.
8. R. Rai, R. Khazeber, K. M. Sureshan. *Angew. Chem. Int. Ed.*, **2023**, 62, e202315742
9. J. R. Pathan, S. Bhandary, K. M. Sureshan. *J. Am. Chem. Soc.* **2023**, 145, 22633.
10. C. Raju, K. Mridula, N. Srinivasan, S. Kunnikuruvan, K. M. Sureshan. *Angew. Chem. Int. Ed.*, **2023**, 62, e202306504.
11. A. Ravi, A. Pathigoolla, H. Balan, R. Gupta, G. Raj, R. Varghese, K. M. Sureshan. *Angew. Chem. Int. Ed.*, **2023**, 62, e202307324.
12. C. Raju, G. R. Ramteke, K. V. J. Jose, K. M. Sureshan. *J. Am. Chem. Soc.* **2023**, 145, 9607.
13. R. Khazeber, K. M. Sureshan. *Proc. Natl. Acad. Sci. U.S.A.* **2022**, 119, e2205320119.
14. R. Rai, B. P. Krishnan, K. M. Sureshan. *Proc. Natl. Acad. Sci. U. S. A.* **2018**, 115, 2896.

Speaker Profile

Kana M. Sureshan received PhD from the University of Pune in 2002. He has carried out his post-doctoral research at Ehime University, Japan (2002-

2004) availing JSPS fellowship, at the University of Bath (2004-2006) and at the Max Planck Institute for Molecular Physiology, Dortmund, Germany as an Alexander von Humboldt postdoctoral Fellow (2006-2008). In 2008, he joined the Institute of Life Sciences, Hyderabad as a senior scientist. In 2009, he moved to IISER Thiruvananthapuram as an Assistant Professor and from 2020 onwards he is a full professor and the Dean of Infrastructure & Planning. His research interests broadly lie in the fields of organic chemistry and supramolecular chemistry. He has published 125 research papers in international journals of high repute and has filed eight patents. He gave more than 250 invited-talks/plenary-lectures at various international conferences worldwide. Sureshan is a Fellow of the Royal Society of Chemistry, London, U. K. and Indian Academy of Sciences. He is an International Advisory/Editorial Board member of journals, *Angewandte Chemie*, *Chemistry Europe*, *Chemical Society Reviews* and *ACS Applied Polymer Materials*.

PROFESSOR SIVA UMAPATHY

Dept. of Inorganic and Physical Chemistry and Dept. of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore

Raman spectroscopy at time and spatial resolution



Raman spectroscopy has advanced to high spatial resolution enabling the study of chemical composition of single bacteria and to high time resolution to be able to follow the atomic level movements of a chemical bond vibration. We hope to present our work on both these points and then one example of societal applications.

Speaker Profile

S Umapathy, a professor of Indian Institute of science had been researching on Raman spectroscopy close to 40 years. He is a recipient of Swarna Jayanthi Fellowship and Shanti Swarup Bhatnagar

prize and also fellow of Indian Academy of Sciences and Indian National science academy. At Present he is a JC Bose Fellow and honorary professor at the Indian Institute of science.

LECTURE OF INSA DISTINGUISHED LECTURE-1 FELLOW

DR RAMENDRA SUNDAR DEY

Institute of Nano Science and Technology, Mohali, Punjab

The Green Ammonia Revolution: Powering the Future from Fertiliser to Sustainable Fuel



The rapid depletion of non-renewable energy sources made the researchers to incline towards the development of alternative approaches with a long-term vision of a sustainable society. With this advent, green hydrogen/green ammonia plays a dominating role towards a safe, reliable

and electrified future. Although to meet the practical demands of ammonia, the Haber Bosch process is the sole option, but it deviates from the goal to a “net-zero” society. This calls for the electrochemical approach and we have thus keenly focused to develop suitable materials to achieve a significant ammonia production by nitrogen reduction reaction (NRR) in aqueous electrolytes. The structure-function relationship of the materials is extensively rendered emphasizing the impact of the synthesis strategy on the electronic properties of the materials that in turn modulate the elementary steps of NRR. The fundamental understanding between the electronic structure and adsorption energy of N_2 and apparent activity of the active site towards NRR are studied to gain a better understanding on the mechanisms of NRR ongoing on the material surface. On a broader perspective, with these improvisations we aim to develop a full NRR electrolyzer in laboratory scale having a potential of a better energy efficient ammonia synthesis.

References

1. Biswas, A.; Kapse, S.; Ghosh, B.; Thapa, R.; Dey, R. S.* PNAS, **2022**, 119, 33, e2204638119.
2. Biswas, A.; Kapse, S.; Thapa, R.; Dey, R. S.* fiano-Micco Zettecs, **2022**, 14, 1-17.
3. Biswas, A.; Nandi, S.; Kamboj, N.; Pan, J.; Bhowmik, A.; Dey, R. S.*, ACS Nano, **2021**, 15, 20364–20376.
4. Bhardwaj S., Das S. K., Biswas, A.; Kapse, S.; Thapa, R.; Dey, R. S.*, Chemical Science, **2023**, 14, 8936.
5. Biswas A., Barman N., Avinash N., Thapa R., Dey, R. S.*, Matec. Uocix., **2024**, 11, 2217.

Speaker Profile

Dr Ramendra Sundar Dey is a Scientist-D at Institute of Nano Science and Technology (INST), Mohali, India. He received Ph.D. in Chemistry from Indian Institute of Technology (IIT) Kharagpur, India. He is involved in research in the field of electrochemistry of nanomaterials. His current research is focused on the architecture and engineering of nanomaterials for advanced energy storage technology and non-novel metal nanomaterials for electrocatalysis and green ammonia synthesis. He has been honored with a number of prestigious National and International recognitions, like, INSPIRE Faculty Award at 2015, Journal of Materials Chemistry A and Nanoscale Emerging Investigator by RSC and ACS Applied Energy Materials Early Career Energy Scientists 2022. He has been honored with Indian National Science Academy (INSA) Associate Fellow 2023, Associates of Indian Academic of Science (I.A.Sc.), Bengaluru, INSA Distinguished Lecture Fellow 2024 and member of Indian National Young Academy of Sciences (INAYAS). He is also serving as an Associate Editor and Guest Editor of several international journals.

LECTURE INSA YOUNG ASSOCIATES

DR AWADHESH NARAYAN

Associate Professor, Indian Institute of Science, Bangalore

Non-Linear Hall Effect in Flatlands and Chiral Crystals



It has been discovered that inversion symmetry broken systems can exhibit non-linear Hall effects even under time-reversal symmetric conditions. The underlying quantum objects leading to this phenomena are the moments of the Berry curvature, termed the Berry curvature multipoles. In this

talk, I will give examples from our work where such a controllable Berry curvature dipole has been predicted. First, we propose a giant nonlinear Hall effect in the elemental buckled honeycomb lattices -- silicene, germanene, and stanene. We show that the Berry curvature dipole is tunable by a transverse electric field which breaks inversion symmetry. We demonstrate that the electric field induced topological phase transitions are associated with a giant Berry curvature dipole near the critical field. Next, I will present chiral systems as promising platforms to study the nonlinear Hall effects. We use state-of-the-art first-principles computations, in conjunction with symmetry analyses, to explore a variety of chiral material classes. We demonstrate that the two enantiomeric pairs exhibit an opposite sign of the Berry curvature dipole, which may enable their identification via a non-linear Hall response.

Speaker Profile

Awadhesh Narayan is an Associate Professor at the Indian Institute of Science. He obtained his Ph.D. from Trinity College Dublin, Ireland, where his dissertation won the Dan Bradley prize. After postdoctoral appointments at the University of Illinois at UrbanaChampaign, USA and ETH Zurich, Switzerland, he joined the Indian Institute of Science in 2019. He was selected as an outstanding referee of the American Physical Society in 2023. His research

interests are in solid state and materials theory, including topological phases, ferroic materials, and non-Hermitian systems.

DR PANKAJ CHAUHAN

Associate Professor, Department of Chemistry, Indian Institute of Technology, Jammu

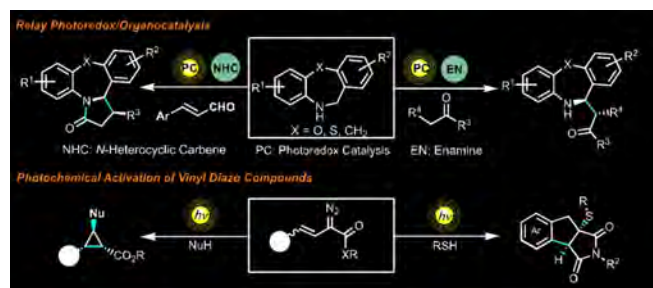
Harvesting Light for Developing Enantio-/Diastereo-/Chemoselective Transformations



Applications of light energy to carry out organic reactions lead to orthogonal reactivities to that of ground-state thermal reactions. Previously, strong UV-radiations have been exploited to activate molecules, enabling them to react in the excited state. However, certain limitations are associated with

these high-energy UV-light-driven organic processes, viz., the requirement of specialized reaction vessels, undesired side reactions, and decomposition of reactants, thereby restricting its broad applications. Recently, the development of reactions under low-energy UV light and visible light, directly or facilitated with photocatalysis has opened new gates for efficient organic synthesis. The renaissance of photocatalysts led to tremendous progress in organic photochemical reactions by activating non-absorbing organic molecules with photo-redox catalysts. These developments provided new avenues for unusual reactivities and assessing complex molecular architectures with high selectivity, which have not been achievable through conventional organic synthesis. We have explored the applications of photoredox catalysis and direct activation of organic molecules with low-energy light to generate valuable reactive intermediates that have been probed further to discover new reactivities in highly chemo- and stereo-selective fashions. In this context, we have investigated the relay photoredox/organocatalysis for diastereo-/enantioselective synthesis of valuable seven-membered scaffolds.^{1,2} Alternatively, we have developed photochemical chemo- and stereo-selective transformations of vinyl diazo carbonyl compounds.^{3,4}

The detailed results of our investigations will be presented.



References

1. Y. Hussain, D. Sharma, N. Kotwal, I. Kumar, P. Chauhan, *Chem. Sus. Chem.* **2022**, 12, e202200415.
2. Y. Hussain, D. Sharma, Tamanna, P. Chauhan, *Org. Lett.* **2023**, 25, 3772-3777.
3. Y. Hussain, C. Empel, R. M. Koenigs, P. Chauhan, *Angew. Chem. Int. Ed.* **2023**, 62, e202309184.
4. Y. Hussain, R. Prasanna, C. Empel, D. Sharma, L. Kloene, W. F. Zhu, A. Kaiser, L. Weizel, E. Proschak, R. M. Koenigs, P. Chauhan, *Chem. Rxiv.* **2024**; doi:10.26434/chemrxiv-2024-cl8g8.

Speaker Profile

Pankaj Chauhan obtained his B.Sc. from Himachal Pradesh University in 2004 and M.Sc. Chemistry from Guru Nanak Dev University, Amritsar, in 2007. He completed his Ph.D. under the supervision of Professor S. S. Chimni at Guru Nanak Dev University in 2012. In April 2013, he joined the research group of Professor Dieter Enders as a postdoctoral researcher at RWTH Aachen University, Germany. He worked as a sub-group leader in the same research group from April 2014 to September 2017. In October 2017, he started his independent research career as an Assistant Professor in the Department of Chemistry, Indian Institute of Technology Jammu, where he is currently working as Associate Professor. His research interests include asymmetric synthesis, organocatalysis, photocatalysis and direct photoactivation, electroorganic synthesis and synergistic catalysis.

DR MRINMOYEE BASU

Assistant Professor, Department of Chemistry, Birla Institute of Technology and Science, Pilani

Efficient Photoelectrodes for Photoelectrochemical Water Splitting



High energy density of H₂ drives to replace all the available non-renewable energy sources in near future and can function as efficient fuel. H₂ generation via water splitting through photoelectrochemical (PEC) approach is a greener, renewable, and promising pathway. So, to attain

adequate quantity of H₂, stable and efficient photoelectrodes should be developed. On the way of developing efficient photoelectrodes, initially morphology of the photoelectrodes is tuned in such a way that the optical activity of the material under visible light has been enhanced to a greater extent and result of which PEC activity of the electrode enhances. Further the surface engineering is carried out to increase the charge carrier mobility of the photoelectrode. In this regard, ZnIn₂S₄ is targeted as the model semiconductor. Vertically grown 2D nanosheets of ZnIn₂S₄ is developed first through wet-chemical method which shows enhanced efficiency of H₂ generation. ZnIn₂S₄ photoanode can generate ~2.74 % maximum photoconversion efficiency at an applied potential of 0.51 V vs. RHE. Further efficiency of the photoelectrode is enhanced by surface engineering. Cd-ZnIn₂S₄ is developed from ZnIn₂S₄ which shows higher charge transportation ability. The Cd-ZnIn₂S₄ photoanode shows ~3.10% photoconversion efficiency at an applied potential of 0.53 V vs. RHE.

Speaker Profile

Dr Mrinmoyee Basu is working as Assistant Professor in Department of Chemistry, BITS Pilani, Pilani Campus since January, 2021. Presently, she is working in the field of PEC water splitting. She has worked as DST-Inspire faculty in the same department from November 2015-October 2020. She worked as a postdoctoral fellow in National Taiwan University for almost two years (December 2013-September

2015). She has also worked as research associate in IIT-Delhi (July 2012-November 2013). She did her Ph. D. in Nanoscience and Nanotechnology from IIT-Kharagpur (July 2007-June 2011).

LECTURE INSA ASSOCIATES FELLOW

PROFESSOR CHIDAMBARAM GUNANATHAN

Professor, School of Chemical Sciences, National Institute of Science Education and Research, Bhubaneswar

Catalysis Enabled by Metal-Ligand Cooperation

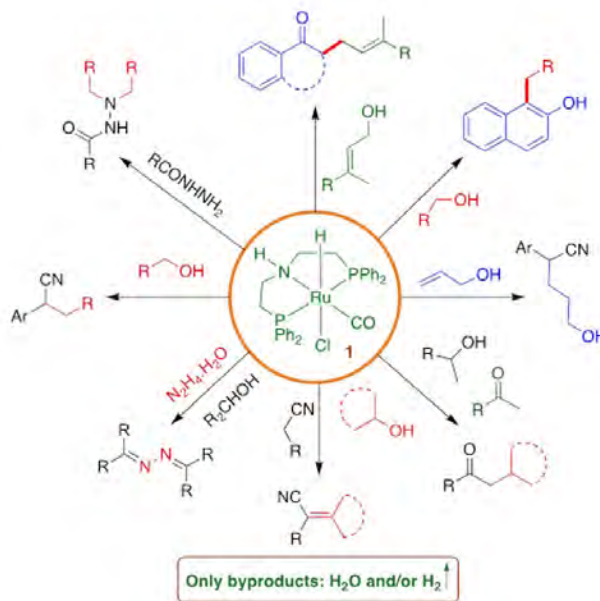


Construction of C-C and C-N bonds are important reactions in organic synthesis. Catalytic alkylation using alcohol as an alkylation reagent is a green alternative to the conventional alkylation reactions involving alkyl halides and stoichiometric reagents. Employing Ru-macho

pincer catalyst which operates via amine-amide metal-ligand cooperation, simple and atom-economical direct alkylation of nitriles was attained. We have also discovered the catalytic cross-coupling of secondary alcohols. α -Alkylation and α -prenylation of ketones using secondary alcohols and prenol, respectively, were reported. α -Alkylation of *b*-naphthols using primary alcohols was reported recently. Catalytic formal conjugate addition of nitriles with allylic alcohols was developed. Using secondary alcohols, α -alkenylation of nitriles and synthesis of ketazine were also reported. Remarkably, water and liberated molecular hydrogen are the only byproducts in these reactions making these catalytic transformations environmentally benign.

References

1. Thiagarajan, S.; Gunanathan, C. ACS Catal. **2017**, 7, 5483-5490.
2. Thiagarajan, S.; Gunanathan, C. ACS Catal. **2018**, 8, 2473-2478.
3. Kishore, J.; Thiagarajan, S.; Gunanathan, C. Chem. Commun. **2019**, 55, 4542-4545.
4. Thiagarajan, S.; Gunanathan, C. J. Am. Chem. Soc. **2019**, 141, 3822-3827.
5. Thiagarajan, S.; Gunanathan, C. Org. Lett. **2020**, 22, 6617-6622.
6. Thiagarajan, S.; Vijaya Sankar, R. Gunanathan, C. Org. Lett. **2020**, 22, 7879-7884.
7. Thiagarajan, S.; Gunanathan, C. Org. Lett. **2019**, 21, 9774-9778.
8. Thiagarajan, S.; Vijaya Sankar, R.; Anjalikrishna, P. K.; Suresh, C. H.; Gunanathan, C. ACS Catal. **2022**, 12, 2191-2204.
9. Vijaya Sankar, R.; Manikpuri, D.; Gunanathan, C. Org. Biomol. Chem. **2023**, 21, 273-278.
10. Kumar, N.; Sankar, R. V.; Gunanathan, C. J. Org. Chem. **2023**, 88, 17155-17163.
11. Manikpuri, D.; Vijaya Sankar, R.; Gunanathan, C. Chem. Asian J. **2023**, e202300678.
12. Vijaya Sankar, R.; Mathew, A.; Pradhan, S; Kuniyil, R.; Gunanathan, C. Chem. Eur. J. **2023**, e202302102.



Speaker Profile

Gunanathan's research interest include the catalytic applications of pincer complexes for sustainable development and the development of atom-economical

hydro elementation processes. He is a recipient of the prestigious Ramanujan Fellowship from DST-SERB, New Delhi. He won the first prize in the Evonik Research Proposal Competition in 2016. He received the top peer reviewer award from Publons in 2019. In 2020, he received the bronze medal of the Chemical Research Society of India, and Thieme Chemistry Journals award. He also serves as Co-opted member of the SERB Expert Committee in Chemical Sciences (2021- 2024) and Editorial Board Member of Journal of Chemical Sciences (2023-2025). He became INDA Associate Fellow in the year 2024.

PROFESSOR SUKHENDU MANDAL

School of Chemistry, Indian Institute of Science Education and Research, Thiruvananthapuram

Atomically Precise Quantum Nanoclusters



Atomically precise quantum metal nanoclusters, a new class of materials composed of tens to hundreds of metal atoms in the core possess unique structures, high stability, and attractive properties. Built on the significant success of Au nanoclusters, Ag nanoclusters

have recently received increasing attention. Synthesis and structural elucidation of Ag NCs is challenging because the zero-valent oxidation state of Ag is very reactive and prone to oxidization.¹ We have designed a strategy to generate functionality and correlate their structure-property relationship. In this discussion, we will detail the design and synthesis of this new Ag-based cluster and cluster assembly, focusing on elucidating the origin of electronic, electrochemical, and photocatalytic properties for environmental applications and establishing correlations at the atomic level (Figure 1) 2-5.

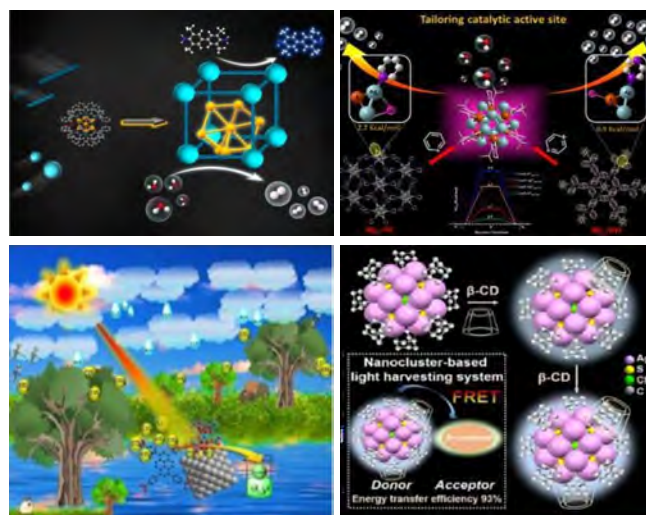


Figure 1. Structural illustration of the newly synthesized cluster and cluster assembly and their catalytic properties

References

1. Yang, J.; Jin, R. ACS Mater. Lett. 2019, 1, 482-489.
2. Mandal et al. Nano Lett. 2022, 22, 3721-3727.
3. Mandal, et al. Chem. Sci. 2022, 13, 7616-7625.
4. Mandal, et al. Manuscript under submission.
5. Mandal, et. al. Manuscript under revision.

Speaker Profile

His primary research interest is on atom-precise quantum metal nanoclusters and metal- organic frameworks to explore their photo-physical and chemical properties with an emphasis on energy and environment. He has published more than 125 papers in international peer-reviewed journals and contributed to 4 book chapters. He is the recipient of the CRSI Bronze medal in 2021 and was inducted as a Fellow of the Royal Society of Chemistry through the leader in the Field. He is the recipient of the Dr D. S. Bhakuni Award by the Chemical Society of India in 2023 and an Associate Fellow of the Indian National Science Academy in 2024.

DR SURYA PRAKASH SINGH

Principal Scientist, Department of Polymers and Functional Materials, CSIR-Indian Institute of Chemical Technology (IICT), Hyderabad, India

Functional π -Conjugated Small Molecules: From Structure to Function



Energy is a crucial factor in driving social, economic, and industrial progress. Our daily energy consumption continues to rise gradually. In recent decades, rising energy demand has increased reliance on fossil fuels such as coal, petroleum and natural gas,

releasing CO₂ and contributing to global warming. Small organic molecules with suitable photophysical and electronic properties have garnered attention in advanced technology applications, especially in photonic devices such as dye-sensitized solar cells, organic solar cells, emissive displays like OLEDs; electronic materials such as organic semiconductors, and security printing. Organic photovoltaics are gaining popularity as a cost-effective, color-tunable, and mechanically flexible renewable energy technology. Numerous research endeavors aim to develop novel organic materials and enhance their efficiency and durability. Our research group is focussing on producing stable organic molecules for diverse applications. In the upcoming event, I will present our progress on developing hole-transport materials for perovskite solar cells. The presentation will commence with a brief introduction to solar cells, followed by an exploration of industrial applications and the commercialization potential of dye molecules.

Speaker Profile

Dr Surya Prakash Singh, is currently working as a Principal Scientist at Department of Polymers and Functional Materials, CSIR-Indian Institute of Chemical Technology, Hyderabad. Dr Singh graduated with Ph.D. from University of Allahabad, India. After working at Nagoya Institute of Technology, Japan, as a postdoctoral fellow, he joined Osaka University, in 2008 as an Assistant Professor.

He also worked as a researcher at Photovoltaic Materials Unit, National Institute for Materials Science (NIMS), Tsukuba, Japan before joining as a scientist at CSIR-IICT in 2011. He has published over 230 papers, reviews in peer-reviewed journals and patents, edited two books and author of one book chapter. BODIPY based dyes for mitochondrial tracking developed by Singh and colleagues has been licensed and commercialised by TCI (Japan). During his tenure at CSIR-IICT he has been a recipient of several prestigious awards like CRSI-bronze medal (2024), NASI-young scientist platinum jubilee award (2012), AVRA young scientist award (2015). Dr Singh is a Fellow of Telangana academy of sciences (2022) and Associate Fellow of Andhra Pradesh academy of sciences (2013) and Indian National Science Academy-INSA (2024).

LECTURE INSA HISTORY OF SCIENCE YOUNG ASSOCIATES

DR ASADULLA ASRAF ALI

Department of Chemistry, Assam Kaziranga University, Jorhat

Integrating Traditional Knowledge with Scientific Techniques by Conserving Sāncipāt Manuscripts and Hengul-Hāitāl Paintings Tradition from Medieval Assam

Asadulla Asraf Ali^{1*}, Robin Kumar Dutta²



^{1*}PhD student, Department of Chemical Sciences, Tezpur University, and Former Postdoctoral Research Associate, Centre for Earth Science, Indian Institute of Science, Currently guest faculty at The Assam Kaziranga University, rizbi.asraf@

gmail.com

This study investigates the integration of traditional knowledge with modern scientific techniques for the conservation of Sāncipāt manuscripts and Hengul-Hāitāl paintings, two significant cultural heritage artifacts from medieval Assam. Sāncipāt manuscripts,

made from the bark of the Sānci tree, and Hengul-Hāitāl paintings, known for their vibrant red and yellow pigments derived from natural sources, are invaluable cultural legacies of the region. Despite their historical importance, these artifacts are prone to deterioration due to environmental factors and inadequate conservation practices.

To address these challenges, the research employs a multidisciplinary approach, combining ethnographic studies, materials science, and analytical chemistry, to develop innovative conservation strategies that respect and preserve the original materials and techniques used by ancient artisans. The study analyzes the physical and chemical properties of the manuscripts and pigments, identifying traditional methods that contributed to their longevity. Advanced analytical techniques, including FTIR, SEM-EDS, TGA, DSC, UTM, and Hunter colour analysis etc., are utilized to understand degradation processes and assess the effectiveness of various conservation treatments.

Additionally, the research explores the use of non-invasive and environmentally sustainable materials for restoration, drawing from both traditional practices and contemporary scientific advancements. The findings highlight the importance of integrating indigenous knowledge with modern scientific methods, not only for preserving cultural heritage but also for enhancing our understanding of historical materials and techniques. This approach offers a sustainable model for conserving cultural artifacts, ensuring their preservation for future generations. The study also suggests potential insights into medieval Assam's climate through $\delta^{18}\text{O}$ analysis of cellulose samples.

Keywords: Traditional Knowledge, Sāncipāt, Hengul-Hāitāl, Conservation, Restoration *For correspondence

Speaker Profile

Dr Asadulla Asraf Ali is a Guest Faculty in the Department of Chemistry at The Assam Kaziranga University, Jorhat. He holds a PhD in Chemistry from Tezpur University, an MSc from The Assam Kaziranga University, and a BSc from Dibrugarh University. Previously, he was a Postdoctoral Research Associate at the Centre for Earth Science, Indian Institute of Science (IISc), Bangalore. Dr Ali's

interdisciplinary research spans heritage conservation, water purification, and stable isotope analysis, with over ten research articles and six book chapters to his name. He has also served as a resource person for workshops on heritage conservation and water purification in Assam and beyond, showcasing his dedication to both scientific research and community engagement.

SECTIONAL COMMITTEE IV

Chair: Dr Kalachand Sain

Director, Wadia Institute of Himalayan Geology (WIHG-DST), Dehradun



Dr Kalachand Sain, presently JC Bose National Fellow at CSIR-NGRI, Hyderabad, held the position of Director at Wadia Institute of Himalayan Geology (WIHG-DST), Dehradun, and Chief Scientist & Head of Seismic Group at CSIR-NGRI. He is a Fellow of

all three Indian Science Academies - Indian National Science Academy (Delhi), Indian Academy of Sciences (Bangalore), National Academy of Science in India (Allahabad). He has been recognized with numerous National awards/prizes for his outstanding contributions to Georesources, Geohazards, Geodynamics, and seismotectonics through development of Geoscientific tools based on AI/ML algorithms, seismic tomography, advanced processing, and attribute characterization.

LECTURE OF INSA DISTINGUISHED LECTURE-2 FELLOW

PROFESSOR HARSH K. GUPTA

INSA Senior Scientist, CSIR-National Geophysical Research Institute (NGRI), Hyderabad

Indian Tsunami Early Warning System (ITEWS)



Before the occurrence of the 26 December 2004 mega-tsunami caused by the Mw 9.2 Sumatra earthquake, there was no tsunami warning facility in the Indian Ocean, and one depended on the tsunami alerts being issued by the Pacific Tsunami Warning Center and the Japan Meteorological

Agency which were often withdrawn causing immense inconvenience. It was also discovered that unlike the Circum-Pacific earthquake belt, which could host tsunamigenic earthquakes along the entire Pacific Coast, for the Indian Ocean, there are only two sources of tsunamigenic earthquakes: Sumatra to Andaman Islands: a stretch of ~4000 km and Makaran coast in the Arabian Sea. After a considerable discussion, these findings were accepted by the Inter-Governmental Commission on Oceanography. This provided the foundation of setting up of the Indian Tsunami Early Warning System. India undertook a very ambitious project to set up a state of art Tsunami warning capability in a short time of 30 months. This was achieved by end of August 2007 and tested by 12 September 2007 earthquake. Over the past 17 years the system has worked very efficiently. It is now assessed as among the best in the world.

Speaker Profile

Currently President of the Geological Society of India and a Member of the Atomic Energy Regulatory Board. Formerly, a Member of the National Disaster Management Authority, India; Secretary to Government of India, Ministry of Earth Sciences; Director, NGRI; Vice Chancellor, Cochin University of Science and Technology; Professor, University of Texas at Dallas. Former

President of IUGG and AOGS. Globally known for discovering 65-70 km thick crust below Himalaya and Tibet Plateau; developing criteria to discriminate artificial water reservoir triggered earthquakes from normal earthquakes; setting up of India's first permanent station in Antarctica in a record time of one Antarctic summer; Chairing the Steering Committee of Global Seismic Hazard Program where ~500 scientists worked globally from 1992 to 1999 to produce Global Seismic hazard Map; setting up of the Indian Ocean Tsunami Warning System after the disastrous 2004 Mw 9.2 Sumatra earthquake; planning and editing Encyclopedia of Solid Earth Geophysics 1st Edition in 2011 and Second Edition in 2021 published by Springer. Recognitions include S.S. Bhatnagar Award (1983); National Mineral Award for Excellence (2002); Padma Shri (2006); Waldo Smith Award (2008); Axford Medal (2016); National Lifetime Excellence Award by the Ministry of Earth

Sciences, India (2022); IASPEI Medal (2023). Prof Gupta is a fellow of Indian Academies; TWAS; AGU; IUGG; Foreign Fellow of Russian Academy of Sciences and Fellow of the International Science Council.

LECTURE NEW FELLOW

PROFESSOR VVSS SARMA

CSIR-National Institute of Oceanography, Regional Centre, Visakhapatnam

A fallacy on anthropogenic nitrogen on Indian coastal waters



The discharge of fertilizers and untreated sewage from India was attributed to damaging the fishery resources and forming dead zones. Based on the stable isotopic composition of carbon, nitrogen and oxygen data collected along the Indian coasts, the fate of anthropogenic nitrogen was identified.

The groundwaters are contaminated by nitrogen fertilizers but were modified through nitrification and denitrification. A significant fraction of the groundwater nitrate in the groundwater is denitrified, resulting in the formation of nitrous oxide however, the indirect emission factor is too low compared to the global mean. No traces of fertilizer nitrogen were noticed in the Indian estuaries, and isotopic composition nitrogen suggests that denitrified signatures were observed in the estuaries, suggesting that anthropogenic nitrogen may be denitrified in the upstream river. No signatures of fertilizer nitrogen signatures were observed, including at off Godavari River mouth in the coastal Bay of Bengal, where the highest magnitude of fertilizer nitrogen is used, indicating that fertilizer nitrogen is not responsible for the formation of coastal blooms. Similarly, the impact of municipal sewage is restricted close to the coast rather than spreading to the international waters. Therefore, coastal eutrophication, hypoxia or shift in the ecosystem were caused by natural processes.

Speaker Profile

Professor V.V.S.S. Sarma is the Chief Scientist and Scientist-in-Charge at the CSIR-National Institute of Oceanography, Regional Centre, Visakhapatnam. He is an expert in the biogeochemistry of elemental cycling, marine trace gas fluxes, food web studies, and the use of stable isotopes. His research also encompasses remote sensing and numerical modeling, contributing significantly to the understanding of oceanic processes and their broader environmental impact. Professor Sarma's work is pivotal in advancing knowledge in marine science and addressing critical issues related to ocean health and sustainability.

LECTURE OF INSA DISTINGUISHED LECTURE-1 FELLOW

PROFESSOR VIKRAM VISHAL

Convener, DST-National Centre of Excellence in CCUS, Professor, Department of Earth Sciences, Indian Institute of Technology Bombay, Mumbai

Geomechanical constraints in CO₂ enhanced oil recovery



High-level studies indicate that India has significant potential for CO₂ storage, but detailed technical evaluations are limited, leaving much of this resource undiscovered. To support emission reduction targets, it's essential to define representative CO₂ storage complexes in key areas.

The study identifies various storage opportunities, including hydrocarbon-bearing sandstones and marine shales that can serve as seals. With the help of novel experimental methods and protocols, and building extensive geomechanical models, we carried out accurate volume determination of sandstone for CO₂ storage capacity estimates, characterization of the top seal, and assessing well integrity due to numerous legacy wells. We emphasize on analyzing rock deformation characteristics during fluid flow under various stress conditions as valid inputs to large-scale numerical models.

Speaker Profile

Dr Vikram Vishal serves as a Professor in the Department of Earth Sciences and the Centre for Climate Studies at IIT Bombay. His academic journey includes various roles at MIT, Stanford University, Monash University, IIT Roorkee, IIT Bhubaneswar along with professional stints at Tata Steel and Shell. He is the Convener of the DST-National Centre of Excellence in CCUS.

Professor Vishal specializes in reservoir geomechanics, carbon sequestration and unconventional petrophysics. A three-time national award

and two-time Fulbright fellowship recipient, he has authored over a hundred research publications, a dozen national and international S&T roadmaps and has received five patents.

LECTURE OF INSA YOUNG ASSOCIATES

DR RISHITOSH SINHA

Scientist/Engineer SE, Physical Research Laboratory, Ahmedabad



On 23 August 2023, the Chandrayaan-3 mission marked a significant milestone by soft-landing successfully in the southern high-latitude region of the Moon. The Vikram lander touched down at 69.37° S, 32.32° E, and the Pragyan rover traversed about 103 meters on the lunar surface within a

single lunar day. A successful lunar landing presents two key challenges. The first challenge involves analyzing the suitability of the pre-selected landing site, focusing on potential hazards such as boulders, craters, and variations in terrain elevation and slope. Conversely, the second challenge is to ensure that upon successful landing, the interpretations from data acquired by the instruments onboard lander and rover are well placed into the current understanding of the lunar geologic and evolutionary history. My presentation will be focused on these two aspects. I will discuss the work done to characterize the geology of the Chandrayaan-3 landing site. Subsequently, I shall discuss some of our recent findings using the data acquired by the Chandrayaan-2 orbiter and Chandrayaan-3 rover. These results provide valuable context for the interpretation of Chandrayaan-3 mission data and contribute to understanding the geological history of the Moon's southern high-latitude region.

Speaker Profile

Rishitosh is a dynamic scientist specializing in planetary remote sensing at the Physical Research Laboratory in Ahmedabad. He earned his B.Tech in Instrumentation and Control Engineering in

2009, followed by an M.Tech in Remote Sensing and GIS in 2011, both from SRM University, Chennai. In 2022, he completed his PhD at IIT Gandhinagar, with a thesis titled 'Glacial and gully landforms on Mars'. Since joining the Physical Research Laboratory, Ahmedabad in 2011, he has been engaged in morphological and quantitative topographic analysis of surface processes on the Moon and Mars. His research involves the in-depth study of data from Chandrayaan-1/2/3, the Mars Orbiter Mission (MOM), and other planetary missions. Currently, he is working as Scientist/Engineer SE at PRL Ahmedabad. In 2023, he received the 'Eminent Alumni' award in Science and Technology from SRM University, Chennai.

LECTURE INSA ASSOCIATE FELLOW

PROFESSOR SUPRIYO MITRA

Department of Earth Sciences, Indian Institute of Science Education and Research, Kolkata

Atomically Precise Quantum Nanoclusters



The NW Himalayan "seismic gap" lies between the 1905 and 2005 earthquake rupture Zones and straddles the meiseoseismal zone of the 1555-Kashmir earthquake. This region is marked by hinterland-to-foreland reduction in GPS-geodetic arc-normal convergence-velocity and increase in horizontal

strain-rate, associated with occurrence of moderate-to-small earthquakes. These point to sufficient elastic strain accumulation to drive a megathrust earthquake. We model the crustal structure and geometry of the Main Himalayan Thrust (MHT) and locate moderate-to-micro seismicity using the Jammu and Kashmir Seismological NETWORK (JAKSNET) data. Body-wave common-conversion-point (CCP) stacks, and joint inversion with surface-waves are used to construct a 3D Vs model. This reveals increasing crustal thickness from foreland-to-hinterland, and an under-thrust Indian crust beneath NW Himalaya. The Moho deepens from the Sub-Himalaya to Higher/Tethyan Himalaya with a

gentle NE dip. The MHT forms a low-velocity layer and has a flat-ramp geometry. 610 local earthquakes, located using the 3D Vs model, are shallower than 20 km, and lie on or above the Main Himalayan Thrust (MHT), clustered beneath the Jammu-Kishtwar Higher Himalaya. These have been used to show the presence of a Lesser Himalayan duplex (LHD) beneath the Kishtwar Window and MHT lateral-ramp and transverse structures within the Himalayan wedge.

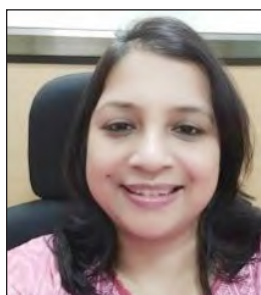
Speaker Profile

Supriyo Mitra is a seismologist interested in earthquake source physics, internal structure of the Earth, attenuation characteristics of seismic waves and simulation of earthquake ground motion. He obtained his PhD from the University of Cambridge, UK (2004). He is a recipient of the INSA Young Scientist medal (2010), NASI-Scopus Young Scientist Award (2012), Associate of the Indian Academy of Sciences (2011-2014), National Geoscience Award (2016), Cambridge-Hamied Fellowship (2016), Fellow of the Royal Astronomical Society (FRAS), Fellow of the West Bengal Academy of Science and Technology (FWAST), Visiting Professor of the Earthquake Research Institute (ERI), University of Tokyo, Japan (2019) and is a Regular Associate of the International Center for Theoretical Physics (ICTP), Trieste (2019-2024).

DR TANUSHREE BHATTACHARYA

Associate Professor, Civil and Environmental Engineering, Birla Institute of Technology, Mesra, Ranchi

Application of biochar for arsenic remediation in soil



Arsenic (As) contamination in soils, poses a global environmental threat. Biochar, produced via slow pyrolysis of organic waste biomass, offers a promising solution for soil remediation and improvement. This study explores biochar's

potential in As removal, soil quality enhancement, and resilience to extreme weather conditions. Biochars were produced from various waste sources (wheat straw, rice straw, kitchen waste, leaf litter, Lantana camara, orange peel, and walnut shell) at 300-700°C. Higher pyrolysis temperatures improved As removal efficiency and enhanced biochar properties, such as increased pH, electrical conductivity, water holding capacity, and nutrient content, while reducing bulk density and volatile matter.

Biochar amendments in As-contaminated soils decreased mobile As fractions and improved soil properties, promoting plant growth. Wheat straw biochar (WSB) effectively reduced As accumulation in plants, while kitchen waste biochar (KWB) enhanced soil pH and nutrient levels. Nutrient-enriched biochar, created using cow manure, further improved As removal and plant growth, even under drought and flood conditions. The study highlights biochar's potential in sustainable agriculture, waste management, and climate resilience, promoting a circular economy and enhancing food security.

Speaker Profile

Dr Tanushree Bhattacharya, Associate Professor, Civil and Environmental Engineering, Birla Institute of Technology, Mesra, Ranchi, Jharkhand. PhD in Environmental Science from School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, in 2007. Teaching experience: 18 years

Research: published 70 research papers in national and international journals, 30 conference proceedings, 10 book chapters, 2 books, completed 4 research projects, and guided 10 Ph.D students, 28 PG students and 40 UG students.

SECTIONAL COMMITTEE X

Chair: Dr Manmohan Singh Chauhan

Vice Chancellor, Govind Ballabh Pant University of Agriculture & Technology, Uttarakhand



Dr Manmohan Singh Chauhan, Vice Chancellor of Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Udham Singh Nagar, Uttarakhand, is a distinguished scientist and academic leader with extensive expertise

in agriculture, animal biotechnology, and reproductive biology. His career reflects a commitment to excellence in research, teaching, and academic administration. Dr Chauhan holds an MSc and Ph.D. in Reproductive Biology from Garhwal University, Srinagar Garhwal, and is recognized as a Fellow of the National Academy of Sciences (FNA), the National Academy of Sciences of India (FNASc), the National Academy of Agricultural Sciences (FNAAS), and the National Academy of Dairy Sciences (FNADS).

Dr Chauhan's research achievements are remarkable. He developed Embryonic Stem Cell technology, producing five buffalo embryonic stem cell lines and two spermatogonial stem cell lines. Notably, he produced India's first OPU-IVF Sahiwal calf, 'Holi,' and the first OPU-IVF yak calf, 'Norgyal.' His pioneering work includes developing hand-guided cloning technology for buffaloes and cattle, resulting in the production of 27 cloned buffaloes and India's first cloned Gir cattle calf. He also established transgenic animal production methodologies in buffaloes for pharmaceutical and agricultural applications.

His contributions have earned him numerous prestigious awards, including the Rafi Ahmed Kidwai Award from ICAR (2015), the Dr P. Bhattacharya Memorial Award from NAAS (2020), the Rao Bahadur B. Viswanath

Award (2019), the VASVIK Industrial Award in Agricultural Sciences (2015), the ICAR-Team Award in Animal Sciences (2014), and the DBT Biotechnology Overseas Fellowship Award (1997).

Dr Chauhan has published over 155 original research articles in reputable journals, authored or co-authored nine books, and contributed to 44 scientific and technical publications.

LECTURE OF INSA DISTINGUISHED LECTURE-2 FELLOW

PROFESSOR RUP LAL

Senior Scientist, Acharya Narendra Dev College, University of Delhi

Unlocking the Potential of Rifamycin Polyketide Gene Clusters in *Amycolatopsis mediterranei* for Combating *M. tuberculosis* Resistance: A 35-Year Journey



Amycolatopsis mediterranei, an actinobacterium, produces rifamycin B, and its semisynthetic derivatives, such as rifampicin, are widely used to treat tuberculosis and other mycobacterial infections. Rifampicin was first administered to TB patients in 1968, but over time, many rifampicin-resistant strains of

Mycobacterium tuberculosis have emerged, complicating TB treatment. A promising alternative strategy to address this resistance involves producing rifamycin B analogues by manipulating the rifamycin polyketide biosynthetic (PKS) gene cluster. Over the past 35 years, our research has successfully generated rifamycin analogues by altering the PKS gene cluster in *A. mediterranei*. However, production levels of these analogues in mutant strains have remained extremely low. To overcome this bottleneck, we discovered that in mutant strains, the export of these analogues is regulated by specific genes within the rifamycin biosynthetic cluster. By targeting and manipulating these regulatory genes, we aim to enhance analogue production in mutants. Achieving this breakthrough would mark a significant step

toward commercializing these analogues to effectively counter rifampicin resistance in *M. tuberculosis*, providing improved treatment options for TB patients.

Speaker Profile

Professor Rup Lal (FNA, FNASc, FNAAS, FAAM) is an INSA Senior Scientist at the University of Delhi and a former ASM Ambassador for India (2012-2015). He is currently the ISME, FEMS, and IMiLi Ambassador.

He has received numerous awards, including the Alexander von Humboldt Fellowship, DBT-Overseas Fellowship, Indo-US-ASM Professorship in Microbiology, and the Australian Government Endeavour Executive Fellowship (2018-2019), ASM Moselio Schaechter Distinguished Service Award, Professor S.R. Vyas Memorial Award, Professor BN Johri Award, and Lifetime Achievement Award from the Association of Microbiologists of India. He served as Editor-in-Chief of the Indian Journal of Microbiology from 2006 to 2013 and is a member of the editorial board for several journals including SME, mSystem, Environmental Microbiology etc. With over 45 years of experience in microbial diversity and genomics, he has supervised more than 75 Ph.D. theses, published over 250 papers with more than 11,000 citations, and holds two patents.

LECTURE NEW FELLOW

DR PARVEEN CHHUNEJA

School of Agricultural Biotechnology, Punjab Agricultural University, Ludhiana

Unveiling Genetic Diversity in Wild Wheat *Aegilops tauschii* to Enhance Nitrogen Use Efficiency in Cultivated Wheat



Improving nitrogen-use efficiency (NUE) in wheat is essential for sustainable agriculture, reducing dependency on costly and environmentally harmful synthetic nitrogen fertilizers. The genetic diversity of *Aegilops tauschii* (the D-genome donor of wheat) was mined to identify traits linked

to NUE using multipronged approach. A panel of 135 *Ae. tauschii* accessions was evaluated under two nitrogen levels, revealing strong marker-trait associations. Gene expression profiling of key associations pinpointed potential candidates for enhancing NUE.

Additionally, a backcross introgression line (BIL) library, developed from in-house developed synthetic wheat, was phenotyped for NUE across different nitrogen levels. Genotyping with the 35K Axiom® Wheat Breeder's Array uncovered 65 stable marker-trait associations, linking specific markers to key biological and yield traits for NUE. Nitrate transporters play a critical role in nitrogen metabolism and 412 nitrate transporter genes belonging to four gene families NRT1, NRT2, CLC, and SLAC/SLAH were identified in wheat genome. A number of these genes were identified to be in close proximity to the marker trait associations identified in above field based studies. In *Ae. tauschii*, novel allelic variations in 17 NRT2 genes were mined and four to six haplotypes have been identified in different *Ae. tauschii* NRT2 genes.

These findings highlight new genetic resources and NUE-associated alleles in *Ae. tauschii*, paving a way for breeding enhanced nitrogen-efficient, high-yielding wheat varieties for future.

Speaker Profile

Dr Parveen Chhuneja Principal Molecular Geneticist at Punjab Agricultural University, Ludhiana has made substantial advancements in wheat research over her 28-year career, establishing and utilising wild wheat gene pool to introduce novel genetic diversity into cultivated wheat varieties. Her work has led to the development of 11 high-yielding wheat varieties and 163 high-impact research papers. Dr Chhuneja's contributions have earned her fellowships of India's top scientific academies including INSA (w.e.f. Jan. 1, 2025), NASI and NAAS) and multiple prestigious awards and recognitions, highlighting her role in advancing wheat research.

DR DINESH A. NAGEGOWDA

Chief Scientist & Scientist In-Charge, CSIR-Central Institute of Medicinal and Aromatic Plants, Research Center, Bengaluru

Protein-geranylgeranylation and beyond: Novel molecular switches driving anticancer alkaloid biosynthesis in periwinkle



Madagascar periwinkle (*Catharanthus roseus*), a tropical herb, is renowned for producing >130 monoterpene indole alkaloids (MIAs), including two valuable anticancer drugs: vincristine and vinblastine. However, low natural accumulation and impractical chemical synthesis result in exorbitant market prices.

Several jasmonate-inducible transcription factors (TFs) are shown to function either independently or collaboratively to regulate MIA biosynthesis. Nevertheless, how these TFs are in-turn controlled to modulate MIA biosynthesis remains unexplored. Initial studies had suggested that protein geranylgeranylation triggers signaling cascade that affect TFs which in-turn modulate biosynthesis of MIA. Here, using a multipronged approach, we demonstrated that a plastid-localized GGPP synthase (CrGGPPS2) provides geranylgeranyl moiety to protein geranylgeranyl transferase (CrPGGT-I), for geranylgeranylation specific Rho-of-Plant (ROP) proteins, CrROP3 and CrROP5, having CAAL motif.

Next, geranylgeranylated ROP proteins interact with specific upstream ROP-GTPase regulatory proteins (RGRPs), including guanine-nucleotide-exchange-factor-1 (CrGEF1), GTPase-activating protein-1 (CrGAP1), and guanine-nucleotide-dissociation-inhibitor-2 (CrGDI2), for their spatiotemporal regulation. This interaction allows them to function as master switches that control the expression of TFs and genes in the MIA pathway, thereby modulating alkaloid accumulation. Together, our findings reveal a previously unreported, highly coordinated regulatory network upstream of jasmonate signaling, involving GGPP synthesis, geranylgeranylated ROPs, and their regulatory proteins, which collectively orchestrate the biosynthesis of MIAs in *C. roseus*.

Speaker Profile

Dr Dinesh's research focuses on functional genomics and biotechnology to unravel the biosynthetic pathways and regulatory aspects of specialized metabolism in plants. His group also applies the knowledge gained from pathway elucidation to metabolic engineering and synthetic biology for the overproduction of therapeutically and commercially important medicinal and aromatic compounds.

DR AJIT KUMAR SHASANY

Director, CSIR-National Botanical Research Institute, Lucknow

Secondary metabolites and internal immunity of plants



Plants produce primary and secondary metabolites. Secondary metabolites are produced in plants to protect themselves or used by them for different purposes. These small molecules directly or indirectly interfere in the life process of pathogens and insects and thus provide the protection to

plants against biotic stresses as in the case of (E,E)-farnesol in bacterial defense through upregulation of phytosterol biosynthesis and defense genes. Similarly, pod borer attacks *Cajanus cajan* but not *Cajanus plicatipacpus*. Flavonoids and the corresponding genes are

tightly regulated in *C. platycarpus* during its encounter with *Heliothis armigera*. From all flavonoids, maximum reduction in larval weight was observed when fed with the diet spiked with epicatechin-3-gallate. The relevance of this molecule was validated by overexpressing the pathway gene CpF3050H_2 in transgenic tobacco leading to reduced leaf damage and increased larval mortality. Further analysis indicated increased lipolysis and decreased lipogenesis in the insect. The novel molecule viridiflorol from *Mentha piperita* when overexpressed in transgenic plant also proved to be deterrent against *Helicoverpa armigera*. In addition, the phenylpropanoids also inhibits the pathogenic fungus. Hence, for organic cultivation the internal immunity of plants can be strengthened by understanding the interaction of secondary metabolites with biotic stresses.

Speaker Profile

Dr Ajit Kumar Shasany is presently the Director, CSIR-National Botanical Research Institute, Lucknow. Earlier he was the Director, ICAR-National Institute for Plant Biotechnology, New Delhi. He is the fellow of NAAS and NASI with more than 150 papers and 106 patents. Three times he has been awarded with CSIR Technology Award along with CSIR Young Scientist Award.

LECTURE OF INSA DISTINGUISHED LECTURE-1 FELLOW

DR AMIT KUMAR RAI

Scientist D, National Agri-Food Biotechnological Institute (NABI), Mohali

Understanding microbiome of traditional fermented foods for development of functional foods with health benefits



The richness and diversity of ethnic fermented food products are chiefly observed in many Himalayan States. In our study, multi-omics approaches were applied for the characterization of microbial diversity, metabolomics and

peptidome of fermented soybean, fermented millets and milk products. Our group research is focused on the effect of fermented foods on gut microbiome and production of specific metabolites (peptides and transformed polyphenols) during fermentation having beneficial effects on diabetes, hypertension and oxidative stress. Many bioactive peptides were identified using a combination of mass spectroscopy and computational analysis, followed by validation of selected peptides. The peptides identified in these foods are possibly involved in diverse functionalities. Further, several multi-functional peptides were identified in some of the protein-rich food products. Fermented food products consumed at higher altitude regions can be explored to produce functional foods, providing nutrition security.

Keywords: Fermented foods, bioactive peptides, health benefits, functional foods, nutrition security

Speaker Profile

Dr Amit Kumar Rai is Scientist D at the DBT-National Agri-Food Biotechnology Institute, Mohali. His current research focuses on functional foods and nutraceuticals, traditional fermented foods, microbial biotransformation, bioactive peptides, and microbial enzymes. To his credit, he has 5 patents, 124 publications including 82 publications in SCI Journals and Edited/Authoried 5 books and author 35 book chapters with >4100 citations.

LECTURE INSA YOUNG ASSOCIATES

DR M. IQBAL R. KHAN

Assistant Professor, Department of Botany, Jamia Hamdard, New Delhi

GABA fostering salt stress mechanisms in wheat



The increasing risk of salt stress in agriculture has serious questions about crop health and food production in the future. Cultivating cereal crops, especially wheat, in this age of dynamic climate swings presents a variety of obstacles due to the virtue

of salt intolerance from the standpoint of growth, metabolic, and yield components. The vulnerability of agriculture has increased significantly as a result of the prevalence of salt-contaminated environmental regimes. As a result, efficient methods must be implemented to coordinate salt resistance to the essential cellular elements influencing physiological complexes and related processes. γ -aminobutyric acid (GABA), well known as animal neurotransmitter, has been the focus of much discussion in recent years due to its potential to stimulate growth and function that trigger plant innate immune responses. In order to identify and provide a thorough stipulation of GABA, we have carried out investigations on wheat genotypes based on salt tolerance. These include their potential interactions with growth, physiological and yield responses under salt stress. Conclusively, GABA has shown alleviation response, and could protect salt-mediated adverse changes in wheat and may help in developing salt-smart wheat crop.

Keywords: GABA, salt stress, wheat physiology

Speaker Profile

Dr M. Iqbal R. Khan is an Assistant Professor of Botany at Jamia Hamdard, New Delhi, India. Also, He is Deputy Director, Centre for Environment and Sustainable Development, Jamia Hamdard, New Delhi, India and Adjunct Associate Professor, The UWA Institute of Agriculture, The University of Western Australia, Perth, Australia.

His current research interests are elucidation physiological and molecular mechanisms associated with abiotic stress tolerance. Dr Khan has found a significant role of phytohormones and novel signaling molecule GABA in the regulation of plant growth and development.

Dr Khan has been recognized as Young Associates Indian National Science Academy (INSA), Member-The National Academy of Sciences, India (NASI), R. H. Dastur Gold Medal by Indian Society for Plant Physiology (ISPP), India, Young Scientist Platinum Jubilee Award, The National Academy of Sciences, India (NASI), Young Scientist Award

Indian Society of Plant Physiology (ISPP), India. He is also Clarivate Highly Cited Researcher in 2022 and 2023 in Plant and Animal Science Category.

DR VEDA KRISHNAN

Senior Scientist, ICAR-Indian Agricultural Research Institute (IARI), New Delhi

Connecting the dots: Starch quality, Sweet Signaling & Satiety



Starch, as a key dietary carbohydrate, is essential in regulating energy, satiety, and metabolic health. Starch quality is determined by the rate and extent of digestion with various indices like glycemic index, glycemic potential, glycemic response, and so on. Our work aims

to examine the complex relationships between starch quality and its key determinants along with sweet taste signaling, and satiety, using millet and rice models. Dived in-depth to explore the key determinants of glycemic quality, the role of microstructure, molecular structure, and food-matrix interactions were unraveled. Interactions between starch and proanthocyanidins (PCs) have shown reduced digestibility in vitro, producing slowly digestible carbs that likely engage the gut-brain axis to enhance satiety. In this present research, we analyzed how digestible starch and PCs (monomeric, oligomeric, and polymeric) might help manage food intake and weight by boosting glucagon-like peptide (GLP)-1 secretion, which is crucial for gut-brain communication. Monomeric PCs, as specific inhibitors of α -amylase and starch-binding agents, had the most significant effect, prolonging starch digestion to the distal small intestine. An acute mouse model revealed that extended digestion resulted in a distinctive glycemic profile with elevated GLP-1, significantly promoting satiety ($p < 0.05$). Using the STC-1 cell culture model, the GLP-1 secretion mechanism through G-protein-coupled receptor signaling was further clarified. These results suggest a new role for millet phenolics in managing hyperglycemia and weight loss. Long-term studies

are necessary to further understand the implications for industry and public health, particularly for creating carbohydrate-based foods with millet phenolics to help manage obesity and diabetes.

Speaker Profile

Dr Veda Krishnan is a Senior Scientist in Biochemistry at ICAR-IARI, New Delhi, with twelve years of research and teaching experience. After earning her PhD in Biotechnology, she completed postdoctoral work at Purdue University's Whistler Centre for Carbohydrate Research as a Fulbright-Nehru Fellow in 2022. As head of the Food Matrix Lab, Dr Krishnan focuses on enhancing human health through food and nutrition research, particularly in bio-functional foods. Her work aims to improve carbohydrate quality for satiety by exploring gut-sweet receptor signaling. She has over 60 publications, 8 book chapters, a patent, and has commercialized two high-quality carbohydrate products.

DR KALIKRISHNA HAZRA

Senior Scientist, ICAR-Indian Institute of Pulses Research, Kanpur

Ecological and system-based phosphorus management approaches for enhancing crop productivity and agricultural sustainability



Efficient phosphorus (P) management is essential for achieving higher crop yields while maintaining ecological balance. Currently, optimal P nutrition in field crops faces multiple challenges, largely due to inefficiencies in the soil-plant system and over-reliance on fertilizer-P. This results in low P

use efficiency and suboptimal crop yields. Additionally, the depletion of global mineral P reserves, rising fertilizer costs, and pollution associated with P applications further emphasize the need for effective P management strategies in agricultural systems. Our study explores a sustainable, system-based approach to P management in cereal-legume systems within tropical alkaline soils. In these conditions, P biochemistry

is complex, and P bioavailability is significantly limited due to high P sorption into Ca-P forms. Our findings suggest that an integrated P management strategy—utilizing organic amendments, phosphate-solubilizing microorganisms, and system-based fertilizer-P applications—can improve P bioavailability and boost yields, while also conserving P resources, benefiting farmers. Additionally, selecting P-efficient genotypes and considering seasonal P dynamics in relation to crop demands can further enhance P use efficiency. Technologies such as P-enriched compost/biochar, alongside enhancing plants' capacity for P remobilization through plant breeding, offer promising methods for improving fertilizer P efficiency. These strategies require systematic research to advance sustainable P management in agriculture.

Speaker Profile

Dr Kalikrishna Hazra, am currently serving as a Senior Scientist in Agronomy at the ICAR- Indian Institute of Pulses Research, Kanpur. I earned my Bachelor's degree in Agriculture from Visva-Bharati University, Santiniketan, West Bengal; my Master's degree from Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand; and my Ph.D. from IIT Kharagpur. I joined Agricultural Research Service in 2010 and have since been dedicated to agronomic research focused on pulse crops. My research specialties encompass plant nutrition, cropping systems, carbon sequestration, sustainable intensification of rice-fallow systems, and abiotic stress management. I am also keen to advance research in smart agricultural technologies and remote sensing applications.

LECTURE INSA ASSOCIATES FELLOW

PROFESSOR SUDHIR PRATAP SINGH

Head (Industrial Biotech. Dept.) & Dean (Research), Gujarat Biotechnology University, Gandhinagar

Catalytic innovations for bioproduction of high-value functional biomolecules



We have generated metagenomic resources from thermal springs, cold-lakes, acidic mine tailings and fermented foods, and characterized novel genes encoding enzymes of superior catalytic properties and high-value to biotechnology, e.g., D-allulose 3-epimerase, trehalose synthase, L-rhamnose

isomerase, cellobiose 2-epimerase, amylosucrase, xylose isomerase, type I pullulanase, glutamate decarboxylase, β -galactosidase, endoglucanase, β -glucosidase, xylanase, endopolygalacturonase, and pectate lyase. Deploying these, he achieved the biosynthesis of many high-value biomolecules, e.g., D-allulose, trehalose, trehalulose, D-allose, epilactose, turanose, α -arbutin, GABA, 4-galactosyl-kojibiose, fructooligosaccharides, glucooligosaccharides, pecticoligosaccharides, xylooligo-saccharides, levan, dextran, and type-III & type-V resistant starch. The novel β -galactosidase can hydrolyze lactose in acidic whey to neutral milk samples, improving their nutritional value. The polymer levan has been utilized to develop biodegradable films for wrapping and packaging applications. The novel pectate lyase with highly alkaline tolerance is a potential biocatalyst for pectin removal from plant fibers, i.e. bioscouring, improving fiber qualities.

Speaker Profile

Professor Sudhir Singh is currently working as a Professor of Industrial Biotechnology at Gujarat Biotechnology University, Gandhinagar. His current area of research pertains to gene mining, biocatalyst engineering for high-value rare sugar and functional biomolecules. Professor Singh has published more than 75 research articles in SCI journals and 12 patents

have been granted. His scientific contributions are recognised by several prestigious scientific honours, e.g. TATA Innovation Fellowship (DBT, Govt. of India) and Professor Hira Lal Chakravarty Award (Indian Science Congress Association, DST, Govt. of India). His team has been awarded the Gandhian Young Technological Innovation Award by the SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions), India. Professor Singh is an elected Fellow of the National Academy of Agricultural Sciences (FNAAS) and the International Society of Energy, Environment, and Sustainability (FISEES).

PROFESSOR KASHMIR SINGH

Professor & Coordinator, DST-Centre for Policy Research, Panjab University, Chandigarh

Metabolic Engineering of medicinally important plants, *Chlorophytum borivilianum* and *Saussurea lappa*



Plants synthesize hundreds of chemical compounds for various functions, including defense and protection against insects, fungi, diseases, and herbivorous mammals. Majority of these also possess medicinal properties. have been discovered and used in traditional medicine practices

since prehistoric times. We are working on two important medicinal plant and understanding the molecular aspects of biosynthesis and regulation of secondary metabolic pathways. *C. borivilianum* has high potential for the pharmaceutical interest selected as priority plant by Medicinal Plant Board of India. We have identified all the genes involved in terpenoid/saponins biosynthesis in this plant using degenerate primers approach suppression subtractive hybridization and by transcriptome sequencing using Illumina HiSeq sequencing platform. Further, miRNAs regulating saponins biosynthesis were identified from this plant. Efforts are now underway to enhance saponins contents in this plant using transgenic approach. Another important plant, *S. lappa*, an Asteraceae family plant

found in upper Himalayas is of huge pharmaceutical importance. We used multi-omics approaches and done in-depth annotation of biosynthetic pathway for costunolides along with the tissue-specific relative gene expression in *S. lappa*. Further, they studied of transcriptional regulators of these genes by cloning the promoter region of key genes of pathway and studied their interactions with transcription factors by yeast hybrid assay. The study on miRNAs and their target prediction have been done by smRNAome and Degradome sequencing. This data will contribute to functional genomics and metabolic engineering studies on above mentioned plants.

Speaker Profile

Professor Kashmir Singh is Professor at the Department of Biotechnology, and the Coordinator, DST-Centre for Policy Research, Panjab University, Chandigarh. He has over 19 years of teaching and research experience. He has obtained his Ph.D from CSIR-IHBT, Palampur and has vast international exposure. He was awarded Marie Curie Fellowship by European commission on Biotechnology and worked at Adam Mickiewicz University, Poland. Further he worked as Research Associate, at Missouri State University, USA and visiting scientist at McGill University, Canada. He is also recipient of INSA b=visiting fellowship to Poland. His research is focussed on medicinally and commercially important plants such as *Chlorophytum borivilianum*, *Saussurea lappa*, *Vitis vinifera*, *Solanum tuberosum*, *Brassica juncea* etc. His research group at PU has characterized important defence-related protein families such as R-gene family and anti-oxidant genes, transcription factor families, lncRNAs related to the abiotic and biotic stress response, miRNAs, CAP-binding proteins, genes involved in secondary metabolism etc. He has authored more than 150 national and International research publications, review articles and book chapters. He has edited three books and is serving as editor of reputed international journals. He has supervised over 20 Ph.D. students and guided number of master's students.

LECTURE NEW FOREIGN FELLOW

PROFESSOR PRABHU PINGALI

Professor & Director, Tata-Cornell Institute, Cornell University, New York, USA

India's Food Systems Transformation: Opportunities & Challenges



India has seen phenomenal changes in its food systems over the past century, rapid productivity growth in staple grains - rice and wheat - resulted in the continent beating the Malthusian scare of widespread hunger and starvation. Agricultural transformation also kickstarted

overall economic growth, moving the country into middle income status. India's celebrated success in becoming food secure has not been without long term costs and unintended consequences. Strong political support for enhancing the supply of staple grains has resulted in reduced emphasis on the nutritional quality of the food system. Intensification of crop production has resulted in significant environmental damage, and climate impacts. The slow growth of non-farm employment opportunities is widening rural-urban income disparities, and stubbornly high levels of rural poverty, particularly in dry-land areas. Can the negative consequences of the current food system be reversed? On the positive side, rising urban middle class demand for diet diversity can help induce a widening of the food basket and create new opportunities for rural growth. Also, increased consumer awareness of food quality and sustainability could lead to improved incentives for environmentally smarter and climate friendly production practices. However, getting to a consensus among the multiple stakeholders on the appropriate way forward will be a challenge. The stickiness of existing agricultural policies and the difficult politics around policy reform could impede progress towards a more nutritious, environmentally sustainable and climate friendly food system.

Speaker Profile

Prabhu Pingali is a Professor in the Charles H. Dyson

School of Applied Economics and Management, Cornell University, with a joint appointment in the Department of Global Development, and the Founding Director of the Tata-Cornell Institute for Agriculture and Nutrition (TCI). He is Chair of the Governing Board of ICRISAT, a CGIAR Center focused on dryland agricultural systems. Prior to joining Cornell, he was Deputy Director, Agricultural Development at the Bill & Melinda Gates Foundation (2008-13), and Director of the UN Food and Agriculture Organization's Agriculture and Development Economics Division (2002-08). In addition, he worked with the CGIAR for 15 years from 1987-2002, first with IRRI in the Philippines and then with CIMMYT in Mexico. Dr Pingali is a member of the U.S. National Academy of Sciences, and the Indian National Academy of Sciences; a Fellow of the American Association for the Advancement of Science (AAAS), and the American Agricultural Economics Association (AAEA), and the African Association of Agricultural Economists; and a former President of the International Association of Agricultural Economists (IAAE). He is globally recognized for his research and policy contributions focused on the nexus of hunger, poverty and environmental sustainability. Professor Pingali has written 14 books and over 200 refereed journal articles and book chapters.

SECTIONAL COMMITTEE V

Chair: Professor Santosh Kapuria

R. C. Malhotra, Chair Professor & Head, Applied Mechanics, Indian Institute of Technology, Delhi



Santosh Kapuria, currently the R. C. Malhotra Chair Professor and Head of Applied Mechanics at IIT Delhi, earned his PhD in Applied Mechanics in 1997. He began his career in 1991 at Engineers India Limited, gaining extensive experience in engineering

and R&D. In 2002, he joined IIT Delhi as an Associate Professor, advancing to full Professor

in 2006 and receiving the higher academic grade in 2013. He served as Director of the CSIR-Structural Engineering Research Centre from 2015 to 2020 and was the Theme Director for Civil Infrastructure and Engineering at CSIR. His research focuses on multifunctional materials and structures, computational mechanics, and structural health monitoring, with over 165 publications in top journals. He has been a Humboldt Research Fellow at TU Darmstadt and a Fulbright Senior Research Fellow at Stanford University. He is a Fellow of four national academies of India (INSA, IASc, INAE, NASI) and received the J. C. Bose National Fellowship in 2018. In 2022, he was honored with the Professor P. C. P. Bhatt Faculty Research Award for best researcher at IIT Delhi.

LECTURE OF INSA DISTINGUISHED LECTURE-2 FELLOW

PROFESSOR SANKAR K. PAL

Emeritus Professor, Indian Statistical Institute, Kolkata

Granular Deep Learning: Concept, Models and Applications



The talk first describes the components of granular computing (GrC), viz, granulation, granules and information granules, and its significance towards computational gain in mining large data. The definition of a cluster in granulated domain and the associated uncertainties

in terms of roughness are explained.

Characteristics of deep learning (DL), a popular machine learning technique, are then mentioned along with the challenges. Since DL is time consuming, the incorporation of GrC in reducing its computation time is relevant.

The problem of multi-object detection and

tracking in DL framework is then considered as an example. The principle of using granulation in CNN (convolutional neural network) in reducing its computation time is explained. Accordingly, a granulated region proposal network, viz, G-RCNN, which is a two-stage object detector, is designed based on AlexNet deep architecture. G-RCNN accepts video directly as input. It is an improved version of Fast RCNN and Faster RCNN for extracting RoIs (regions of interest) by incorporating spatio-temporal granulation. Spatio-temporal granules enable extraction of less but more representative RoI-pixels of object regions, and thereby make the G-RCNN superior in real-time detection speed and accuracy. The merits of G-RCNN are demonstrated, as a case study, on real-time traffic scenarios for anomaly detection in safety analytics.

The talk concludes by mentioning some challenging issues and future directions of research.

Speaker Profile

Sankar K. Pal received PhD degrees from the University of Calcutta, Kolkata, and Imperial College, London. He joined the Indian Statistical Institute, Kolkata in 1975 as a CSIR-SRF where he became a full professor in 1987, a distinguished scientist in 1998, the Director in 2005, and the President in 2022. Currently, he is a National Science Chair, and an ISI Emeritus Professor. He was an INSA Distinguished Professor. He founded the Machine Intelligence Unit and the Center for Soft Computing Research at ISI, Kolkata.

He worked at the University of California Berkeley, University of Maryland College Park, NASA Johnson Space Center, Houston, and US Naval Research Laboratory, Washington, DC. He has coauthored 21 books and about 500 research publications in the areas of pattern recognition, machine learning, image/video processing, data mining, web intelligence, soft computing, bioinformatics, and cognitive machines.

Professor Pal received several national/international awards including the S.S. Bhatnagar Prize, the Padma Shri, the G.D Birla Award, and the Khwarizmi International Award from Iran. He is/was on the editorial boards of 25 journals including

several IEEE Transactions. Fellow of TWAS and all four National Academies for Science/Engineering in India, and a foreign member of the European Academy of Sciences and Arts.

LECTURE NEW FELLOW

PROFESSOR SIVAJI CHAKRAVORTI

Electrical Engineering, Jadavpur University, Kolkata

Non-Invasive Condition Assessment of Transformer Insulation – Why and How?



Transformers are not only critical components but also very expensive equipment in electrical power system. Large number of power transformers, which have oil-paper as the insulation, have already crossed their design life, but are still working fine. The strategy for health management

of transformers is therefore of immense economic importance to power utilities all over the globe. Such strategy depends on assessment of the present condition of insulation. Health monitoring is best performed if it is non-invasive in nature and if it could identify the ageing status of the most vulnerable insulation, viz. paper. The contaminant that damages paper insulation most is moisture. Hence, a good health monitoring technique of transformer is the one that could estimate moisture content in paper insulation accurately, which requires a proper understanding of moisture dynamics within the transformer insulation. Measuring dielectric response in time-domain and frequency-domain, the present status of the paper insulation within a transformer can be assessed accurately in a non-invasive manner.

Speaker Profile

Sivaji Chakravorti is currently Professor in Electrical Engineering at Jadavpur University, Kolkata. From August 2015 to August 2020, he was the Director of National Institute of Technology Calicut. He worked at the Technical University Munich as Humboldt

Research Fellow and at the Virginia Tech, USA, as US-NSF guest scientist. He is the recipient of Technical University Munich Ambassador Award and AICTE Technology Day Award in 2003. He is Fellow of Indian National Academy of Engineering, Fellow of National Academy of Sciences India and Distinguished Lecturer of IEEE Power and Energy Society. He is presently Vice-President of the Indian National Academy of Engineering and President of the West Bengal Academy of Science & Technology and is former Chairman of IEEE India Council. He has published more than 270 research papers, authored three books, and owns one US patent, four Indian patents and two software copyrights. His current fields of interest are condition monitoring of power equipment, numerical field computation and optimization of insulation system.

PROFESSOR SIRSHENDU DE

Department of Chemical Engineering, Indian Institute of Technology, Kharagpur

Ultra low cost laterite based indigenous arsenic removal filter



About 230 million people in more than 130 countries including 180 million from Asia and more than 50 million in India are adversely affected by arsenic contamination in groundwater. World Health Organization recommended the maximum level of arsenic in drinking water 10 µg/L

and 99% of exposed population live in rural areas. Therefore, developing economical, effective, sustainable and eco-friendly treatment technique for arsenic removal is necessary.

Professor Sirshendu De and his group invented an ultra-low cost laterite based material with remarkably high adsorption capacity of total arsenic (46.5 mg/g). The material was thoroughly characterized and the commercial filters were scaled-up using convection-diffusion-adsorption based fundamental model. The

unique features of the filter are: (i) high scalability; (ii) long life upto 5 years; (iii) no regeneration of media during lifetime making the maintenance easy; (iv) the spent media satisfies TCLP protocol and hence can be disposed easily; (v) the cost of the treated water is INR 10/m³; (vi) no electric power needed for the domestic filter (100 L/day) suitable for rural set-up. The technology is commercialized by 4 companies. More than 450 community scale filters (2-10 m³/h) came up catering about 8 lakh people per day.

Speaker Profile

Sirshendu De is a professor in the Department of Chemical Engineering IIT Kharagpur. His research interest is the treatment of ground and waste water, membrane separation, modeling of Chemical Engineering systems. Professor Sirshendu De did his B. Tech (1990), M. Tech (1993) and PhD (1997) from Department of Chemical Engineering, IIT Kanpur. He has authored 8 books, 21 patents, 372 publications in journals of repute with H index 68 and handled more than 50 research projects and transferred 6 technologies for commercialization to eleven companies. He has guided 31 PhD and 70+ M. Tech students. Professor De has been awarded several awards, including Institute Chair Professorship, 2020, Abdul Kalam Fellowship for Innovative Research 2017, Shanti Swarup Bhatnagar Prize in "Engineering Science" (2011). He is a Fellow of Indian National Academy of Engineers, New Delhi, The National Academy of Sciences, India, Allahabad, Indian Academy of Sciences, Bangalore apart from Indian National Science Academy, New Delhi. He is the founder of the spin-off company M/s. Technoquips Separation Pvt. Ltd.

PROFESSOR ANIMANGSU GHATAK

C. V. Seshadri Chair Professor, Department of Chemical Engineering, Indian Institute of Technology, Kanpur

Biomimetics: An Engineer's Approach Towards Unravelling Nature's Marvels



"The smallest insect is more complex than a star or Galaxy", thus goes the saying. And truly so, as we know, that insects and for that matter most organisms that inhabit this planet have evolved for millions of years and as result, each of their organs, tissue, cells, in fact all the way to the

organization of every molecule that constitute them is globally optimized to allow them survive in harmony with the nature in their habitat and propagate their species. What can we learn by observing them, by studying them and by mimicking their form and function? The way these organisms walk, fly, dart, forage, bite, find mating partners, defend against their predators, attack enemies, capture preys, communicate and collaborate among themselves, in fact, express their emotions to each other, all can be subject of intense and useful research. From engineering perspective, this research often leads to unravelling of novel and multifunctional materials, knowledge about new physical principles and discovery and development of novel manufacturing ideas and processes. In my talk, I will discuss research on biomimetics in the context of reversible adhesion, incision of soft tissue by sharp objects like a needle and surface tension induced deformation in soft solids.

Speaker Profile

Dr Animangsu Ghatak is currently C. V. Seshadri Chair Professor at the Department of Chemical Engineering, IIT Kanpur. He is a B.Tech. from IIT Kharagpur, M.Tech. from IIT Kanpur. He did his Doctoral research at Lehigh University, USA. He carried out post-doctoral research at Cambridge University UK and Harvard University, USA. Professor Ghatak was elected a Fellow of Indian National Academy of Engineering in 2018; he was also a Humboldt Fellow. Professor Ghatak works in

the area of soft materials, wetting, adhesion, friction, fracture and instabilities at soft interfaces.

PROFESSOR DEBDEEP MUKHOPADHYAY

Institute Chair Professor, Department of CSE, Indian Institute of Technology, Kharagpur

Hardware Security in the Modern World Baby-Step Giant-Step Approach!



Hardware Security is a fascinating field of research attempting to provide a root of trust to our computing systems. In this talk, I shall share some of my experiences in the world of Hardware Security and Cryptographic Engineering. The talk shall also present an overview of

the journey of our laboratory at IIT Kharagpur, which we call Secured Embedded Architecture Laboratory (SEAL).

In particular, this talk will highlight that while mathematically strong cryptographic algorithms are an important beginning for cryptographic designs, they can be compromised via physical channels of information, often referred to as side channels. We discuss how faults in crypto-algorithms can be utilized to decipher the key from modern systems, highlighting the importance of fault tolerance in cryptography. Subsequently, we discuss how side channel attacks are threatening modern day computing systems by exploiting the underlying micro-architectural footprints, obviating the need for design-for-secure approaches. We conclude the talk with some new directions of SEAL, IIT Kharagpur namely in the directions of post-quantum cryptography and assu.

Key words: Hardware Security, Side Channel Analysis, Fault Analysis, Micro-architectural attacks, Design-for-Security, Trust and Assurance.

Speaker Profile

Professor Debdeep Mukhopadhyay is an Institute Chair Professor at the Department of CSE, IIT Kharagpur,

India. At IIT Kharagpur he initiated Secured Embedded Architecture Laboratory (SEAL), focusing on Hardware-Security. He holds a Ph.D, M.S., and a B.Tech from IIT Kharagpur. His research interests are on the topics of Cryptographic Engineering, Micro- architectural security and Hardware-Security. Recently he is intrigued by adversarial attacks on machine-learning, and encrypted computations, which includes homomorphic computations and searchable encryptions.

Dr Mukhopadhyay has published more than 250 papers in peer reviewed conferences and journals, and is in the editorial boards and program committees of several top journals and conferences. Debdeep is the recipient of the prestigious Shanti Swarup Bhatnagar Award 2021 for Science and Technology. He is a Fellow of the National Academy of Engineers, and the Asia-Pacific Artificial Intelligence Association (AAIA) for contributions to Information Security. He has been enlisted in Asia's most outstanding researchers compiled by Asian Scientist Magazine.

PROFESSOR SATYAM SUWAS

Department of Materials Engineering, Indian Institute of Science, Bangalore

Role of stacking fault energy on evolution of crystallographic texture in metals and alloys



Understanding deformation mechanisms is crucial for making engineering products of metallic materials, and the performance of engineered products. The deformation mechanisms are controlled by crystal structure, crystallographic texture and other microstructural attributes.

It is known that stacking fault energy associated with the crystal structures plays an important role in the choice of deformation mechanisms. In this presentation, an attempt will be made to elucidate the effect of and stacking fault energy on the evolution of crystallographic texture in close packed metals and alloys. Typical examples of Nickel-base alloys, Magnesium-base alloys

and Titanium-base alloys will be presented to demonstrate the effect of stacking fault energy and deformation mechanisms. In some cases, the deviation from the above mentioned hypothesis will also be presented.

Speaker Profile

Dr Satyam Suwas is a Professor and currently the Chair of Materials Engineering at Indian Institute of Science, Bangalore, India. He obtained his Ph.D. in Materials and Metallurgical Engineering from IIT Kanpur, and worked at Defence Metallurgical Research Laboratory, Hyderabad; University of Lorraine, France and RWTH Aachen, Germany before joining Indian Institute of Science. His specialization includes materials processing, crystallographic texture and mechanical behaviour of materials.

LECTURE OF INSA DISTINGUISHED LECTURE-1 FELLOW

PROFESSOR M. TANVEER

Machine Learning (OPTIMAL) Research Lab, Indian Institute of Technology, Indore

Recent Progress in AI/ML/DL Algorithms for Alzheimer's Disease



Alzheimer's disease (AD) is a leading neurodegenerative disorder and the primary cause of dementia worldwide. Numerous machine learning (ML) and deep learning (DL) algorithms have been developed for the early diagnosis of AD. However, they often struggle with the issues of

noise and outliers. Loss function plays a crucial role in ML and DL frameworks. The selection of the appropriate loss function holds the potential to influence the behavior and efficacy of the algorithm. This lecture will cover recent advancements in loss function design, specifically the Wave Loss and RoBoSS Loss functions, both aimed at enhancing

classification accuracy, robustness to outliers and noise, and scalability. Additionally, we will explore ensemble DL for AD characterization and estimation, as well as brain age estimation using DL techniques.

Speaker Profile

Dr M. Tanveer is currently a full Professor at the Indian Institute of Technology Indore. Previously, he was a Postdoctoral Research Fellow at the Rolls-Royce@NTU Corporate Lab, Nanyang Technological University, Singapore. His research interests encompass support vector machines, optimization, machine learning, deep learning, and applications to Alzheimer's disease and dementia. Tanveer has published over 165 refereed journal papers with more than 7,600 citations and an h-index of 42 (Google Scholar, November 2024). He has served on review boards for over 100 scientific journals and participated in various national and international scientific committees. He is the recipient of the INNS Aharon Katzir Young Investigator Award for 2024, IIT Indore Excellence in Research Award for 2023, Asia Pacific Neural Network Society Young Researcher Award for 2022, and the 29th ICONIP and IJCNN 2024 Best Research Paper Awards for 2022 and 2024 respectively. He has held editorial roles for several journals, including IEEE Transactions on Neural Networks and Learning Systems, Pattern Recognition, Neural Networks, and Neurocomputing. Tanveer has organized numerous international and national conferences and symposiums as General Chair or Organizing Chair, and has delivered keynote talks at various events. He is/was the Principal Investigator (PI) or Co-PI of 12 major research projects funded by the Government of India. He is also an elected member of the Board of Governors of the Asian Pacific Neural Network Society (APNNS) and an INSA Associate Fellow, recently awarded the prestigious INSA Distinguished Lecture Award for 2024.

LECTURE OF INSA YOUNG ASSOCIATES

DR SURENDRA NADH SOMALA

Associate Professor, Indian Institute of Technology, Hyderabad

Sensitivity of Length (Directivity) and Speed (Supershear) of Earthquake Rupture on Bridges and Offshore Wind Turbines



Large earthquakes are finite-size fractures that have 2 propagation effects [i] Length of propagation (Directivity) [ii] Speed of propagation (Supershear). Directivity depends on where exactly (at one the edges, or in the middle, or somewhere in between) on the tectonic fault the earthquake initiates.

Longer the permissible propagation length, greater is the extent of directivity. Supershear can occur in mode-II earthquake fractures, where the rupture propagates at speeds faster than the shear-wave speed of the medium. Quite a few earthquakes have proven to have propagated at supershear speeds. Using 3D spectral finite element open source dynamic rupture modeling codes (that I co-developed), ruptures of various extents of directivity are simulated and applied to bridges and offshore wind turbines. The same set of structures are also subjected to earthquake time histories from simulated subshear and supershear ruptures, and fragility curves are developed. More realistic scenarios from highly seismic tectonic environments are also included from Southern California, Northern California, and the Cascadia Subduction zones.

Speaker Profile

Surendra Nadh Somala has PhD (2013) from the California Institute of Technology (CalTech), and is currently an Associate Professor at Indian Institute of Technology Hyderabad with primary affiliation in the Department of Civil Engineering and is an Adjunct faculty in the Department of Heritage Science and Technology. Prior to joining IIT Hyderabad, Dr Somala worked on induced seismicity due to shale gas extraction with Halliburton, based out of UK, as

a senior-scientist Physics. He is also associated with the Laser Interferometric Gravitational Observatory (LIGO), India and the Lunar Gravitational Wave Antenna (LGWA) project. He is currently working on various applications of Generative Artificial Intelligence (AI), Large Language Models (LLMs), Agentic AI.

DR SRIPARNA SAHA

Associate Professor, Department of Computer Science and Engineering, Indian Institute of Technology, Patna

Multimodal Information Processing: Some recent NLP applications



Multimodal information processing deals with the efficient usage of information available in different modalities such as audio, video, text, etc. for solving various task applications of real life. This talk will discuss how the multimodal information extracted from different

modalities can help in improving different tasks of dialogue systems, summarization, hate speech detection, and complaint mining. Multimodal information collected from audio tones, facial expressions, and texts is utilized for determining the type of utterance in a multitask setting where emotion recognition and dialogue act classification tasks are solved simultaneously. Multimodal information collected from videos, images, and texts can also be utilized for generating a summary. Images and texts collected from Amazon reviews are utilized for developing some aspect-based multimodal complaint detection systems in a multi-task setting where sentiment and emotion information are utilized as auxiliary tasks. Memes collected from social media are utilized for the detection of hate speech in a multitask setting where sentiment, emotion, and sarcasm detection are utilized as auxiliary tasks. This talk will highlight these different applications of multimodal information processing in solving different NLP tasks.

Speaker Profile

Dr Sriparna Saha is currently serving as an Associate Professor in the Department of Computer Science and Engineering, Indian Institute of Technology Patna, India. She has authored or co-authored more than 400 papers. Her current research interests include machine learning, deep learning, natural language processing, multiobjective optimization and biomedical information extraction. Her h5-index is 44 and the total citation count of her papers is 9945 (according to Google-scholar). She is also a senior-member of IEEE, fellow of IET, UK. She is the recipient of Lt Rashi Roy Memorial Gold Medal from the Indian Statistical Institute for outstanding performance in MTech (computer-science), Google-India-Women- in-Engineering-Award-2008, NASI-Young-Scientist-Platinum- Jubilee- Award-2016, BIRD Award-2016, IEI-Young-Engineers'-Award-2016, SERB-Women In Excellence Award 2018, SERB Early Career Research Award 2018, Pattern Recognition Letters Editor Award 2023, prestigious Young Faculty Research-Fellowship under Visvesvaraya PhD-Scheme for Electronics-&-IT for 5 years (Jan2019-Jan2024), Fulbright-Nehru Academic and Professional Excellence Fellowships 2024, Humboldt.

DR BAHNI RAY

Associate Professor, Department of Mechanical Engineering, Indian Institute of Technology, Delhi

Exploring micro-scale mechanism for pollutant mitigation in air and water



The knowledge of multiphase fluid mechanics can contribute to different air and water pollution mitigation technology. Aeration has been an important step in water cleaning system, but the mechanism demands huge power. It is considered to be the most energy-intensive part of wastewater treatment technology, usually

consuming up to 50%-60% of the total energy. The use of water droplets falling on water surface to get different sized bubbles can further be used in aeration of the water body. This method not only reduces the energy usage, but the droplet also carries oxygen along with it when it travels the atmosphere before falling on the water body. Apart from adding oxygen, the bubbling technology can be used in removing the oil from water by mixing with surfactant, which reduces the oil droplet size that is biodegradable. A major challenge faced in water pollution is the micro plastic sedimentation and propagation in water. The bubbles again can be used to remove these solid impurities. Air pollution research involves the use of water droplet dynamics in air pollutant capture. Pollutants can be captured by two different mechanisms: (a) particle absorption inside droplet for the case of hydrophilic and conductive particles and (b) particle attachment on the droplet surface for the case of hydrophobic particles. The same understanding of the mechanism led to the proof-of-concept of electrospray mechanism for pollutant mitigation.

Speaker Profile

Professor Bahni Ray is an Associate Professor from the Department of Mechanical Engineering in the Indian Institute of Technology Delhi. Her current research areas deal with exploring air and water pollution mitigation techniques. Her work emphasizes on using modeling and experimental tools to understand the multiphase physics of solid and fluid interactions which is the basis for all natural and industrial phenomena. Her lab is named the WATER MATTERS LAB which stand for Water, Air, Thermal, Energy Resource, Medical and Additive Technology towards Emerging Research on Sustainability. The sustainability is targeted by using available natural resource to address the energy production and pollution mitigation.

DR SWATANTRA PRATAP SINGH

Associate Professor, Indian Institute of Technology, Bombay

Fabrication of Electroconductive Surfaces and Membranes for Environmental Application



Laser-induced graphene (LIG) has garnered increasing interest due to its advantage of simple mask-free and chemical-free fabrication of graphene electrodes. One of the major advantages of LIG is that it can be produced from many substrates ranging from commercial polymers to waste

organic materials such as cloth, paper, and food. This flexibility offers the potential to explore recyclable and cheaper materials for flexible electronics and other applications. The porous graphene structures have shown great promise for developing electrochemical sensors for medical diagnostics, food safety, and environmental applications. Biofouling and selectivity permeability trade-offs are the leading challenges in membrane-based desalination and wastewater recycling. Electro-conductive membranes have shown their potential for controlling biofouling and selectivity permeability trade-offs. Laser-induced graphene (LIG) is a single-step, chemical-free method to fabricate graphene surfaces with a 10.6 μm CO₂ laser. Single-step conversion of Polyethersulfone (PES) membranes to LIG filters and further surface modification of these filters leads to UF composite membranes that have been demonstrated with excellent catalytic and anti-biofouling properties. The “catalytic mechanisms of these doped LIG filters and membranes are mainly due to LIG’s graphene and 3D texture effect and further enhanced through doping of hetero atoms. These surfaces and membranes (single-step laser printed) have great potential in environmental applications.

Speaker Profile

Dr Swatantra Pratap Singh is Professor-In-Charge for the Gogri Hub for Membrane Translational Research and Convenor for the Centre of Excellence on Membrane Technologies for Desalination, Brine

Management and Water Recycling (DeSaltM) at IIT Bombay, supported by the DST, India. He is an Associate Professor at the Indian Institute of Technology Bombay in the Environmental Science and Engineering Department and leads the interdisciplinary Environmental Nanotechnology Lab (ENano). He received his Ph.D. and M.Tech from the Indian Institute of Technology Kanpur, India, in Environmental Engineering and was a post-doctoral scholar at Zuckerberg Institute of Water Research, Ben-Gurion University of the Negev, Israel. He was awarded the INAE Young Engineer Award (2020), ISEES Young Scientists Award (2020), DST-SYST (2020), European Membrane Society Young Associates (2020), and IITB Early Research Achiever Award (2021). Most recently, he has been awarded the Professor Krithi Ramamritham Award for Creative Research 2022, Awarded in 2023, and INSA Young Associates 2024. His current research focuses on desalination and wastewater treatment by membrane technology and nanomaterials for environmental remediation, where his group has developed membranes and filters based on

Laser-induced graphene and part of 10 patents on the same technology, two prototypes under testing and has more than 52 journal articles.

PROFESSOR PARAG R. GOGATE

Institute of Chemical Technology, Mumbai

Intensified wastewater treatment based on hydrodynamic cavitation



The spectacular effects of cavitation viz. generation of highly reactive free radicals, local hotspots and liquid circulation associated by intense turbulence make cavitation a lucrative technique for wastewater treatment. The present work will initially highlight the different aspects

of hydrodynamic cavitation reactors including mechanism of generation, reactor designs and optimum operating parameters. Experimental case studies based on

the research work at Institute of Chemical Technology conclusively establish that the various pollutants such as dyes, pesticides and insecticides can be effectively degraded by hydrodynamic cavitation-based treatment schemes. The successful application of hydrodynamic cavitation along with other advanced oxidants such as H₂O₂, Fenton's reagent and O₃ will be described explaining the obtained synergy. A technology actually being implemented at commercial scale, which is based on the principle of combining the individual effects of Ozone, Hydrodynamic Cavitation, Acoustic Cavitation, and Electro-Chemical Oxidation to achieve synergistic effects, will also be highlighted in terms of basic design and case studies of applications.

Overall, it appears that the use of hydrodynamic cavitation result into a significant increase in the rates of degradation and also increases the scope of applicability of these techniques to more and more complex effluents containing a variety of pollutants

Speaker Profile

Professor Gogate is currently working as Professor of Chemical Engineering at ICT, Mumbai. The main research interests of Dr Gogate include Cavitation phenomena, Wastewater treatment, Design of Multiphase reactors, Separation Processes and Process Intensification.

Professor Gogate has published over 435 research papers in International journals and has also written 30 chapters in books. He is Indian National Academy of Engineering and The National Academy of Sciences, India. Dr Gogate is also consultant to many industrial organizations in the area of process intensification, process improvement and Wastewater treatment.

PROFESSOR VINEETH N BALASUBRAMANIAN

Department of Computer Science and Engineering, Indian Institute of Technology, Hyderabad (IIT-H)

AI Models Can Predict, but Can They Reason? A Journey Toward Explainable AI Systems



For decades, the quest to replicate human intelligence has fascinated scientists across disciplines. Initially inspired by the remarkable capabilities of the human brain, this pursuit has evolved into an exploration of digital technologies that significantly shape our daily lives. Central to this endeavor

is the capacity of machines to learn from historical data and make predictions. However, a crucial question remains: can these systems truly reason? As AI and machine learning models increasingly permeate risk-sensitive and safety-critical domains, the demand for explainability has surged. While existing methods for post-hoc explanations have been a significant stride forward, they raise pressing concerns about accountability and the depth of reasoning. This brief talk will journey through our efforts in explaining the outputs of deep learning models (Grad-CAM++, WACV 2018), explore causal reasoning in neural networks (ACE, ICML 2019), align the explanations of neural networks with domain knowledge (CREDO, ICML 2022); and more recently, learn models that implicitly learn via explanations. These principled approaches stand for our overall objective to transition from learning via prediction to learning via reasoning, fundamentally changing how explainable AI systems can be developed and used.

Speaker Profile

Vineeth N Balasubramanian is a Professor in the Department of Computer Science and Engineering at the Indian Institute of Technology, Hyderabad (IIT-H), India, and currently a Principal Researcher at Microsoft Research India. He is also the Founding Head of the Department of Artificial Intelligence at IIT-H from 2019-22, and was also a visiting

faculty at Carnegie Mellon University under the Fulbright-Nehru Fellowship in 2022-23. His research interests include deep learning, machine learning, and computer vision with a focus on explainability, continual learning and learning with limited labelled data. His research has been published at premier venues in the field including ICML, CVPR, NeurIPS, ICCV, KDD, AAAI, and IEEE TPAMI, with Best Paper Awards at recent venues such as CODS-COMAD 2022, CVPR 2021 Workshop on Causality in Vision, etc. He is listed among the World's Top 2% Scientists (2022,2023,2024), is a recipient of the Research Excellence Award at IIT-H (2022), Google Research Scholar Award (2021), NASSCOM AI Gamechanger Award (2022), Teaching Excellence Award at IIT-H (2017 and 2021), Outstanding Reviewer Award (IJCAI 2023, ICLR 2021, CVPR 2019, etc), among others.

PROFESSOR NEETU SINGH

Professor & Head, Center for Biomedical Engineering, Indian Institute of Technology, Delhi

Breaking Barriers: Healthcare Solutions at the Interface of Chemistry & Biology



Among myriad of health issues of global populace today, the problems associated with better means of diagnosis, and repair and regeneration of organs, bones, cartilages, etc. remain a big challenge. The prospect of using nanoscience and nanotechnology as a tool to answer questions arising out of

these healthcare issues are exciting and form the basis of this talk. Nanostructures, due to their similar size scale as bio-macromolecules and cellular components, provide an unprecedented opportunity to target and potentially modulate important biological processes. Some of the key nanotechnology based scientific and technological contributions from our laboratory that will impact future healthcare strategies impacting disease diagnostics, better therapeutics delivery and

tissue engineering will be discussed. Briefly, examples illustrating how knowledge of chemical science & nanotechnology has enabled us to develop platform technologies for easy quantification of cell growth, migration and disease progression along with nano-based solutions from our lab for improving drug delivery, wound healing and tissue engineering will be discussed.

Speaker Profile

Neetu Singh obtained her Bachelors and Masters degrees from University of Mumbai and her doctoral degree in chemistry from Georgia Institute of Technology, Atlanta, USA. She obtained her postdoctoral training at the Harvard-MIT Division of Health Sciences and Technology, USA. Professor Singh returned to India and joined IIT Delhi as an Assistant Professor in the Center for Biomedical Engineering in 2014.

In her current program at IITD, she is establishing a research program that explores systematic probing into nanomaterials biological activity and formulates “design rules” for developing nanosystem for specific bio-medical & healthcare applications. Her group at IIT Delhi is integrating concepts and skills from chemistry, materials science, and biology to design nano-structured materials with enhanced functionalities for applications in biomedical implants, disease diagnostics, tissue engineering and regenerative medicine.

Her scientific contribution has been recognized by several awards and honors. She is the recipient of “Innovative Young Biotechnologist award 2013” by Department of Biotechnology (DBT), India. In 2019, she received the Veena Arora young researcher award by IIT Delhi, which recognizes best research contributions at IIT Delhi by faculty below 40 years. She is the receipt of NASI-SCOPUS young Scientist award for “Women-in Science”-2019; DBT’s Janaki Ammal Young scientist -2021 and Science and Engineering Research Board (SERB)-India, POWER Fellow 2021. She is also a mentor for an IITD start-up, “Kriya-Labs”, that is bringing valorization to agro waste by technological solutions.

She is also an editorial advisory board member of the journal *Bioconjugate Chemistry* (a pioneering publication of American Chemical Society) and a new Springer journal.

PROFESSOR NEELIMA SATYAM

Department of Civil Engineering, Indian Institute of Technology, Indore

Landslide Monitoring and Susceptibility Analysis in Indian Scenarios: Insights from the Himalayas and Western Ghats



Landslide susceptibility in India, particularly in the Indian Himalayas and Western Ghats, presents significant challenges due to frequent rainfall-triggered and seismic-induced landslides. My research explores a probabilistic approach to susceptibility analysis, incorporating both rainfall intensity-duration thresholds and seismic activity as primary triggering factors. We leverage cutting-edge MEMS-based and soil sensors integrated via IoT to capture real-time data on critical parameters, enhancing our understanding of the conditions leading up to landslide events. Our laboratory experiments and field monitoring efforts aim to improve the spatial and temporal prediction of landslides, while ensuring the robustness and reliability of early warning indicators.

Using this sensor-based, data-driven approach, we assess the dynamic behavior of slopes, allowing for more accurate susceptibility mapping. This analysis has proven valuable for anticipating potential hazards under varying environmental conditions. Recognizing the urgent need for a practical early warning system, this talk will discuss an approach to effectively monitor and alert vulnerable areas, potentially saving lives and reducing economic losses in landslide-prone regions.

Speaker Profile

Dr Neelima Satyam is a Professor in Civil Engineering at IIT Indore, specializing in Geotechnical

Engineering with expertise in landslide hazard assessment, earthquake geotechnics, and microseismic monitoring. She has served on prestigious committees, including the Indian Geotechnical Society (IGS) and Bureau of Indian Standards (BIS). With over 120 international publications, Dr Satyam's research has received awards from IGS, AGU, and IIT Indore, and she is a recognized fellow of JSPS, IGS, ISET, and IEI.

LECTURE PREVIOUS INSA ASSOCIATE FELLOW

DR SANDEEP ANAND

Professor, Department of Electrical Engineering, Indian Institute of Technology, Bombay

From Import to Innovation: The Journey of EV Power Electronics Components



The rapid growth of electric vehicles (EVs) presents both opportunities and challenges in the Indian automotive industry. This talk will delve into the critical components of EV powertrains, especially those based on power electronics, highlighting their roles and interdependencies. The talk

will start with discussion on the localization of these components, addressing the current reliance on imported products and the strategic importance of developing local manufacturing capabilities. The talk then examine the need for advancing technology in EV powertrains to enhance performance, efficiency, and sustainability. This includes the development of cutting-edge power electronic based products. The talk will include, some of the recent research carried out by the speaker's research group in this area, such as motor controllers, use of wide bandgap devices, integrated chargers and dc-dc converters etc. Overall the talk aims to highlight the pivotal role, localization and technological innovation can play in driving the future of electric mobility in the country.

Speaker Profile

Dr Sandeep Anand is a teacher and researcher in the field of power electronics. His work focuses on three key areas: making EVs sustainable and green through renewable integration in the grid, enhancing the efficiency and compactness of EV power electronics using wide bandgap devices (such as SiC & GaN), and ensuring high reliability of EV power electronic components. He received the B.Tech. and Ph.D degrees in electrical engineering from the Indian Institute of Technology Bombay, Mumbai, India, in 2007 and 2013, respectively. He had brief stints at Industry, working previously with Emerson Network Power, Mumbai, and Cosmic Circuits Pvt. Ltd., Bengaluru, India. From 2013 to 2020, he was a faculty member at the Indian Institute of Technology (IIT), Kanpur, India. He is currently a Professor with IIT Bombay, India. He is also the professor-in-charge of the C'72 EV PowerTrain laboratory at IIT Bombay, group leader for power integration at National Centre for Photovoltaic Research and Education (NCPRE) and faculty advisor for the IIT Bombay Student Racing Team. Dr Anand has been recognized with the "C1973 Research Excellence Award" by IIT Bombay in 2024, was named an "INSA Associate Fellow" by The Indian National Science Academy (INSA) in 2023, Young Scientist Platinum Jubilee Award" by The National Academy of Sciences, India (NASI) in 2019, and Young Engineer Award" by Indian National Academy of Engineering (INAE) in 2017.

LECTURE NEW FOREIGN FELLOW

PROFESSOR SANTOKH BADESHA

Distinguished Professor, Elmore Family School of Electrical and Computer Engineering

Ideas to Innovation via Open Innovation Mindset



The presentation will cover three main topics. First, it will address materials design challenges in digital printing systems, focusing on balancing multiple performance attributes while resolving subsystem integration issues. Second, it will showcase the tangible impact of foundational

inventions in printing technologies. Third, the focus will shift to Inter-Academy collaboration between National Academies, emphasizing the need to address collaboration challenges in emerging technologies. Finally, it will outline key enablers and barriers to generating intellectual property in specialized fields, offering insights into innovation in these areas.

Speaker Profile

Santokh Badesha, a Distinguished Professor in the Elmore Family School of Electrical and Computer Engineering, has played a pivotal role in driving the digital publishing revolution. His inventions have profoundly impacted the productivity and communication of millions of individuals and businesses worldwide. Since the 1990s, nearly all Xerox printing machines have incorporated his innovations. Badesha's inventions have been instrumental in popularizing laser printing technology and pioneering color laser printing. With an impressive portfolio of 273 U.S.-issued patents, he is one of the most prolific inventors in history. He is a Member of the National Academy of Engineering, a Fellow of the National Academy of Inventors, a Fellow of the Royal Society of Chemistry, and an Honorary Member of the Society for Imaging Science & Technology. The Institute of Engineering and Technology honored him with the IET Mountbatten Medal in 2022. Badesha continues to fuel advances in

digital printing, cementing his legacy as a visionary inventor and leader.

LECTURE OF INSA HISTORY OF SCIENCE YOUNG ASSOCIATES

DR SWATHY MANOHAR

Department of Civil Engineering, Indian Institute of Technology, Bombay

Bridging Eras: Reviving Historical Construction Practices and Pioneering Scientific Approaches for Future-Ready Heritage Conservation



Heritage conservation is a complex endeavor that demands an in-depth understanding of ancient construction materials to prevent frequent and often disruptive future interventions. The lack of scientific insights into the porosity, pore structure evolution, and inherent characteristics of these historic

materials has often compromised the efficacy and compatibility of restoration efforts. This talk, titled "Bridging Eras: Reviving Historical Construction Practices and Pioneering Scientific Approaches for Future-Ready Heritage Conservation," explores the role of micro-analytical studies in diagnosing and preserving the integrity of materials used in historical structures. Through an examination of key parameters—particularly pore structure and porosity—this presentation addresses essential aspects such as (i) assessing the weathering state of materials, (ii) identifying specific damage mechanisms under various environmental conditions, (iii) ensuring compatibility of repair materials with native substrates, (iv) detecting bio mineralization processes, and (v) tracing the original construction methodologies. Highlighting materials like fired clay bricks, stones, and lime mortars, this study also reviews existing techniques for analyzing pore structure, weighing the advantages and limitations of each. Given the challenges in obtaining samples from heritage sites, this work also evaluates non-destructive testing (NDT) methods suitable for determining pore-size distributions without

compromising the material integrity. The talk culminates in an evidence-based hypothesis that is validated through case studies from five ancient sites, each presenting unique conservation challenges. This approach aims to bridge the gap between traditional construction methods and advanced scientific interventions, fostering a conservation paradigm that respects the past while securing the longevity of these historic structures for future generations.

Speaker Profile

Dr Swathy Manohar is an Assistant Professor in the Department of Civil Engineering at IIT Bombay since 2022. She earned her B.Tech. from Kerala University/TKM College of Engineering, M.Tech. from IIT Roorkee, and Ph.D. from IIT Madras. Before joining IIT Bombay, she held research positions at IIT Madras and IIT Gandhinagar. Her research focuses on heritage conservation, particularly the durability and preservation of stone and masonry structures, and material characterisation exploring the ancient and traditional construction materials and practices. She has worked as a visiting professor at ETH Zurich, Switzerland during Sept 2023-Jan 2024 under SERB SIRE fellowship, and was awarded with Shree Gayatri Devi Award and medal at IIT Madras (2020), Early Career Fellowship at IIT Gandhinagar (2021), Young Faculty Award at IIT Bombay (2022), ANSYS PhD award IIT Bombay (2022), ACCESS (Accelerating Climate Change & Emerging Sustainable Solutions) award at IIT Bombay (2023).

SECTIONAL COMMITTEE VI

Chair: Professor Nirupama Mallick

**Agricultural and Food Engineering Department
Indian Institute of Technology, Kharagpur**



Dr Nirupama Mallick has more than three-decade research experience in the field of Algal Physiology, Biochemistry and Biotechnology. So far, she has a total number of citations above 6000 with h-index of 44 (SCOPUS).

As a researcher, she has consecutively been among the world's top 2% of scientific communities for the last five years, as assessed by Stanford University, USA. Indian National Science Academy (INSA) and the National Academy of Sciences, India (NASI) inducted her as Fellow in 2015 and 2018, respectively. The Royal Society of Research, London inducted her as an Elite Member in 2021. She received the Women Scientist Medal from the Biotech Research Society of India in 2005. She was an Alexander von Humboldt Fellow in 1998-99 at Forschungszentrum Juelich, Germany.

LECTURE OF INSA DISTINGUISHED LECTURE-2 FELLOW

DR EKLABYA SHARMA

Strategic Advisor and Distinguished Fellow, Ashoka Trust for Research in Ecology and the Environment (ATREE) Bangalore

A Vision for Ecological Security in the Indian Subcontinent vis-à-vis Sustainability



Ecological security in the Indian Subcontinent is highly influenced by the mountain regions such as Hindu Kush Himalaya in the north and Western Ghats in the south. There are four global biodiversity hotspots in the region namely, Himalaya, Indo-Burman, Western Ghats and Sunderland. India shares

nearly 9% of global species having 45,000 plant species, 91,000 animal species and it is designated as 12th mega-diversity country. The region is rich in endemic species with about 7,000 plant species in the Indo-Burman and 3,136 plant species in the Himalaya hotspots. Climate change, land use/cover change, urbanization and globalization are major drivers of change causing degradation of habitats and loss of biodiversity. Climate change is a major driver having impacts at local, national and regional levels. Disasters, specially floods are causing huge impacts on river basins, landscapes and agricultural lands with loss of assets including productive lands, loss of economy and life. Agricultural and forest produce, and livelihoods are negatively impacted by climate change. Adaptation to climate change, resilience and conservation of multi-functional landscapes for ecological security can be achieved by adopting transformative actions. Integrated approach using research, policy and practices, and managing their interphases for sustainable solutions show great promise. There are many community conserved initiatives in the Indian Subcontinent if consolidated could bring sustainability in the region. Impact studies on the policy and management of invasive alien species in India are highlighted.

Speaker Profile

Dr Eklabya Sharma, Padma Shri Awardee of 2024, is the Strategic Advisor and Distinguished Fellow of Ashoka Trust for Research in Ecology and the Environment (ATREE), Bangalore, India. He is an ecologist with over 40 years of experience in sustainable mountain development, and contributed to research and development as Regional Head of the G.B. Pant National Institute of Himalayan Environment in Sikkim and the Deputy Director General at the International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal. He was Vice-Chancellor of TERI School of Advanced Studies, New Delhi. His expertise is on biodiversity conservation, natural resources, transboundary landscape management, biogeochemical cycling in ecosystems including agroforestry systems, climate change impact assessments, adaptation and nature-based solutions, and resilience building.

LECTURE NEW FELLOW

PROFESSOR SANJAY P. SANE

National Centre for Biological Sciences Bangalore

How do insects fly? A multidisciplinary perspective



The evolution of flight and the miniaturization of the insect body size drove the spectacular success of insects. However, for flying insects a smaller body size also means a corresponding increase in the frequency of their wing motion. Yet several insects can flap their wings at frequencies exceeding hundreds

of cycles per second while displaying extraordinary aerobic control of their aerial maneuvers. Such fine control of flight requires enhanced sampling rates by the sensory system, rapid sensorimotor integration by the central nervous system and fast actuation by the flight muscles. Moreover, these movements must occur with great precision because even small deviations from

the intended motion can lead to large errors from the desired flight path. High-frequency flapping thus pushes the insect flight system to the very limits of its neural and biomechanical capability. Recent work from our lab has addressed the mechanisms that underlie such rapid yet precise control. These findings will be discussed in my seminar.

Speaker Profile

Dr Sanjay P. Sane is a professor at the National Centre for Biological Sciences (NCBS) in Bangalore, India. He earned his Ph.D. from the University of California, Berkeley, in 2001, where he studied the physics and aerodynamics of insect flight in the laboratory of Professor Michael H. Dickinson. He then transitioned to the field of sensory neurobiology, conducting postdoctoral research on flying insects with Professor Thomas Daniel at the University of Washington in Seattle. At NCBS, Dr Sane leads a research group focused on two main areas of inquiry: the biomechanics and control of insect flight, and the mechanisms by which insects collaboratively construct complex structures, such as termite mounds. His work addresses both sensory processing and collective behaviour in insects.

PROFESSOR T.N.C. VIDYA

Evolutionary and Organismal Biology Unit, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru

Testing socioecological theory in the Asian elephant



We report on the first tests of socioecological theory in the Asian elephant, relating food resource availability with between- and within-clan agonistic interactions. We found that the grassland created around the Kabini reservoir (between Nagarahole and Bandipur

National Parks) had about three times as much grass abundance as forests on either side. In keeping with this grassland being a small, resource-rich patch,

we found between-clan dominance to be very high, in contrast to that previously reported from forest habitat. The rate of agonism between females between clans (the most inclusive social unit) was also higher than that within clans. The rate of between-clan encounters increased with the number of clans and the duration of such encounters was weakly related to grass abundance. Despite fission-fusion dynamics, within-clan agonism was also fairly high, but not correlated with grass abundance, in contradiction to socioecological prediction. Within-clan agonism increased with group size, suggesting that the opposing effects of group size on between- and within-clan agonism might govern group sizes. Overall, competitor density seems to influence both between- and within-clan agonism, and food distribution seems to influence between-clan agonism.

Speaker Profile

T.N.C. Vidya is a Professor at the Evolutionary and Organismal Biology Unit, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru, India. She completed an Integrated Ph.D. from the Indian Institute of Science, and in research collaboration with Columbia University, New York. She subsequently carried out postdoctoral research at Stellenbosch University, South Africa, before joining JNCASR. She has worked in the areas of behavioural ecology, conservation genetics, phylogeography, and evolution.

LECTURE INSA YOUNG ASSOCIATES

DR GAURAV MAJUMDAR

Assistant Professor, University of Allahabad

Lights on Brain: Implications in Neuroplasticity and Cognition



Environmental factors like light drive many important physiological functions in animals. It is now understood that light can directly affect many physiologies including mood and cognition via the activation of the orexinergic system which in turn regulates the functioning of brain regions

of the limbic system like amygdala, hippocampus and prefrontal cortex. These areas are also the primary processing centers of sensory information and thus play a role in mediating the transduction of environmental cues to brain. Furthermore, a significant effect of light duration, independent of hormones have been shown on brain plasticity. This hints towards at a more direct pathway between light stimulation and neuroplasticity (NP) which is defined as the capacity of brain cells to change in response to intrinsic and extrinsic factors. Our lab focuses on understanding how light may influence brain processes of neuroplasticity and cognition. We use manipulation of light schedules (e.g. Seasonal light patterns) to test its effect on retinal and neuronal physiology of animal models like birds and seasonal hamsters. Understanding these processes may have huge implication in cognitive science research paving way to modulate state of neuroplasticity or cognition in adults and aged individuals.

Speaker Profile

Dr Gaurav Majumdar is currently working as Assistant Professor of Zoology at University of Allahabad, Allahabad. He did his Ph.D. in chronobiology from University of Delhi which focused on the role of circadian and seasonal factors in regulating avian migratory physiology. After his Ph.D., Dr Majumdar acquired two prestigious European post-doctoral research fellowships (BELSPO and FWO) to continue

his post-doctoral research at the Bio-imaging laboratory, University of Antwerp, Belgium where he worked on the role of light, opsin molecules and circadian clock in mediating neuro-degenerative diseases with an emphasis on Alzheimer's disease. He then moved to University of Glasgow to work on molecular mechanism involved in seasonal clock regulation of animal physiology. His lab, laboratory of Bio-clocks at University of Allahabad is working on understanding the role of biological rhythms in regulating neurophysiology generously funded by SERB and DBT projects.

LECTURE INSA ASSOCIATE FELLOW

PROFESSOR ANZAR A. KHURROO

Centre for Biodiversity & Taxonomy, Department of Botany, University of Kashmir, Srinagar

Aliens in the Anthropocene: inventory and impacts of invasive alien plants in India



In an era of Anthropocene, invasive alien species are recognized as one of the major drivers of global biodiversity loss. In recent times, increasing spread of invasive species mainly aided by unsustainable anthropogenic activities are posing risks to ecology,

economy and human health worldwide. India - a mega- biodiverse country - is also beset with the problem of invasive species with severe consequences for its rich biodiversity. A recent conservative estimate revealed that the invasive species have costed Indian economy between ₹ 8.3 to 11.9 trillion over the last 4 decades. It is in this context that the talk presents a scientific synthesis of the research studies conducted on invasive alien plants in India during the last more than a decade. Major findings of biotic inventory of the alien plant species conducted at multiple spatial scales: local (Kashmir), regional (Indian Himalaya), national (India) and supranational (South Asia) are summarized. The ecological impacts of invasive species

on biodiversity, ecosystem processes and soil systems are discussed by showcasing the case studies on model invasive plants from Kashmir Himalaya. Looking ahead, the implications of research insights gained from these inventory and impact studies on the policy and management of invasive alien species in India are highlighted.

Speaker Profile

Professor Anzar A. Khuroo is a botanist specializing in plant taxonomy, ecology, and biodiversity, currently serving as a Professor at the Centre for Biodiversity & Taxonomy, Department of Botany, University of Kashmir, Srinagar, Jammu & Kashmir. For over a decade, he has been leading the BIOTA (BIODiversity & TAXonomy) Lab at the university, focusing on key research areas such as alpine flora, invasion ecology, and global change biology. His prolific academic contributions include more than 180 publications and two notable books: Biodiversity of the Himalaya: Jammu and Kashmir and Field Manual on Alien Flora of Kashmir Himalaya. Professor Khuroo has also discovered 12 new plant species, underscoring his significant role in advancing botanical research and conservation.

LECTURE PREVIOUS INSA FELLOW

PROFESSOR SAROJ KANTA BARIK

Department of Botany, North-Eastern Hill University, Shillong

Ecological niche concepts contribute to fundamental understanding and applications in climate change biology and biodiversity science



The fundamental concept of ecological niche has been diversified and different concepts of niche viz., Grinnellian, Eltonian, Hutchinsonian and Evolutionary niche have evolved. Niche reconstruction theory i.e. the process by which organisms modify their environment and evolutionary

niches, which can influence natural selection pressures and evolution, is the latest in this concept evolution process. While evolutionary niche is a basis of adaptive radiation (i.e. rapid evolution of ecologically different species from a single ancestor), Eltonian niche is fundamental to ecological niche modeling (ENM). Quantification of Hutchinsonian niches of the constituent species provides mechanistic explanation to high species diversity in the tropical and subtropical forests of north-east India. The niche segregation during regeneration phase leads to the existence of two distinct regeneration guilds that explained the high species diversity in such forests. The ENM or Species Distribution Modeling (SDM) often integrated with Global and Regional Climate models is widely used by the author to understand the response of the species, crop varieties, and invasive species to changing climate. The model outputs have been validated through Free Air Carbon dioxide (FACE) experiments on wheat varieties. Concepts of cryptic species behavior and adaptation to climate change have been well understood using correlational SDM duly validated through eco-physiological experiments in three *Ilex* species. The fundamental scientific concept of niche has high application values through ENM, which has been demonstrated in new species discovery, threatened species conservation, corridor planning, species reintroduction, and invasion prediction.

Speaker Profile

Dr Saroj Kanta Barik is currently Professor at the Centre for Advanced Studies in Botany, Department of Botany, North-Eastern Hill University, Shillong. He was Director, CSIR- National Botanical Research Institute, Lucknow, Director, CSIR-Indian Institute of Toxicology Research, Lucknow (Additional Charge), and the CSIR theme Director for Agriculture, Nutrition and Biotechnology. An accomplished ecologist, Professor Barik has been working extensively in the fields of Population, Chemical and Molecular ecology, Climate change biology, Biodiversity, and Bioprospection for the past 36 years. He is a Fellow of INSA, NASI and NAAS, and the recipient of several awards from various national science academies and societies.

DR ARJUN SRIVATHSA

DST INSPIRE Campus Fellow, National Centre for Biological Sciences-TIFR, Bengaluru

Who let the dogs out? An integrated landscape-scale approach to understand and conserve Asiatic wild dog metapopulations in India



Conserving endangered species across large landscapes requires a holistic and thorough understanding of their ecological requirements. The Asiatic wild dog ('dhole' *Cuon alpinus*) is among the world's most endangered carnivores, found in the forests of south and southeast Asia. India hosts the highest

global population of the species, with the Western Ghats serving as a potential population stronghold. Efforts to protect their purportedly dwindling populations have been hindered by the lack of rigorous science rooted in principles of applied ecology. My broad objective is to adopt an integrated landscape-scale approach to guide policies that can safeguard dhole populations: (1) population dynamics, (2) social/pack dynamics, (3) human interactions, (4) anthropogenic threat assessments, (5) functional connectivity and (6) conservation in production agroforests. Focusing on seven locations in the Western Ghats, my work combines (1) molecular tools, camera traps and population estimation models, (2) chemical ecology, vocal behavior, pack-interactions and genetic relatedness within and across packs, (3) human-dhole interactions based on vernacular knowledge, (4) mapping patterns and determinants of anthropogenic threats, (5) gauging functional genetic connectivity of the dhole metapopulation in India's Western Ghats and (6) the assessing the potential of agroforests for conserving dholes along with all the associated mega-fauna in shared human-wildlife habitats across the Ghats.

Speaker Profile

Dr Arjun Srivathsa is a DST INSPIRE Campus Fellow at the National Centre for Biological Sciences-TIFR, and an Affiliate Scientist with the Wildlife Conservation Society-India. His research focuses on the conservation ecology of carnivores and other

threatened megafaunal diversity of India. Arjun is also a cartoonist and a science communicator, and uses art as a tool for nature education and conservation awareness.

SECTIONAL COMMITTEE IX

Chair: Professor Rakesh Aggarwal

Director, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry



Dr Rakesh Aggarwal is Director of the Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India. Previously, he was Professor of Gastroenterology at the Sanjay Gandhi Postgraduate Institute of

Medical Sciences, Lucknow, where he worked for nearly 30 years. Besides gastroenterology and hepatology, he has received formal training in epidemiology and laboratory sciences. He has worked extensively on epidemiologic, clinical, molecular and immunologic aspects of viral hepatitis, with more than 300 published papers. He is also deeply interested and active in the field of vaccinology and health economics.

He currently serves on the WHO's Immunization and Vaccines Related Implementation Research Advisory Committee (IVIR-AC), WHO's Global Advisory Committee on Vaccine Safety (GACVS), WHO Strategic and Technical Advisory Group on Viral Hepatitis, HIV and Sexually Transmitted Infections (STAG-HHS), and Chairs the WHO South-East Asia Region's Immunization Technical Advisory Group (SEAR-ITAG).

He has also held editorial positions with several journals.

Chair: Dr Thandavarayan Ramamurthy

INSA-Senior Scientist, ICMR-National Institute for Research in Bacterial Infections, Kolkata



After completion of Ph.D in Marine Microbiology from the Annamalai University in 1988, he was awarded Guest researcher fellowship by the Japan Human Health Science Foundation to work at the National Children's Medical Research Centre and International Medical Centre of Japan, Tokyo. He joined as Assistant Director in NICED in 1997 and superannuated as Scientist-G in 2015. He worked as DBT-THSTI National Chair until 2020.

Dr Ramamurthy served as a member in several National and International committees. He is the elected Fellow of the Indian National Science Academy, National Academy of Sciences, West Bengal Academy of Science and Technology and American Academy of Microbiology. He has published more than 300 papers and several book chapters.

LECTURE OF INSA DISTINGUISHED LECTURE-2 FELLOW

PROFESSOR KUMAR SOMASUNDARAM

Department of Microbiology Cell Biology, Indian Institute of Science, Bangalore

PITAR (p53 Inactivating TRIM28-associated RNA) lncRNA is an inhibitor of p53: mechanism and biological consequences



Despite decades of hard work, our current understanding of the complex events that lead to cancer development and progression remains incomplete. Therefore, our ability to cure relapsed or metastatic cancers stands at an abysmal rate. This can be partly explained by the fact that we need to

fully comprehend how the genome works, particularly the functional contribution of noncoding regions. With the advent of high-throughput RNA and DNA sequencing technologies, it is now evident that the non-coding genome encodes tens of thousands of long non-coding RNAs (lncRNAs), facilitating complex and coordinated gene expression programs that contribute to vital cellular functions in normal development. Thus, exploring how lncRNAs coordinate gene expression events during normal development and disease will enable us to formulate new treatment strategies for more difficult-to-treat relapsed, metastatic cancers. Recent work from our laboratory identified FAM95B1 as glioblastoma (GBM; the grade IV glioma) and GSC (glioma stem cell) upregulated lncRNA. FAM95B1 is found to be an inhibitor of p53 and was named PITAR, which stands for p53 Inactivating TRIM28 associated RNA. We established an alternate way of p53 inactivation by PITAR, which maintains low p53 levels in normal cells and attenuates the DNA damage response by p53. Thus, this study identified a non-genetic mechanism of p53 inactivation and proposes the potential to develop an oligonucleotide-based therapeutic approach for treating glioma.

Speaker Profile

Kumar Somasundaram is a Senior Professor at the Department of Microbiology Cell Biology, Indian Institute of Science, Bangalore, India. He obtained his Veterinary Medicine degree (1985) from Madras Veterinary College, Master's in Biotechnology (1987), and Ph.D. in bacterial genetics (1993) from Madurai Kamaraj University, Madurai, India. Subsequently, he did his post-doctoral training in cancer genetics at Northwestern University and the University of Pennsylvania before moving to the Indian Institute of Science (1999). The primary focus of his laboratory is the genetics of glioma, the most common primary adult cancer.

LECTURE NEW FELLOW

PROFESSOR SANJAY BEHARI

Director, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram

Differences between reducible and irreducible congenital atlantoaxial dislocation



Background; Congenital craniovertebral junction anomalies have a high incidence in India. The commonest anomaly encountered is atlantoaxial dislocation (AAD), causing instability between atlas (first cervical vertebra), and axis (second cervical vertebra). This

may cause either vertebra to slip backwards leading to spinal cord compression. Thus, even a small sudden jerk on the neck may precipitate quadriplegia and respiratory arrest.

Methods: Two varieties of AAD are: reducible (atlas and axis are freely mobile); and, irreducible (no relative vertebral movement is demonstrable). Differences in radiological associations and genetic polymorphisms existing between patients with reducible and irreducible AAD were studied.

Results: Bony abnormalities like central dislocation of axis into atlantal ring; atlanto-axial joint fusion;

atlanto-axial rotation; and, atlantal fusion to occipital bone were significant in patients with irreducible AAD. Reducible AAD seldom had these abnormalities. Genetic pleomorphisms are also more evident in irreducible AAD.

Conclusions: Irreducible and reducible AAD are distinct entities. Associated bony abnormalities and specific genetic polymorphisms are significantly associated with irreducible AAD, indicating its genetic association. Neurological deficits occur in irreducible AAD due to spinal cord tenting against bones during neck movement. Reducible AAD, however, occurs due to ligamentous laxity that allows atlantoaxial mobility and displacement of vertebrae on the spinal cord.

Speaker Profile

Professor Sanjay Behari, an accomplished neurosurgeon, holds multiple prestigious qualifications, including MBBS, MS, MCh, DNB, FRCS (Edinburgh) ad hominem, IFAANS, FAS (Honoris Causa), FACS, FAMS, FNA, and the Vigyan Shri (Medicine). He currently serves as the Director of the Sree Chitra Tirunal Institute for Medical Sciences and Technology in Thiruvananthapuram. Before this, he was the Head of the Department of Neurosurgery at the Sanjay Gandhi Postgraduate Institute of Medical Sciences (SGPGIMS), Lucknow. Professor Behari's distinguished career reflects his expertise and leadership in advancing neurosurgical science and medical education.

PROFESSOR NEERJA BHATLA

Department of Obstetrics & Gynaecology, All India Institute of Medical Sciences, New Delhi

Cervical Cancer Prevention and Control: From bench to bedside and beyond



Background: The natural history of cervical cancer with its long precancerous phase has been known for nearly two centuries. But it was only in 1980s that the pivotal role of human papillomavirus (HPV) was documented. It led to the development of

prophylactic vaccines and HPV diagnostic tests for screening. In India, the last two decades have witnessed rapid scientific progress in this field.

Methods and Results: We first established HPV epidemiology among normal women, cervical precancers and cancers through extended genotyping. Next we evaluated affordable HPV testing along with other low-resource screening methods; collaborated for development of new HPV tests, portable colposcopes and treatment devices; currently validation of indigenously developed tests by international standards is under way. This will be a game changer in the field of secondary prevention. Implementation research is under way to understand barriers to widespread introduction in the community.

Primary prevention by HPV vaccination is a major pillar of WHO's strategy for cervical cancer elimination. The IARC-India trial has resulted in fewer dosage recommendations globally. The Indian vaccine has been successfully launched. Make-in-India initiatives will reach Indo-Pacific region soon.

Conclusions: Indian science is well poised to meet the targets for cervical cancer elimination within this century.

Speaker Profile

Professor Neerja Bhatla is Former Head of the Department of Obstetrics & Gynaecology and Inaugural Director of the WHO Collaborating Centre for Cervical Cancer Prevention and Research at the All India Institute of Medical Sciences, New Delhi. She has held many prestigious positions nationally and internationally, including Past Chairperson of the FIGO Committee for Gynecologic Oncology (first from India). Presently she is Vice President, Federation of Obstetric & Gynaecological Societies of India (FOGSI) and Vice President, National Academy of Medical Sciences, India. She is a member of the WHO DG's Technical Expert Group for Cervical Cancer Elimination

Dr Bhatla has conducted trials and published extensively on various aspects of cervical cancer prevention, including HPV epidemiology, HPV vaccination, screening and treatment with special

reference to low resource situations. In 2021, she was awarded the Shobha S. Wenger Distinguished Chair of Gynaecologic Oncology at AIIMS, New Delhi and the FRCOG (ad eundem). She is the recipient of the 2023 IARC Award for Women in Cancer Research. She has been named Inaugural Scholar GPS 2024 for her contributions to cervical cancer research and is ranked in top 2% of scholars globally since 2019.

PROFESSOR JAYANTA BHATTACHARYA

BRIC-Translational Health Science & Technology Institute Faridabad, Haryana

Discovery of protective human monoclonal antibodies against SARS-CoV-2 Delta and Omicron variants of concern



The COVID-19 pandemic was brought on by the highly contagious and harmful virus SARS-CoV-2, which has caused unheard-of destruction and disruption in public safety, human health, and the world economy. In addition to pre-exposure prophylaxis, monoclonal antibodies are

regarded as an effective alternative for rapid therapy, especially for immunocompromised persons, even though effective vaccines have greatly decreased the morbidity and mortality of COVID-19. In India, emergence of the Delta variation resulted in a huge increase in caseloads and mortality, overwhelming health-care institutions. During peak Delta wave, we invented from an unvaccinated individual by single B cell cloning two novel monoclonal antibodies (mAbs) which demonstrated very potent neutralization of SARS-CoV-2 variants of concern (VOC) by targeting non-overlapping epitopes in the receptor binding domain (RBD). Additionally, passive transfer of mAb combination provided a significant level of protection against infection by the Delta variant at a low dose in a hACE2 transgenic mouse model, suggesting that these two extremely powerful mAbs could be developed as products for therapeutic and preventive application against SARS-CoV-2 infection. The lessons learnt

from the COVID-19 pandemic emphasise the significance of responding quickly by discovering effective mAbs as part of pandemic preparation for future emerging infectious illnesses.

Speaker Profile

Dr Jayanta Bhattacharya is the Dean and a Professor at the BRIC-Translational Health Science & Technology Institute, Department of Biotechnology, NCR-Faridabad Biotech Science Cluster. He heads the Centre for Virus Research, Vaccines & Therapeutics at and is the Principal Investigator of the IAVI-THSTI Antibody Translational Research Program and the Director of the CEPI Centralized Laboratory Network at THSTI. Dr Bhattacharya's lab primarily focuses on developing prevention and therapeutic strategies against viruses of pandemic and epidemic potential such as HIV, SARS-CoV-2, Nipah and RSV in working with global and national collaborators.

PROFESSOR GOVIND K MAKHARIA

Associate Dean (Research), Department of Gastroenterology and Human Nutrition, All India Institute of Medical Sciences, New Delhi

Celiac disease: A public Health Problem in India



Celiac disease is a immune-mediated enteropathy, which is caused by ingestion of gluten (a protein present in wheat, barley and rye) in genetically susceptible individuals. With population prevalence of 1% globally, approximately 60-80 million people have celiac disease globally. Although

thought to be a uncommon in India and Asia earlier, through a series of population based-studies, we showed that the prevalence of celiac disease in India is 0.67% (one in 140) and much higher in Northern part of India (1.04% or 1 in 100). With that population based estimates, approximately 60-80 lakhs Indians are expected to have celiac disease, of which only a fraction are diagnosed. In order to find out where are they,

we summarized the high risk groups who should be screened for celiac disease. Through a series of clinical studies and systematic reviews, we demonstrated that one in 10 with chronic diarrhea, one in 10 with short stature, one in 10 with chronic anaemia, one in 25 with cryptogenic cirrhosis and one in 8 first degree relatives have celiac disease. While strongly believed that celiac disease is uncommon in many Asia countries, through Asian Celiac Disease Study, we showed that celiac disease occurs in many Asian countries. There is a need to increase awareness about celiac disease amongst health care professionals.

Speaker Profile

Dr Govind K. Makharia is a Professor in the Department of Gastroenterology and Human Nutrition at the All India Institute of Medical Sciences (AIIMS), New Delhi, where he also serves as the Associate Dean (Research). He is the President of the Indian Society of Gastroenterology and a Member of the Governing Body of the Indian Council of Medical Research (ICMR). Internationally, he is a Governing Council Member of the World Gastroenterology Organization, Chair of its Clinical Research Committee, and a Board Member of the International Society for Studies on Celiac Disease. Dr Makharia's contributions to gastroenterology, both nationally and globally, have positioned him as a leading figure in clinical research and the advancement of gastrointestinal health.

PROFESSOR VANDANA B. PATRAVALE

Department of Pharmaceutical Sciences and Technology Institute of Chemical Technology, Mumbai

Non-invasive peptide therapeutics for osteoporosis



Peptide based therapeutics, in the current biopharmaceutical market, are majorly available as parenteral formulations. Inherent physicochemical properties of peptides including hydrophilicity, bulky size, enzymatic degradation,

and stress induced denaturation make their delivery challenging. Global quest for delivery of biomolecules by non-invasive routes has been ongoing with limited commercial success. Salmon calcitonin is a 32 amino acid peptide which is approved by the US FDA for use in postmenopausal osteoporosis (PMO), hypercalcemia, and Paget's disease, mandating long-term therapy. We have designed and developed oral peptide delivery system using an in-house synthesized lipomer P-lipid, which was found to exhibit a remarkable dual mechanism to enable chymotrypsin inhibition and intestinal membrane permeation. P-lipid based mixed micelles loaded onto silica carrier enabled oral delivery of salmon calcitonin using enteric coated capsules. The results obtained in the in vivo pharmacokinetic studies reveal affirmative prospective of this proof-of-concept platform for oral delivery of peptides. Also, transdermal delivery using a polymeric microneedle array patch (MAP) systems was attempted. Developed MAPs were evaluated in vitro and ex vivo using neonatal porcine skin models. The in vivo pharmacokinetics and organ biodistribution revealed the potential of this platform to enable transdermal peptide delivery.

Speaker Profile

Dr Vandana B. Patravale is Professor of Pharmaceutics at Institute of Chemical Technology, Mumbai. She is also elected as a fellow of Indian National Academy of Engineers (INAE) this year. Major focus of her research is to develop cost effective and scalable technologies. She has transferred about 20+ drug delivery technologies to industry including drug eluting stents being marketed in more than 65 countries. Her research interests also include nanodiagnostics and nanovaccines. She actively collaborates with researchers and industries within country and abroad and is recipient of many coveted awards.

PROFESSOR ASHISH SURI

Unit Head, Department of Neurosurgery, All India Institute of Medical Sciences (AIIMS), New Delhi

Advancing Neurosurgical Simulation: Pioneering 3D-Printing, AI, AR/VR-Driven Innovations in Skill Training and Evaluation



The emergence of 3D printing, AI, and AR/VR has revolutionized the human perspective on neurosurgical simulation. Our AIIMS-IITD Neuro-Engineering collaboration, supported by DBT-ICMR, has achieved significant advancements in neurosurgical simulation and

surgical data science. Our team's groundbreaking work includes AI-based deep learning and machine learning evaluations of neurosurgical skills, as well as instrument segmentation, culminating in the development of multiple patented and widely recognized innovations. Notably, the Neuroendoscopic box trainer and camera-aided evaluation system, patented in the U.S., and the vision- sensor-aided micro-suturing evaluation system, presented at ICIP 2023, have gained wide recognition and appreciation. Our high-speed craniotomy drilling simulator, as well as a micro-drilling simulator designed for sheep head and synthetic bone-based practice, have both gained Indian patents and notable journal publications. Additionally, our team has created an Endonasal Transsphenoidal Surgery (ENTS) simulator with modules for vital skills training, currently under Indian patent consideration. Further, we have also developed a low-cost ArUco-marker-based Neuronavigation simulator for training in hand-eye coordination. Each simulator is primed for technology transfer via BIRAC-PACE-CRS. The team's research work on surgical instrument instance segmentation, featured at MICCAI-2024, MICCAI-2023 and WACV-2023. 3D printing technology allows the creation of highly detailed and customized brain models, enabling surgeons to practice procedures on realistic anatomical structures. The advances in AR and VR have afforded us a unique opportunity for surgery simulation using

virtual patients, with realistic disease and procedure modelling with full visual and haptic feedback. Collectively, these innovations reflect a transformative approach to neurosurgical training and surgical data science.

Abbreviations:

- 3D – 3 Dimensional
- AI – Artificial Intelligence
- AIIMS – All India Institute of Medical Sciences, New Delhi
- AR – Augmented Reality
- DBT – Department of Biotechnology, Govt. of India
- IITD – Indian Institute of Technology, Delhi
- VR – Virtual Reality
- ICMR – Indian Council of Medical Research, Govt. of India

References

1. Dhanakshirur, R. R., Tyagi, M., Baby, B., Suri, A., Kalra, P., & Arora, C. (2024, October). VideoCutMix: Temporal Segmentation of Surgical Videos in Scarce Data Scenarios. In *International Conference on Medical Image Computing and Computer-Assisted Intervention* (pp. 725-735). Cham: Springer Nature Switzerland.
2. Dhanakshirur, R. R., Katiyar, V., Sharma, R., Suri, A., Kalra, P. K., & Arora, C. (2023, October). From Feline Classification to Skills Evaluation: A Multitask Learning Framework for Evaluating Micro Suturing Neurosurgical Skills. In *2023 IEEE International Conference on Image Processing (ICIP)* (pp. 3374-3378). IEEE.
3. Dhanakshirur, R. R., Shastry, K. A., Borgavi, K., Suri, A., Kalra, P. K., & Arora, C. (2023, October). Learnable query initialization for surgical instrument instance segmentation. In *International Conference on Medical Image Computing and Computer-Assisted Intervention* (pp. 728-738). Cham: Springer Nature Switzerland.
4. Manjunath, N., Dhanakshirur, R. R., Joshi, S., Reddy, N. G., Raheja, A., Sebastian, L. J. D., ... & Suri, A. (2024). Novel Method of Calculation of Magnetic Resonance Imaging Perfusion and Comparison of Single versus Double Barrel Superficial Temporal Artery-Middle Cerebral Artery Bypass for Revascularisation in Moyamoya Disease. *World Neurosurgery*, 181, e516-e523.
5. Baby, B., Singh, R., Suri, A., Dhanakshirur, R. R., Chakraborty, A., Kumar, S., ... & Banerjee, S. (2020). A review of virtual reality simulators for neuroendoscopy. *Neuroendoscopy*, 43, 1255-1272.
6. Singh, R., Godiyal, A. K., Chavakula, P., & Suri, A. (2023). Craniotomy simulator with force myography and machine learning based skills assessment. *Bioengineering*, 10(4), 465.
7. Singh, R., & Suri, A. (2022). An ergonomic neuroendoscopic instrument handle design using 3D printing. *NeuroEngineering and Robotics*, 70(4), 1396-1402.
8. Srivastav, V. K., Baby, B., Singh, R., Kalra, P., & Suri, A. (2017, September). Neuro-endo-trainer-online assessment system (NET-OAS) for neuro-endoscopic skills training. In *2017 Federated Conference on Computer Science and Information Systems (FedCSIS)* (pp. 213-219). IEEE.

Speaker Profile

Professor Ashish Suri is a distinguished neurosurgeon and Professor & Unit Head in the Department of Neurosurgery at the Neurosciences Centre, All India Institute of Medical Sciences (AIIMS), New Delhi. He serves as the Principal Investigator for the Neuro-Engineering Facility at the ICMR and DBT Centres of Excellence and is the Professor In-charge of the Neurosurgery Education and Training School and the Neurosurgery Skills Training Facility. Additionally, he is an Adjunct Professor at the Indian Institute of Technology, Delhi (IIT-D). Professor Suri is the President of several prestigious professional societies, including the Skull Base Surgery Society of India, the Neuro-Endoscopy Society of India, and the Cerebrovascular Society of India, reflecting his leadership and expertise in advancing neurosurgical practice and education

LECTURE OF INSA DISTINGUISHED LECTURE-1 FELLOW

DR TARUN KUMAR SHARMA

Department of Medical Biotechnology, Gujarat Biotechnology University, Gandhinagar

Harnessing Functional Nucleic Acids for Biomedical Diagnostics



Currently diagnostic industry is heavily dependent on antibodies (Abs) but Abs have several limitations like high batch-to-batch variation, requirement of cold chain, need an animal to generate Abs, long generation time. To address these limitations in recent years 'Aptamers' has

spurred a great interest as a diagnostic tool and therapeutic agents. Aptamers are structured functional nucleic acids that binds to its target with high affinity and specificity and they offer several advantages over antibodies including but not limited to negligible batch-to-batch variation, ease in functionalization, in vitro evolution, speed in selection, synthesis, scale up and adaptability to various diagnostics formats. Owing to the aforementioned advantages aptamers have ability to replace antibodies in all possible diagnostic format and thus they are regarded as chemical rivals of antibodies. This talk will give an overview of 'Aptamer Technology' Followed by a discussion on some of the recent work from our own group on tuberculosis and snake bite diagnostics.

Speaker Profile

Dr Tarun Sharma is a mid-career science enthusiast trained in Aptamer technology, Bio- medical Diagnostics, Translational research, Health science and Bio-design process for innovation. >12 years of proven experience in Aptamer Technology and Biomedical Diagnostics/Bio-sensing. Conceptualized and executed several projects leading to patents, high quality publications and technologies. Generated funding through extramural grants from DBT, BIRAC, ICMR, open philanthropy & Novonordisk

foundation and Bill and Melinda Gates foundation to support various research programs of national and global importance. Efficiently managed a laboratory having >15 members including PhD, Post-docs, Research Fellows, Technicians and Trainees. He is a Fellow of the Royal Society of Biology (FRSB), INSA Associate Fellow, Indian National Science Academy (INSA) Young Scientist Medal, DBT- Innovative Young Biotechnologist Award (IYBA), Australian Endeavor Research Award by commonwealth of Australia, Innovation Award, BIG grant (BIRAC) and Grand Challenges Exploration (GCE) grant by Bill and Melinda Gates Foundation.

Recognized as a Future Science Leader by Science and Technology for Society Forum-Japan. He has published more than 65 publications in international journals of repute and filed >12 patents.

LECTURE INSA YOUNG ASSOCIATES

DR NEHA JAIN

Associate professor, Department of Bioscience and Bioengineering, Indian Institute of Technology, Jodhpur

Deciphering the Modulation of α -Synuclein Amyloid Assembly by β_2 -Microglobulin conformers



Amyloid formation due to protein misfolding is increasingly recognised for its association with debilitating human ailments such as Parkinson's disease, Dialysis-related amyloidosis and Type II Diabetes mellitus. α -Synuclein (α -syn) and β_2 -microglobulin (β_2 m) are such proteins that

undergo conformational switch to form higher order cross- β -sheet structures, resulting in amyloid formation, which is linked to the pathophysiology of Parkinson's disease (PD) and dialysis-related amyloidosis (DRA), respectively. The present status of research reveals that PD progression may be linked with kidney-related disorders. Unraveling the link between PD and non-neurological diseases may help in early detection

and a better understanding of PD progression. Here we investigated the cross-talk between α -syn and β_2 m conformers during α -syn amyloid assembly. Our results, supported by biophysical and biochemical analysis, suggest that β_2 m in its monomeric form suppresses amyloid formation by α -syn. Monomeric β_2 m drives α -syn to off-pathway oligomers which were found to be non-toxic to the cells. Our results indicate that β_2 m could act as chaperone-like protein and prevent amyloid formation.

However, the higher order species of β_2 m such as oligomers, protofibrils and fibrils lost this capability and accelerated the reaction. Our preliminary findings could shed light on the unraveling of the yet unknown potential linkage of PD with kidney-related disorders.

Speaker Profile

Dr Neha Jain is an associate professor at the Department of Bioscience and Bioengineering, Indian Institute of Technology Jodhpur. She was recently selected as an INSA Young Associate & EMBO Global Investigator in 2024. She completed her BS & MS in Microbiology from the University of Rajasthan and then pursued her doctoral studies in molecular biophysics at IISER Mohali from 2008 to 2014. She then did a postdoc at the University of Michigan from 2014-2017. After a short stint at Ahmedabad University, Dr Jain joined IIT Jodhpur in 2019. Her lab specializes in amyloid-related neurodegenerative diseases and bacterial amyloids associated with biofilms.

LECTURE INSA ASSOCIATE FELLOW

DR GIRDHARI LAL

Senior Scientist, National Centre for Cell Science, Pune

CCR6 intrinsic signaling drives the metabolic reprogramming of pathogenic Th17 cells in the gut



Th17 and regulatory CD4 T cells (Tregs) express gut tropic chemokine receptor CCR6, which drives their migration to the CCL20-rich microenvironment in the gut. In mice and humans, CCL20 expression increases several-fold in the gut during inflammation

and autoimmunity. How Th17 cells adapt to various metabolically altered tissue microenvironments under homeostatic and inflammatory conditions is unclear. The role of CCR6 is mainly studied as a chemotactic molecule. CCR6 is a G protein-coupled receptor, and how it alters the phenotype and function of Th17 cells is unknown.

Using a dextran sodium sulfate (DSS)-induced colitis model in C57BL/6 mice and inflammatory bowel disease (IBD) patient samples, we showed that CCR6 intrinsic signaling drives the differentiation of pathogenic Th17 cells. CCL20 induces AKT-mTOR-STAT3 signaling pathways in a CCR6-dependent manner. Our proteomic data analysis revealed that CCR6 signaling alters the expression of more than 1167 proteins involved in the various critical metabolic pathways in Th17 cells. Further analysis showed that CCR6 signaling in Th17 cells upregulates glycolysis and inhibits oxidative pathways. Together, we showed that CCR6 intrinsic signaling in Th17 cells promotes pathogenic Th17 cells, helps adapt the metabolic requirement in the inflamed tissues, and increases their pathogenicity in the gut.

Speaker Profile

Dr Girdhari Lal is a senior scientist at the National Center for Cell Science (NCCS), Pune. He received

his Ph.D. from IISc, Bangalore. Before joining NCCS (in 2010), he was an Assistant Professor at Mount Sinai School of Medicine, New York City, USA. His laboratory investigates chemokine receptor signaling and neuro immune communication in inflammation and autoimmunity.

Dr Lal received the Ramalingawami Fellowship, Innovative Young Biotechnologist Award (IYBA), and Swarna Jayanti Fellowship from the Ministry of Science and Technology, Government of India. He is also a founding member of the Society of Inflammation Research, Bangalore, and the Immuno-Oncology Society of India. He has published 68 papers and written 7 book chapters, and he has presented his work at more than 200 National and International meetings.

PROFESSOR BISWANATH MAITY

Department of Biological Sciences, Bose Institute, Kolkata

G-protein regulation in onco-cardiology



Chemotherapeutic drugs represent a key component of cancer therapy but dose-limiting adverse events resulting from off-target damage especially cardiac events remains a barrier to the clinical utility. Although progress has been made in elucidating mechanisms underlying the pathogenesis

of chemotherapy-dependent cardio toxicity, the highly diverse rate of disease progression have stymied efforts to prevent cardiac damage. It is well known that G protein signaling plays a central role in cardiac function and thus represents one of the largest class of surface receptors targeted by chemo-drugs. We discovered multiple G-protein regulators especially RGS protein & their binding partners altered in different types of cardiac cells following chemotherapy exposure, as a key driver of chemotherapy-dependent oxidative stress, cell loss, and fibrosis in heart. Importantly, while RGS proteins are both necessary and sufficient to drive chemotherapy-dependent heart damage,

modulation of RGS-Gb5 expression in cancer cells fails to impact their sensitivity to chemotherapeutic drugs. Thus, RGS class of protein emerges as a potential therapeutic target in the detection or mitigation of chemotherapy associated cardiac damage.

Speaker Profile

Dr Maity did his PhD in 2010 from University of Calcutta followed by postdoctoral research at the Carver College of Medicine, University of Iowa, USA. He returned India in 2015 with Ramalingaswami & Ramanujan Fellowship and joined as 'Assistant Professor' at the Centre of Biomedical Research (CBMR), Lucknow. He was then promoted to Associate Professor in 2020 and moved to Bose Institute as Professor in 2024 June. Professor Maity's broad research focus is - G-protein regulation in stress physiology.

SECTIONAL COMMITTEE VII

Chair: Dr Sagar Sengupta

Director, National Institute of Biomedical Genomics, Kalyani



Dr Sagar Sengupta is currently the Director of National Institute of Biomedical Genomics, Kalyani, West Bengal from November 2022. Before this present assignment, Dr Sengupta was in National Institute of Immunology, New Delhi for more than 18

years. The main focus of his research is on trying to understand the mechanisms of genome integrity in nucleus and mitochondria. Dr Sengupta has used molecular, imaging, cellular and in vivo methods to understand how signaling pathways crosstalk with each other during the process of cancer initiation and progression with emphasis on cancer predisposed syndromes and colorectal carcinoma. In mitochondria Dr Sengupta's lab discovered the second known mitochondrial helicase RECQL4 and also made contributions

in the understanding of mitochondrial genome integrity during mitochondrial replication. Dr Sengupta is a member of all the three Indian science academies and is also currently a Jagadish Chandra Bose (JC Bose) Fellow.

LECTURE OF INSA DISTINGUISHED LECTURE-2 FELLOW

PROFESSOR VIDITA VAIDYA

Senior Professor and Chairperson, Department of Biological Sciences, Tata Institute of Fundamental Research, Mumbai

Early Adversity and Accelerated Aging: How the brain and body keeps score



Early adversity has a major impact on brain development and later cognitive functioning. It is also a common risk factor for neuropsychiatric and neurodegenerative disorders. Environment leaves its imprints on the body and brain at a molecular, epigenetic, cellular, circuit and behavioral level.

Understanding these imprints provides tools on how to ameliorate or reverse some of the scars of early trauma. In my talk I will discuss ongoing research in our group at TIFR that addresses these questions from a neuroscience perspective.

Speaker Profile

Vidita Vaidya is a Senior Professor and Chairperson of the Department of Biological Sciences at the Tata Institute of Fundamental Research, Mumbai, India. She received her undergraduate training in Life Science and Biochemistry at St. Xavier's College in Mumbai. She obtained her doctoral degree in Neuroscience at Yale University with the late Professor Ronald Duman, and after postdoctoral fellowships at the Karolinska Institute and Oxford University she returned to a faculty position at the Tata Institute of Fundamental Research in 2000. She is a fellow of all three Indian Science academies. She received

the National Bioscientist Award in 2012, the Shanti Swarup Bhatnagar Award in Medical Sciences in 2015, and the Infosys Prize for Life-Sciences in 2022. She was awarded the Nature Award for Excellence in Mentorship in India in 2019. Her research group is interested in understanding the neurocircuitry of emotion, its modulation by life experience and the alterations in emotional neurocircuitry that underlie complex psychiatric disorders like depression. Her team is also interested in understanding the actions of serotonergic psychedelics at the molecular, cellular, neurocircuit and behavioral level. She is committed to enhancing equity, diversity and inclusion in academia.

LECTURE NEW FELLOW

DR AMIT AWASTHI

Senior Professor, Translational Health Science & Technology Institute, Faridabad

Role of IL-9-producing helper T cells in health and diseases



Interleukin (IL)-9-producing helper T (Th)9 cells contribute to immunity against extracellular pathogens and promote allergic inflammation in asthma. Th9 cells also play a role in antitumor immune responses. Given the diverse functions of IL-9 in various pathophysiological

conditions, it is essential to understand the differentiation and stability of Th9 cells. Using high-throughput techniques such as RNA sequencing, proteomics, and metabolomics, we identified key factors driving the generation and function of Th9 cells. Additionally, we mapped the transcriptional landscape of Th9 cells, identifying transcription factors like Foxo1 and HIF-1 α as critical in their development and function. Considering the involvement of IL-9 in allergic inflammation and given the similarities of allergic inflammation with COVID-19 infection, we investigated the role of Th9 cells in COVID-19. Our

findings suggest that Th9 cells contribute to lung inflammation and the pathogenesis of COVID-19 by enhancing the activity of mast cells and eosinophils. Blocking IL-9 suppresses airway inflammation in SARS-CoV-2 infection, supporting the presence of a Foxo1-IL-9-mediated Th cell-specific pathway involved in COVID-19. Overall, our studies provide mechanistic insights into the role of inflammatory Th9 cells, which are crucial in health and disease.

Speaker Profile

Dr Amit Awasthi is a Senior Professor at THSTI, Faridabad. He is an internationally renowned immunologist with significant research contributions in T cell biology related to inflammatory and infectious diseases. Dr Awasthi has published over 100 research papers, including several seminal works in prestigious international journals such as Nature, Nature Immunology, Nature Communications, Science Advances, and Lancet Infectious Diseases, with an h-index of 39 and more than 14,000 citations. He has received numerous prestigious awards, including the Innovative Young Biotechnologist Award and the GN Ramachandran National Bioscience Award from the Department of Biotechnology; the CDRI Award for excellence in drug discovery research from CSIR-Central Drug Research Institute; the GP Talwar Mid-Career Award from the Indian Immunology Society; and the Young Scientist Platinum Jubilee Award from the National Academy of Sciences, India. Dr Awasthi previously served as the Secretary-General of the Indian Immunology Society (2018–2022) and is currently the President of the society.

PROFESSOR A. K. BANERJEE

Rahul Bajaj Chair Professor Dean R & D, Indian Institutes of Science Education and Research, Pune

Long distance macromolecular signalling governs tuber development in potato



“Potato tubers are belowground modified stems (stolons) and it develops under favourable inductive conditions (short-day). Tuber serves as an interesting model to study long-distance signalling mechanism. From perception of signals to delivery of signals to the target organ (stolon-

tip), wherein, a number of mobile RNAs and proteins, transcription factors, and phytohormones work in concerted manner leading to the activation of potato tuber formation (tuberization). Over the last two decades, we have identified a number of mobile RNAs (positive and negative regulators) and microRNAs that play a major role in tuber development and act as long distance signals. Besides the demonstration of miR156 is a transmissible signal, we have reported the first evidence for induction of profuse aerial stolons and tubers from axillary meristems under short-day (SD) rface tension induced deformation in soft solids. photoperiod in microRNA156 overexpression lines of potato. The striking phenotype appears to be under epigenetic control of PRC proteins. Recently, we have demonstrated the functionality of a novel phasiRNA [siRD29(-)] module, St-miR482c-StGA4-siRD29(-)-StGA3ox3, in potato using multiple experimental evidences, we showed that this GRN (gene regulatory module) fine-tune the tuber development process, particularly from stolon-to-tuber induction steps by regulating the key phytohormone, gibberellin. I will share our efforts in understanding the molecular basis of tuberization.

Speaker Profile

Professor at Department of Biology, IISER Pune. Elected fellow of two National Science Academy (Bangalore and Allahabad). He is also honored with Shree Rahul Bajaj Chair Professorship at IISER-

Pune. Currently, Professor Banerjee is the Dean R&D of the institute and the recipient of TATA Innovation Fellow Award. Elected member of GRC and PTCA. He did his postdoc from Iowa State University, USA and joined IISER Pune during 2008 as an Asst. Professor.

DR SANTOSH CHAUHAN

Senior Principal Scientist (Scientist-F) AcSIR Professor, CSIR-Centre for Cellular and Molecular Biology (CCMB), Hyderabad

Understanding IRGM protein: autophagy, autoimmunity, and antiviral immunity



Immunity-related GTPase M (IRGM) is a medically important gene as its deficiency is shown to be associated with several inflammatory and systemic autoimmune diseases. However, the mechanisms that are employed by IRGM to suppress inflammatory diseases remain elusive. We found that

IRGM suppresses inflammasome and interferon response by mediating autophagic degradation of inflammatory proteins. Deleting IRGM results in a broad antiviral response that could restrict infection of a large number of human viruses including, SARS-COV2, ZIKA, Herpes simplex, West Nile virus, and Chikungunya virus. Recently, we identified a small molecule that could interact with IRGM and restrict multiple viruses.

Speaker Profile

Dr Santosh Chauhan is a Senior Principal Scientist (Scientist-F) and AcSIR Professor at the CSIR-Centre for Cellular and Molecular Biology (CCMB), Hyderabad. His research focuses on understanding how autophagy regulates excessive inflammation and exploring the mechanisms of innate immune responses. Dr Chauhan's lab is also dedicated to identifying and developing novel host-based antiviral therapies, contributing to advancements in cellular and molecular biology with implications for treating infectious and inflammatory diseases.

DR MANOJ MAJEE

Senior Scientist, National Institute of Plant Genome Research, New Delhi

Staying alive under desiccation: A fascinating feature of seed



Seed desiccation tolerance is one of the remarkable adaptive traits in flowering plants, which played a decisive role in the evolution and colonization of land plants. These features allow seeds to extend their viability and germinability while remaining in a desiccated state for long periods of time.

To achieve this feat, seeds engage multi-layered regulatory networks that activate many genes involved in various mechanisms including, protection, repair and detoxification that ultimately improve seed survival and vigor upon maturity.

Our study reveals that protein repairing enzymes, such as PROTEIN L-ISOASPARTYL METHYLTRANSFERASE (PIMT) and METHIONINE SULFO/IDE REDUCTASE (MSR) play a significant role in preserving seed vigor and longevity by repairing protein damage in seeds. Our study further reveals that these protein repairing enzymes are highly abundant in seeds and are primarily regulated by ABA hormone. Our recent study reveals a new module (AtSKIP31-JAZ-ABI5) in ABA signaling in seed that are important for seed maturation, desiccation tolerance and seed vigor. We show that F box protein AtSKIP31 targets JAZ proteins in JA/Ile independent manner for proteasomal degradation that releases the inhibitory effect of JAZ proteins on ABI5 and activate downstream ABA signalling. Our study also provides ways to improve seed vigor and seed storage life of crop plants.

Speaker Profile

Dr Manoj Majee is a senior scientist at BRIC-National Institute of Plant Genome Research (NIPGR), New Delhi. He obtained his Ph.D. degree in Plant Biology from Bose Institute/ Jadavpur University, WB. He did his postdoctoral research

at University of Kentucky, Lexington, USA. Dr Majee has made excellent contributions in the area of seed biology. His research work has provided novel insights into the mechanisms involved in preserving seed vigor and viability. He is the recipient of several awards including prestigious National Bioscience Award for Career Development (2017-18) (DBT), INSA and NASI young scientist awards - a testimony to his credible and impressive research accomplishments. He is also an elected fellow of IAS, Bengaluru (FASc), NASI, Prayag Raj (FNASc) and WAST, Kolkata.

PROFESSOR ELLORA SEN

Professor & Scientist, VII National Brain Research Centre, Haryana

Targeting the metabolism- inflammation interface in brain tumors: Therapeutic Implications



Tumor micro-environment characterized by aberrant inflammation and dysregulated metabolism is intimately coupled with epigenetic/genetic landscape, to regulate genes associated with tumor progression. In collaboration with clinicians at AIIMS-Delhi, our studies have provided

insights into how distinctive genetic alterations converge upon metabolic-inflammation link to affect chemo-sensitivity in Glioblastoma multiforme (GBM), - the most malignant of brain tumors. As alteration in metabolic gene isocitrate dehydrogenase (IDH1) in GBM is associated with better prognosis, our focus is to understand how epigenetic landscape in IDH1 mutant gliomas influence chemoresistance and immune surveillance. We have observed in IDH1 mutant gliomas (i) altered mitochondrial/ telomere function and redox status that have clinical relevance pertaining to their sensitivity to oxidative-stress inducers (ii) dependence on inflammatory molecule Pentraxin 3 (PT/3) for targeting towards ferritinophagy mediated cell death as a treatment regime (iii) anti-phagocytic CD47 gene in the regulation of immune-surveillance. Importantly, by linking metabolism-inflammation axis

with molecular circadian-clock, that bears significant correlation with patient survival and anti-cancer drug sensitivity; our study underscored the importance of chronotherapy in cancers. Taken together, our findings have provided novel insight into glioma biology by demonstrating the existence of distinct metabolic-epigenetic landscape in gliomas harboring different molecular signatures that have prognostic values.

Speaker Profile

Professor Ellora Sen is a Professor and Scientist VII at the National Brain Research Centre (NBRC) in Haryana. Her research focuses on understanding the complex interplay between metabolism, inflammation, and epigenetics in gliomas. Using a multipronged approach that integrates biochemistry, epigenetics, and cell biology, her group investigates how distinct metabolic-inflammatory-epigenetic landscapes in gliomas with varying molecular signatures influence tumor progression. Professor Sen's work is pivotal in advancing the understanding of glioma biology and identifying potential therapeutic targets for these aggressive brain tumors.

PROFESSOR AMIT SINGH

Revati and Satya Nadham Atluri Chair, Department of Microbiology and Cell Biology (MCBL), Centre for Infectious Disease and Research (CIDR), Indian Institute of Science (IISc), Bangalore

Reprogramming mitochondrial bioenergetics to target drug tolerance in Mycobacterium tuberculosis



Mycobacterium tuberculosis (Mtb) persists inside the phagocytic cells despite immune pressures and stresses caused by multiple anti-TB drugs. How Mtb tolerates immune and drug pressures and survives is fundamental in the TB field. We have developed a novel biosensor to image the

redox physiology of Mtb inside the human host during infection and upon chemotherapy. Using this probe,

we identified the role of phagosomal acidity and mitochondrial metabolism in promoting the emergence of a redox-altered subpopulation of *Mtb* that tolerates anti-TB drugs. Importantly, we provide empirical evidence linking intramycobacterial redox balance, mitochondrial bioenergetics, and Nrf2 signaling pathway in the emergence of drug tolerance during infection. Based on these innovative findings, we developed strategies to reset immuno-metabolism to improve the efficacy of anti-TB drugs during infection.

Speaker Profile

Amit Singh got his Ph.D. in Biochemistry, at the University of Delhi, India, under the mentorship of Professor Anil Tyagi, to work on the pathogenesis and gene regulation of *M. tuberculosis*. In 2004, he moved to the University of Alabama at Birmingham, USA, to do his postdoc with Dr Adrie Steyn on mechanisms of redox homeostasis in *Mtb*. In 2010, he started his lab at ICGB, New Delhi, where he developed a redox biosensor of *Mtb* and revealed redox heterogeneity in *Mtb* and how redox regulates drug tolerance in this human pathogen. He moved to IISc, Bangalore, in 2014 and has been ever since. Amit Singh's group exploited interdisciplinary strategies to dissect the redox basis of persistence in human pathogens *Mtb* and HIV. By taking advantage of redox biosensors, XF-flux analyses, omics-based strategies, and animal studies, his work has helped find new mechanisms of how macrophage's acidic pH mobilizes drug tolerance in *Mtb* and how antimalarial drug chloroquine can be used to potentiate the action of anti-TB drugs during infection. In 2015, he was awarded the Senior DBT-Wellcome Trust India Alliance fellowship. Most recently, he was awarded the Shanti Swarup Bhatnagar Award, the most prestigious prize by the Council of Scientific and Industrial Research in India. He is a member of the National Academy of Sciences, India.

LECTURE INSA YOUNG ASSOCIATES

DR JOGENDER SINGH

Department of Biological Sciences, Indian Institute of Science Education and Research Mohali

Iron-deplete diet enhances the lifespan of *Caenorhabditis elegans*



Aging is a multifaceted phenomenon characterized by progressive physiological deterioration and is associated with various disorders, such as cancer, diabetes, and neurodegenerative diseases. Recent studies have highlighted the significance of gut microbiota in influencing host health and

lifespan. Additionally, host lipid metabolism appears to play a role in aging and age-related disorders. However, the role of the gut microbiota in regulating host lipid metabolism that can impact aging remains understudied. In this study, using host lipid metabolism as a proxy, we screened a genome-wide *Escherichia coli* mutant library and discovered 26 *E. coli* mutants that increase *Caenorhabditis elegans* lifespan. Transcriptomic analysis of worms fed on these *E. coli* mutants revealed an increase in oxidative stress response genes. We determined that *C. elegans* fed on these *E. coli* mutants exhibited increased activity of the mitochondrial unfolded protein response (mt-UPR). The increased mt-UPR and enhanced lifespan were due to reduced iron levels in the identified bacterial mutants. Supplementation with ferric chloride rescued the enhanced mt-UPR and abolished the lifespan extension of worms grown on these diets. Mechanistically, we demonstrated that lifespan enhancement on a low-iron diet was dependent on the oxidative stress response pathways of the host.

Speaker Profile

Jogender Singh did his PhD at the National Centre for Biological Sciences (NCBS), TIFR, Bengaluru, in 2015, and his postdoctoral research at Duke University, Durham, USA, and the Oregon Health and Science University, Portland, USA. Subsequently, in January

2020, he joined the Department of Biological Sciences at the Indian Institute of Science Education and Research (IISER) Bhopal as an assistant professor. He moved to the Department of Biological Sciences at IISER Mohali at the end of December 2020, where he currently serves as an assistant professor. His laboratory uses the model nematode *C. elegans* to understand cellular stress responses and their role in maintaining organismal homeostasis. He has been awarded the Ramalingaswami Re-entry Fellowship and the Har-Gobind Khorana Innovative Young Biotechnologist Fellowship from the Department of Biotechnology, India. He is an associate fellow of the Indian Academy of Sciences, Bengaluru, and a young associate of the Indian National Science Academy, New Delhi.

LECTURE PREVIOUS INSA ASSOCIATE FELLOW

DR MAHAK SHARMA

Associate Professor, Department of Biological Sciences, Indian Institutes of Science Education and Research, Mohali

Molecular mechanisms regulating lysosomal cargo sorting and lysosome function



Lysosomes are subcellular organelles that receive and degrade cellular cargo. This includes receptor-ligand complexes endocytosed at the plasma membrane, bacterial pathogens engulfed in phagosomes, or worn-out organelles trapped in autophagosomes. Over 70

lysosomal storage disorders result from impaired substrate degradation, showing the importance of lysosomes in maintaining cellular homeostasis and health. Our research group is interested in the involvement of small GTP-binding (G) proteins and their effectors in regulating lysosome positioning and cargo trafficking. As a general principle, the small G proteins of the Rab, Arf and Arf-like (Arl) families, in their GTP-bound state, recruit downstream effector proteins that mediate

vesicle budding at the donor membrane, vesicle motility on the microtubule tracks, and tethering and fusion with the acceptor membranes. Our previous studies have shown that Arl8b, a small G protein of the Arf-like (Arl) family, recruits the multi-subunit tethering factor HOPS complex to mediate endosome-lysosome fusion. Arl8b also recruits the kinesin-1 adaptor SKIP to mediate microtubule motor-dependent lysosomal positioning to the cell periphery. Recent studies from our group and others have found that RUN and FYVE domain-containing (RUFY) proteins, RUFY3 and RUFY4, are Arl8b effectors that recruit the dynein-dynactin motor complex for retrograde motility of lysosomes. In contrast, RUFY family member, RUFY1 interacts with Arl8b on an early-recycling endosomal compartment. Rab14, a small G protein of the Rab family, mediates recruitment of RUFY1 to this endosome. RUFY1 regulates the sorting of CI-M6PR, the receptor for mannose-6-phosphate-tagged lysosomal proteases from the Rab14-positive compartment towards the trans-Golgi Network. Our studies suggest a new upstream role of Arl8b on Rab14-positive early endosomes, wherein it likely regulates the sorting of transmembrane proteins and proteases for lysosome biogenesis. We will also discuss the implications of Arl8b-dependent lysosome biogenesis in the context of *Salmonella enterica* serovar Typhimurium intravacuolar replication in mammalian cells.

Speaker Profile

Mahak Sharma is an Associate Professor and DBT/Wellcome Trust India alliance Senior Fellow at the Department of Biological Sciences, IISER Mohali. Her research interests are focused on studying the molecular mechanisms regulating membrane transport towards lysosomes and lysosome positioning as well as how intracellular pathogens manipulate the host endolysosomal pathway for their growth and survival. Her profile has been featured in *Journal of Cell Biology* "People & Ideas" and *Journal of Cell Science* "Cell Scientist to watch" columns. Mahak was awarded with the highly competitive DBT-Wellcome Trust (UK) India Alliance Intermediate Fellowship and later Senior Fellowship from the same agency. For her contribution to Indian Science, she was awarded the BM Birla Science Prize in Biology (2020), DBT-National Women Bioscientist

Award (2019), NASI-Young Scientist Platinum, Jubilee Award (2018), INSA Medal for Young Scientist (2018), SERB Women Excellence Award (2017) and was elected as a "member of the Indian National Young Academy of Science (2018) and Young Associate Member" of the Indian Academy of Sciences (2015).

SECTIONAL COMMITTEE VIII

Chair: Dr Rajan Sankaranarayanan

Scientist, CSIR-Centre for Cellular and Molecular Biology (CCMB), Hyderabad



Dr Rajan Sankaranarayanan is currently an Outstanding Scientist at CSIR-CCMB, Hyderabad and carrying out research in the field of Structural and Cellular Biology. His group has made outstanding contributions in the area of translation quality control

with a special reference to how D-amino acids are excluded during protein biosynthesis. He was awarded among others the Shanti Swarup Bhatnagar award in 2011, GN Ramachandran Gold Medal in 2015 and Infosys Science Prize in 2020. He is also a fellow of all the three major science academies of the country and elected as an Associate Member of EMBO in 2022.

LECTURE OF INSA DISTINGUISHED LECTURE-2 FELLOW

PROFESSOR JAYANT B UDGAONKAR

Department of Biology, Indian Institute of Science Education and Research, Pune

Induction of structure in the intrinsically disordered region of the mammalian prion protein in prion protein condensates



The mouse prion protein can undergo different types of phase transitions. In one type of phase transition, the protein forms misfolded aggregates, either oligomers or fibrils. In the first part of my talk, I will briefly describe the multiple structural mechanisms by which the prion protein can

begin to misfold.

In another type of phase transition, the mouse prion protein can undergo liquid-liquid phase separation under physiological conditions to form protein condensates. Upon aging, the liquid-like condensates become more solid-like. Structural changes in the protein during the aging process have been studied by fluorescence methods as well as hydrogen-exchange mass spectrometry. In the structured C-terminal domain of the protein, some segments become more stable, segments remain unaltered in their stability while one segment becomes less stable. Quite strikingly, the N-terminal domain, which remains unstructured in other phase transitions of the protein such as fibril formation, attains significant structure during the aging of the liquid condensates. The N-terminal domain becomes structured with about the same rate constant at which helix 3 becomes more stable, significantly slower than the rate constant at which helix 2 becomes more stable.

Speaker Profile

Jayant Udgaonkar has made significant contributions to the field of protein folding. His work has shown that proteins begin to fold via non-specific hydrophobic chain collapse, that folding occurs on competing pathways that differ structurally, that unfolding

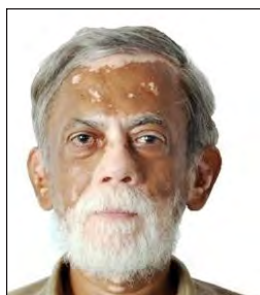
begins by chain expansion to a dry molten globule state, and that folding and unfolding reactions can occur in a completely gradual manner.

LECTURE NEW FELLOW

DR GAUTAM BASU

Former Professor, Department of Biophysics Bose Institute, Kolkata

Novel protein structural motifs involving proline and glycine



Among the canonical set of 20 amino acids that make up a protein, glycine and proline are special – the first lacks sidechain and the second contains a cyclic sidechain – facilitating the amino acids to yield unique local conformations. In this talk I will discuss a few such

unique conformations involving Pro and Gly that were discovered in our research group. Specifically, we will discuss the case of (i) cisPro motifs stabilized by CH-interactions, (ii) helix N-cap motifs involving cisPro and (iii) (Gly-cisPro) as a united residue that appears in α -strands without compromising the structural integrity of the strands. The occurrences of the structural motifs in folded proteins are rare but are often evolutionarily conserved pointing towards their functional significance.

Speaker Profile

Gautam Basu is a former Professor of Biophysics at Bose Institute who is currently affiliated as an Adjunct Professor at IISER Kolkata and Calcutta University. Professor Basu studied at Presidency College, Kolkata, IIT Kanpur and Cornell University, USA, and, was a postdoctoral fellow at Kyoto University, Japan, before joining Bose Institute. His research interest is in Structural and Computational Biology. In addition to scientific research he is actively involved in science communication and history of science.

PROFESSOR RADHAKRISHNAN MAHALAKSHMI

Department of Biological Sciences, Indian Institute of Science Education and Research, Bhopal

Human Mitochondrial Outer Membrane Proteins: From Gatekeepers of the Cell's Power House to Therapeutics for Neurodegeneration



Human mitochondria possess three unique β -barrel membrane protein channels that regulate the transport and assembly of all biomolecules (from proteins to ions) into and out of the outer mitochondrial membrane, thereby acting as the gatekeepers of mitochondria.

These proteins are the core translocase protein Tom40 of the Translocase of the Outer Mitochondrial Membrane (TOM), the three metabolite flux voltage-dependent anion channels (VDACs 1–3), and Sam50 chaperone of the Sorting and Assembly Machinery (SAM). All three proteins – Tom40, VDACs, Sam50 – are indispensable for mitochondrial and cellular homeostasis, and regulate cell death under adverse cellular conditions. Additionally, these proteins are specifically implicated in interaction with α -synuclein, A β 42, tau, Parkin, and tubulin, affecting muscular and neuronal function and triggering the onset of neuropathies. Despite their physiological relevance, and involvement in human pathologies, we have limited knowledge of how these proteins are assembled in the mitochondrial membrane, and what molecular factors regulate their myriad of functions in the cell. Using a unique combinatorial approach involving experimental biophysics, biochemistry, and functional approaches, we are the first to bridge the knowledge gap surrounding these proteins, allowing for the development of targeted peptidomimetics for neurodegenerative diseases caused by mitochondrial disorders.

Speaker Profile

Professor Radhakrishnan Mahalakshmi is a Professor at the Indian Institute of Science Education and Research, Bhopal. Since 15+ years, Professor

Mahalakshmi has made seminal contributions to research on membrane protein biophysics in India. Her work involves the study of mitochondrial outer membrane proteins, wherein she has identified molecular effectors of structure, function, and regulation of these proteins in the cell. She has also revealed molecular dysregulation elements that cause disease states, particularly, cancer and neurodegeneration. Her findings form the foundation for translational peptide-based customized therapeutics for targeting membrane proteins, towards alleviating cancer and neurodegeneration in humans.

PROFESSOR RISHIKESH NARAYANAN

Molecular Biophysics Unit Indian Institute of Science Bengaluru

The brain is a complex adaptive system



The brain is a complex adaptive system. A central theme of research in our laboratory deems biological complexity to be the lynchpin that drives functional robustness in the brain. We employ a combination of electrophysiological, imaging, and computational

techniques to answer outstanding questions on brain complexity and neurophysiology. This lecture will briefly cover different strands of work with this central theme on the impressive utilities of brain complexity: (i) demonstration of the expression of degeneracy across different mammalian neural systems, where there are multiple non-unique routes to achieve the same function; (ii) the robustness consequent to the availability of different degrees of freedom to achieve a specified function; (iii) the diverse and forceful impact of different forms of heterogeneities on a variety of neural circuits; (iv) the formulation of the plasticity manifold framework that effectively balances ubiquitous plasticity with stable continual learning; (v) the demonstration of the different roles of complex dendritic arbors and their active mechanisms across different scales of analysis; (vi) the

demonstration of a direct role for glial cells in dendritic information processing.

Speaker Profile

Rishikesh Narayanan earned his Ph.D. from the Department of Electrical Engineering at the Indian Institute of Science (IISc), Bangalore. Subsequently, he held two postdoctoral positions, first at the National Centre for Biological Sciences, Bangalore and then at the University of Texas at Austin, USA. He returned to IISc as an Assistant Professor at the Molecular Biophysics Unit in July 2009, where he is now a Full Professor. Work in his laboratory has been recognized by a career development award by the Human Frontiers Science Program (HFSP) Organization (2010), the Shanti Swarup Bhatnagar Prize in Biological Sciences by CSIR (2016), a senior fellowship by the DBT-Wellcome Trust India Alliance (2017), the Revati and Satya Nadham Atluri Chair Professorship at IISc Bangalore (2018), and by a fellowship of the Indian Academy of Sciences, Bangalore (2020).

PROFESSOR PINAKI TALUKDAR

Department of Chemistry, Indian Institute of Science Education and Research (IISER), Pune

Development of Artificial Ion Channels to Combat Cancer



The ion transport process across the cell membrane is facilitated by a specific class of membrane-embedded proteins such as channels, carriers, etc. This process is essential for diverse biological functions such as the maintenance of ion homeostasis of cells, sensory transduction, cell proliferation, osmotic stress response, etc. The perturbation of cellular ion homeostasis induces apoptosis, which cancer cells evade and proliferate uncontrollably. Therefore, synthetic ion carriers were used to perturb the chloride homeostasis of cancer cells and kill them via the induction of apoptosis. We have applied artificial ion channels to

destroy cancer cells by perturbing the chloride ion homeostasis. We have developed artificial fluorescent channels that cotransport KCl to kill cancer cells. Our studies revealed that the induced ion transport by these systems leads to either cellular apoptosis or inhibition of autophagy, or both. We have also developed various protransporter molecules that get activated by a specific stimulus, such as intracellular glutathione, enzymes, light, etc., to form active ion channels. Such stimuli-activated ion transport facilitated the perturbation of ionic homeostasis of cancer cells leading to cell death. These approaches present new strategies for combating cancer.

Speaker Profile

Professor Pinaki Talukdar earned his Ph.D. in Organic Chemistry from the University of Geneva in 2005. Following a postdoctoral position at the University of Illinois at Urbana-Champaign, he worked as a Senior Research Scientist in two pharmaceutical companies. In 2009, he joined the Chemistry Department of IISER Pune as an Assistant Professor and is now a Professor at the same institute. He currently serves as the Dean of Faculty at IISER Pune. His expertise includes supramolecular chemistry, membrane transport, and chemical biology.

LECTURE OF INSA DISTINGUISHED LECTURE-1 FELLOW

DR JIBAN JYOTI PANDA

Scientist E, Institute of Nano Science and Technology, Mohali

Exploring BBB traversing Biomolecular
Nanotheranostics for Targeting Neural Disorders



Effective treatment of CNS diseases including brain tumors, HIV and other neurodegenerative diseases has long been hampered by the inability of many drug molecules to cross the blood brain barrier (BBB). Highly restrictive tight junctions between the brain

capillary endothelial cells are mainly responsible for the barrier properties and limit the transfer of almost all drugs from blood to brain. Recent strategies enhance the capacity of therapeutic molecules to cross the BBB by modifying the drug itself, or by coupling it to a vector for receptor or adsorption-mediated transcytosis. Our goal in the present work is to explore the ability of peptide/amino acid and their hybrid nanostructures for safe and effective delivery of drugs across the BBB for theranostic applications. Stimuli responsive nanocarriers for cancer specific delivery are also being developed. These nanostructures owing to their ease of synthesis and high biocompatibility will act as excellent carriers that selectively and aggressively target the CNS. Nanotheranostic systems for Alzheimer's disease has also been explored.

Key words: Theranostics, peptide, glioblastoma, blood brain barrier, Alzheimer's, neural

Speaker Profile

Dr Jiban Jyoti currently holds the position of Scientist E at the Institute of Nano Science and Technology, Mohali, India. Her research focuses on using nanoparticles for integrated diagnosis and therapeutics in CNS disorders, including Alzheimer's, glioblastoma, and cataract. Her lab develops multifunctional nanoparticles, particularly peptide-based, to target the CNS and modulate the Blood-Brain Barrier. Her lab also focuses on using nanoparticles as theragnostic agents against Alzheimer's, cancer, and cataracts by photothermal and photodynamic therapies.

Panda's notable achievements include being honored with the Har Gobind Khorana Young Innovative Biotechnologist Award in 2021, ICMR-DHR International Fellowship for Biomedical Scientists in 2019, Membership of the Indian National Young Academy of Sciences (INAYAS) in 2022, Recognition in the field of STEAM as one of the distinguished 75 women, earning a feature in the 2022 book "SHE-Is." She was also a recipient of the DBT- BIOCARE Award in 2017, coupled with the distinction of being granted the Inspire Faculty Fellowship in the year 2013.

Furthermore, Dr Panda has been recognized on the international stage, securing the UNESCO-L'Oreal International Fellowship in 2011. In 2011, she was awarded the Young Scientist Award by the Organization of Pharmaceutical Producers of India (OPPI) and the American Association of Pharmaceutical Scientist (AAPS) Graduate Student Symposium Award in Formulation Design and Development (Chicago; USA). She is a neuroscientist with over 16 years of experience. She has more than 75 publications and 3 patents to her credit.

LECTURE INSA YOUNG ASSOCIATES

DR GAURAV AHUJA

Associate Professor, Department of Computational Biology, Indian Institute of Information Technology, Delhi

Mechanistic Artificial Intelligence: A Swiss Knife for Decrypting Anti-Aging Interventions



Aging poses a multifaceted challenge rooted in the intricate dynamics of cellular metabolism and phenotypic changes over time. To address this complexity, we present two innovative tools, Age/tend and scCamAge, each offering unique capabilities to decode the mechanisms underlying

aging and identify potential interventions. Age/tend stands as a powerful AI-based geroprotector prediction engine designed to unravel the intricate relationship between bioactive metabolites and aging processes. Leveraging a multimodal approach, Age/tend accurately predicts the geroprotective potential of compounds while providing mechanistic insights, toxicity assessments, and target protein recommendations. Through comprehensive in-silico screening of over a billion compounds, Age/tend identifies promising geroprotectors and establishes links between aging-associated microbiomes, supplemented metabolites, and host longevity. Experimental validation across yeast and human fibroblast models underscores Age/tend's potential for uncovering novel pro-longevity therapeutic

interventions. Complementing Age/tend, scCamAge represents an advanced transfer learning framework tailored to predict cellular age and assess aging-related biological processes at single-cell resolution. scCamAge offers detailed mechanistic insights, cellular morphometrics, and bioactivity summaries by integrating spatiotemporal information from microscopic images. Validated across various datasets and species, scCamAge enables swift screening of pro-longevity interventions, providing invaluable insights into aging-related phenotypic changes and potential interventions. Together, Age/tend and scCamAge present a unified approach harnessing mechanistic artificial intelligence to decipher the complexities of aging and pave the way for developing effective antiaging interventions.

Speaker Profile

Dr Gaurav is an Associate Professor in the Department of Computational Biology at IIIT-Delhi. He earned his Ph.D. in Natural Sciences from the University of Cologne, Germany, graduating summa cum laude. With a strong foundation in Chemical Biology, Dr Gaurav brings extensive expertise in Cheminformatics and highthroughput screening assays. He completed his postdoctoral training at esteemed institutions, including the Center for Molecular Medicine Cologne, the Max Planck Institute for Biology of Ageing, and the Lee Kong Chian School of Medicine in Singapore. At IIIT-Delhi, Dr Gaurav leads an interdisciplinary research lab that integrates Artificial Intelligence, Chemistry, and Biology to explore the functional roles of endogenous metabolites in health, development, and disease. His lab also pioneers high-throughput in vivo assays to experimentally validate AI-based predictions. Within a few years, his team has made significant strides in bridging the chemical and biological dimensions of cellular processes. Dr Gaurav is the recipient of numerous prestigious awards, including the Global 3Rs Award (USA), EMBO Young Investigator Fellowship, Ramalingaswami Re-entry Fellowship from DBT, INSA Young Scientist Award, and INSA Young Associate. He was also selected as a Discovery Track Investigator (IIITD) and is a member of the International Chemical Biology Society.

LECTURE INSA ASSOCIATE FELLOW

PROFESSOR TIMIR TRIPATHI

Department of Zoology, School of Life Sciences,
North-Eastern Hill University, Shillong

Unconventional Thiol-Based Redox Metabolism in the Parasitic Liver Fluke *Fasciola gigantica*



Fascioliasis, caused by the liver flukes *Fasciola hepatica* or *Fasciola gigantica*, infects domestic ruminants (e.g., sheep, cattle) and humans, leading to over US\$3 billion in annual economic losses in livestock. Predominant in tropical regions, this helminth infection affects

marginalized populations with limited access to clean water and healthcare. Approximately 17 million people globally are infected. Although the WHO recommends triclabendazole for treatment, resistance has emerged in several areas. Parasitic flukes survive oxidative stress via thiol-based redox metabolism, making redox enzymes, such as thioredoxin glutathione reductase (TGR), promising drug targets. Our lab aims to identify compounds targeting the redox-active proteins for the treatment of fascioliasis.

We conducted molecular and structural analyses of proteins in the thiol-based antioxidant system of *F. gigantica*. In platyhelminth parasites, thiol-disulfide redox metabolism relies entirely on a single selenocysteine (Sec)-containing flavoenzyme, thioredoxin glutathione reductase (TGRsec). To investigate the structure-function relationship of TGRsec, we examined the catalytic and structural properties of different *F. gigantica* TGR variants, focusing on the role of Sec, the FAD cofactor, and specific domains. Our biochemical studies indicate that Sec is crucial for enhanced thioredoxin reductase (TrxR) and glutathione reductase (GR) activities in FgTGRsec. Additionally, the N-terminal Grx

domain positively regulates TrxR activity and contributes to the structural stability of FgTGRsec. Alterations in the FAD microenvironment were directly associated with reductions in TrxR and GR activities. These findings suggest that the Grx domain stabilizes full-length FgTGRsec for efficient catalysis. We propose that during evolution, the Grx domain integrated with the TrxR domain in platyhelminth flukes to enhance catalytic efficiency and impart structural stability to TGR.

Speaker Profile

Professor Timir Tripathi is a Professor of Molecular Biology in the Department of Zoology, North-Eastern Hill University (NEHU), Shillong. He holds a Ph.D. from JNU, New Delhi, while working at the CDRI, Lucknow. His research interests lie in the field of protein-substrate interaction and dynamics and understanding the roles of non-catalytic domains in regulating the catalytic activity of proteins. His focusses on studying the structural and functional characteristics of drug target proteins from the helminth liver fluke parasite *Fasciola gigantica* to identify new therapeutic strategies.

He has received several national awards, including Professor B.K. Bachhawat Memorial Young Scientist Lecture Award (2020) by the NASI, ISCB-Young Scientist Award (2019), ICMR-Shakuntala Amir Chand Prize (2018), BRSI-Malviya Memorial Award (2017), etc. He has handled several research grants as a principal investigator from funding agencies, including DST-Russian Foundation for Basic Research, UGC-Israel Science Foundation, DBT, SERB, DHR, and ICMR.

He has published over 100 research papers, reviews, commentaries, viewpoints, and editorial articles. He has edited 06 books and authored 02 textbooks for UG and PG students. Currently, he serves as the editor of the *International Journal of Biological Macromolecules* (Elsevier) and is the editorial board member of *Scientific Reports* and *Acta Tropica*.

Annexure-V

INYAS LECTURES 1 & 2

INYAS LECTURE 1

Chair: PROFESSOR INDRANIL MANNA

Vice Chancellor, Birla Institute of Technology Mesra, Ranchi; Vice President, Indian National Science Academy



Professor Manna is currently the Vice Chancellor of BIT Mesra, the 14th President of the Indian National Academy of Engineering (INAE), and the Vice President (Science & Society) of the Indian National Science Academy (INSA). He is an

educationist and material sengineer with research interests in structure-property correlation in nanometric materials, laser- assisted surface engineering, and additive manufacturing. He is a Fellow of all the national academies of science (INSA, IASc, NASI) and engineering (INAE) in India. He received the Engineering Sciences prize from The World Academy of Sciences (TWAS) in 2014 and was elected a Fellow in 2015. He is also a Member of the Asia Pacific Academy of Materials. He worked as a Guest Scientist in Germany (DAAD and Humboldt Fellow), USA, UK, France, Poland, Japan, and Singapore. Since 2010, he has been actively involved in several technology development initiatives including steering IMP acting Research Innovation and Technology (IMPRINT) for 5 years since its launch in 2015. He is a former President of the Indian Institute of Metals (2016-17) and the Materials Science Section of the Indian Science Congress (2009-10). The University of Kalyani and Kazi Nazrul University conferred DSc (hc) on him in 2017. He was selected as a distinguished alumnus by IEST Shibpur (2014) and IIT Kharagpur (2016). He served as the Director of CSIR-CGCRI in Kolkata during 2010-2012 and of IIT Kanpur during 2012-2017.

INYAS LECTURE 2

DRNISHANT CHAKRAVORTY

Chairperson, INYAS& Associate Professor, Indian Institute of Technology, Kharagpur

INYAS: Celebratinga Decade of Excellence

The Indian National Young Academy of Science (INYAS) has been functioning as the flagbearer of science outreach, engagement, and encouragement since its inception in December 2014. As the only recognized academy

for young scientists of our country, INYAS has been proactive in initiating dialogue and deliberations within within the scientific community, industry, and policy curators, while highlighting its corevision of Science for Society.

Over the years, INYAS has actively organized various events under its flagship activities, including symposiums, conferences, workshops, and meetings. The year 2024-25 is a special one for INYAS, as it marks the completion of the first decade of its journey. INYAS has conducted an extensive range of notable events across India, which will be showcased during the INYAS presentation.

The academy also concluded its mid-year meeting and technical symposium, "Empowering Youth: Leveraging Science and Technology for Sustainable Development," held from 26-28 September 2024 at the Indian Institute of Science Education and Research (IISER) Kolkata, celebrating INYAS' 10th anniversary. The symposium successfully covered various sessions on climate science, agriculture, healthcare, cleanenergy, and materials, alongwith panel discussions on the

involvement of young scientists in governance, industry-academia collaboration, and a milestone session on neighbouring young academies

Speaker Profile

Dr Nishant Chakravorty (MBBS, M. Med Sci & Tech, PhD, FRSB), Associate Professor at IIT Kharagpur, currently serves as the Chairperson of INYAS. He is a physician-scientist by training and leads the Regenerative Medicine lab at School of

Medical Science and Technology, IIT Kharagpur. He was selected as a Young Physician Leader in 2021 by IAP to represent India. He serves as an Editorial Board member for several prestigious international journals that include Nature Scientific Reports, PLOSONE, Molecular Biology Reports. Other notable achievements include, the Outstanding Doctoral Thesis Award - Executive Dean's Commendation Award from Science and Engineering Faculty, QUT, Australia and the prestigious Institute Silver Medal from IIT Kharagpur.

Annexure-VI

FELLOWS ELECTED

(Effective from January 1, 2025)



Awasthi, Amit (b 03.07.1977), PhD, Senior Professor, Translational Health Science & Technology Institute, NCR Biotech Science Cluster, Faridabad.

Dr Amit Awasthi has done seminal work on Th9 cells in disease biology which is crucial in the field of immunology. It will help to understand pathogenesis of autoimmune, allergic inflammation, and cancer immunity.



Banerjee, Anjan Kumar (b 03.01.1968), PhD, Professor and Dean (R&D), Biology Division, Indian Institute of Science Education and Research, Pune.

Dr AK Banerjee has done exemplary work in long-distance macromolecular signaling using potato as model. He has unraveled a new avenue of research in plant-science and made pioneering contributions in the understanding of development and yield in potato.



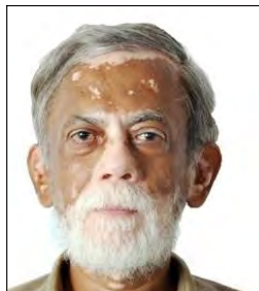
Banerjee, Rahul (b 15.12.1977), PhD, Professor, Department of Chemical Sciences, Indian Institute of Science Education and Research-Kolkata, Mohanpur.

Dr Rahul Banerjee for his work in the field of nano-materials, particularly for the discovery of covalently bonded porous organic nanotubes (CONTs), highly stable porous covalent organic frameworks, nano-porous materials, and their onboard methane storage applications.



Bang, Abhay (b 23.09.1950) Founder-Director, SEARCH (Society for Education, Action and Research in Community Health), Gadchiroli, Maharashtra.

Dr Abhay Bang's journey is deeply rooted in the ethos of Mahatma Gandhi's Sevagram ashram, where he found inspiration. In 1985, he established SEARCH (Society for Education, Action and Research in Community Health) in Maharashtra's underdeveloped Gadchiroli district. Operating across 150 villages, SEARCH delivers community-based healthcare and conducts ground-breaking research, influencing health policies globally. Dr Bang's pioneering work shed light on the hidden burden of gynecological diseases among rural women. His efforts significantly reduced the infant mortality rate. His innovative model, Home-based New-born and Child Care has been adopted nationwide by the Government of India, reaching 11 million rural neonates in 2017 through the dedication of 800,000 ASHAs.



Basu, Gautam (b18.07.1961), PhD, Adjunct Professor, Department of Biological Sciences, Indian Institute of Science Education and Research-Kolkata, Nadia.

Professor Gautam Basu is a biophysical chemist who has made fundamental contributions, both theoretical and experimental, in computational and structural biology. He has identified unique peptide structural motifs in proteins, their stabilization and transitions and their importance to biological functions.



Behari, Sanjay (b27.12.1963), MBBS, MS, Director, Sree Chitra Institute for Medical Sciences and Technology, Thiruvananthapuram.

Dr Sanjay Behari has made immense contributions to the field of Neurosurgery at regional, national, and international levels. His work in the area of treatment of craniovertebral junction anomalies (a condition particularly common in the Indian subcontinent) have yielded meaningful clinical treatment protocols. His work on clinical grading and protocols for the management of craniovertebral tuberculosis are widely cited in international literature. He has also filed for several patents.



Bhatla, Neerja (b02.01.1959), MBBS, MD, Professor & Head, Department of Obstetrics & Gynaecology, All India Institute of Medical Sciences, New Delhi.

Dr Neerja Bhatla is an accomplished gynecologist whose work has been focussed on gynecological oncology.

She has contributed to better understanding of epidemiology of human papillomavirus (HPV) infection in India, and its relationship with cervical cancer. She led an Indian study whose findings contributed to the recent WHO recommendation of need for only one dose of HPV vaccine in young girls, with a huge impact on public health. In addition, she has worked on validation of indigenous affordable tests for HPV infection, including those that permit self-sampling by patients.



Bhattacharya, Dipankar (b 29.05.1959), PhD, Distinguished Professor, Inter-University Centre for Astronomy and Astrophysics, Pune.

Dr Dipankar Bhattacharya, for understanding how magnetic fields of neutron stars change with time.



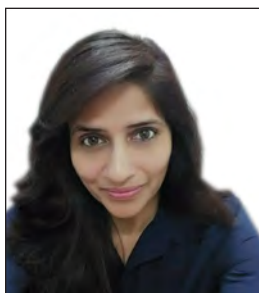
Bhattacharya, Jayanta (b 07.12.1968), PhD, Dean, Translational Health Science & Technology Institute, Department of Biotechnology, NCR Biotech Science Cluster, Faridabad.

Dr Jayanta Bhattacharya has made significant contributions to the pathogenesis of HIV infection, which have helped understand key pathways of antibody development in natural infection, which are likely to help guide rational vaccine design and immunoprophylaxis. His works also focused on rapid discovery of neutralizing antibodies and development of human monoclonal antibodies against SARS-CoV-2 and Nipah virus, that have the potential for use in prophylaxis and treatment of these conditions.



Chakravorti, Sivaji (b 18.09.1962), PhD, Professor, Department of Electrical Engineering, Jadavpur University, Kolkata.

Dr Sivaji Chakravorti for his very significant contributions to the area of fault diagnosis, insulation condition assessment and moisture estimation in solid insulation, and development of non-invasive techniques for health assessment of oil-paper insulation of large electrical equipment with a particular emphasis on transformers.



Chandra, Poonam (b 05.11.1975), PhD, Associate Professor (G), National Centre for Radio Astrophysics, TIFR, Savitribai Phule Pune University Campus, Pune.

Dr Poonam Chandra for the discovery of electron cyclotron, maser emissions in 4 new stars.



Chauhan, Santosh (b 30.08.1978), PhD, Senior Principal Scientist (Scientist-F), CSIR-Centre for Cellular and Molecular Biology, Hyderabad.

Dr Santosh Chauhan has discovered novel mechanisms that control inflammation in the human body with biomedical relevance in the context of autoinflammatory and autoimmune diseases. Further, he has emerged as one of the leaders in the field of autophagy.



Chhuneja, Parveen (b 25.03.1966), PhD, Principal Molecular Geneticist, School of Agricultural Biotechnology, Punjab Agriculture University, Ludhiana.

Dr Parveen Chhuneja has made significant contributions for the improvement of modern wheat genotypes for rust existence and heat tolerance which are two major factors impacting wheat productivity. She has released many wheat varieties developed using both traditional and modern breeding tools by using mild species of wheat.



Dasgupta, Swagata (b 28.09.1962), PhD, Professor, Department of Chemistry, Indian Institute of Technology Kharagpur, Kharagpur.

Dr Swagata Dasgupta for her seminal contributions in protein chemistry research, especially for pioneering work on polyphenols, protein fibrillation and aggregation, protein nanoparticles and films.



De, Sirshendu (b 07.10.1967), PhD, Professor, Department of Chemical Engineering, Indian Institute of Technology-Kharagpur, Kharagpur.

Dr Sirshendu De for his outstanding innovative contributions in chemical engineering that provided new theoretical insights and led to simultaneous translation into technological applications such as water purification that provided immense benefits for the underprivileged and helped in improving their quality of life.



Dey, Abhishek (b 09.07.1977), PhD, Professor, Department of Chemical Science, Indian Association for the Cultivation of Science, Kolkata.

Dr Abhishek Dey for his contribution towards the development of new spectroscopic tools to probe reaction mechanisms, particularly in the areas of selective O_2 , CO_2 , and N_2 reduction.



Ella, Krishna M (b 10.07.1955), Co-Founder and Executive Chairman, Bharat Biotech International Limited, Hyderabad.

Dr Krishna Ella, a prominent Indian scientist and entrepreneur, leads Bharat Biotech in ground-breaking vaccine development. His achievements include India's Covaxin, the world's first clinically proven conjugated Typhoid Vaccine, ROTAVAC, and the first preservative-free vaccine, Revac-B mcf Hepatitis B Vaccine. Bharat Biotech also introduced India's first cell-cultured Swine Flu vaccine and manufactures the world's most affordable Hepatitis vaccines. Additionally, they were the first globally to develop a vaccine for the Zika virus.



Ghatak, Animangsu (b 07.01.1971), PhD, Professor, Department of Chemical Engineering, Indian Institute of Technology-Kanpur, Kanpur.

Dr Animangsu Ghatak for his seminal contributions in advancing the field of surface science of soft materials, including aspects of adhesion, friction, and capillarity, as

well as in the understanding of the complex interplay between capillary effects, deformation, and the resulting mechanical instabilities.



***Ghosh, Ambarish** (b 18.12.1973), PhD, Professor, Centre for Nano Science and Engineering, Indian Institute of Science, Bengaluru.

Dr Ambarish Ghosh for high quality fundamental research to commercialized

technologies.



***Goenka, Pawan** (b 23.09.1954), Chief Operating Officer, Mahindra & Mahindra Ltd., Mumbai.

Dr Pawan Kumar Goenka has retired as the Managing Director of Mahindra & Mahindra. He is the chairman of Ssang Yong Motor Company in Korea. He is also currently the Chairman of INSPACE, a part of India's Space Program. He is also the present Chairman of the Board of Governors of IIT Madras. He is also a national council member of CII.



Gopalakrishnan, Senapathy "Kris" (b 05.04.1955) Chairman, Infosys BPO Limited, Bengaluru.

Mr Gopalakrishnan is recognized as a global business and technology thought leader. He is a Co-Founder of Infosys where he served in various capacities for more than a decade. He is presently the President of the Infosys

Science Foundation. Mr Gopalakrishnan is the Chairperson of Itihaasa Research and Digital, which publishes the history of the Indian IT industry as "itihaasa" microsite, as well as reports on industrial and academic research in India. Mr Gopalakrishnan invests in promoting research on brain sciences, aging related disorders as well as investing in start-ups and the start-up ecosystems.



***Goswami, Ravinder** (b 03.09.1963), MBBS, MD, DM, Professor, Department of Endocrinology and Metabolism, All India Institute of Medical Sciences, New Delhi.

Dr Ravinder Goswami is a clinical endocrinologist who has been working on vitamin D metabolism and its association with bone diseases, especially in India. This work showed existence of widespread vitamin D deficiency and led to a new proposed supplementation schedule based on several well-planned studies. These data have helped establish the national (ICMR/NIN) standards in this field. In addition, he has worked on understanding the pathogenesis of idiopathic hypoparathyroidism, including on demonstration of organ-specific autoimmunity as its cause.



Gupta, Arvind (b 04.12.1953) Indian Toy Inventor, Author, Translator and Scientist, 401, Chitrakoot "B" 1065, Gokhale Cross Road, Model Colony, Pune.

Mr Arvind Gupta's outstanding contribution in designing science teaching aids for young children has been recognized by several international organizations such as UNESCO, UNICEF, International Toy Research Association, Halmstad University,

Boston Science Centre, MIT (Media Lab), Walt Disney Imagineering and Research, Auh of Rehabilitation Centre, Hilpolstien, Germany and the International Play Association, Finland. He has been actively associated with the Bombay Natural History Society, Conservation Society of Delhi, Spastic Society of North India and the Bharat Gyan Vigyan Samiti. He is an advisor to the National Book Trust on popular science books.



Haldar, Jayanta (b 28.11.1974), PhD, Professor, New Chemistry Unit and School of Advanced Materials, Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru.

Dr Jayanta Haldar, for his outstanding contributions in the field of antimicrobial research, in particular, for the synthesis of peptidomimetic antimicrobial agents, semi-synthetic glycopeptide antibiotics, combination therapy, antimicrobial coatings, injectable sealants for eye and tissue infections.



Kakde, Mahesh (b 13.07.1983), PhD, Professor, Department of Mathematics, Indian Institute of Science, Bengaluru.

Dr Mahesh Kakde for his resolution of the main conjecture of non-commutative Iwasawa theory for totally real fields and for his resolution of the Gross-Stark and Brumer-Stark conjectures.



Kakodkar, Anil (b 11.11. 1943), AICTE Distinguished Chair Professor and Chancellor, Homi Bhabha National Institute, Mumbai.

Professor Anil Kakodkar spearheaded India's journey towards self-reliance in thorium-

based nuclear energy, marking a crucial step towards sustainable power generation. He led the design of the Dhruva reactor. His vision includes CILLAGE, a concept for bridging urban-rural gaps through technology-enabled sustainable development. His holistic approach underscores his dedication to shaping a more equitable and prosperous future for all.



Kamat, Samir V (b 29.05.1964), Secretary and Chairman, Defence Research and Development Organisation (DRDO), New Delhi.

Dr Samir Kamat has provided leadership and direction to several critical

materials programmes in DRDO such as the developments of high-strength steels for naval ship hulls, of high-temperature titanium alloys and nickel base superalloy based components for aero engines, of tungsten heavy alloys for kinetic energy penetrators, of fused silica radomes for missile seekers, and of armour solutions for personnel as well as combat vehicles and stealth materials for airborne and naval applications. In addition, he has spearheaded the development of naval systems such as advanced lightweight torpedo, anti-torpedo decoy systems, autonomous underwater vehicles, advanced hull-mounted and towed array sonars for ships, and fuel cells-based air-independent propulsion systems for submarines.



***Konijeti, Sreenadh** (b 02.05.1975), PhD, Institute Chair Professor and HAG, Department of Mathematics, Indian Institute of Technology Delhi, New Delhi.

Dr Sreenadh Konijeti for the study of existence, multiplicity and regularity results for partial differential equations involving non-linear source terms and non-local operators.



Kumar, Sanjay (b 01.01. 1965), PhD, Professor, Department of Physics, Banaras Hindu University, Varanasi.

Dr Sanjay Kumar for understanding of response of polymers under translocation and multigradient fields.



Mahalakshmi, Radha-krishnan (b 08.04. 1980), PhD, Professor and Welcome Trust-DBT Senior Fellow, Molecular Biophysics Laboratory, Indian Institute of Science Education and Research Bhopal, Bhopal.

Professor Mahalakshmi has made important contributions to membrane protein biophysics and bioenergetics by mapping structure-function effectors of vital human mitochondrial outermembrane channel VDAC, translocase Tom40, and chaperone Sam50. Her pioneering contributions include developing peptidomimetics as precise indicators of membrane protein aggregation and as therapeutics for mitochondria-triggered cancer and neurodegeneration.



Majee, Manoj (b 12.07.1976), PhD, Scientist - V, National Institute of Plant Genome Research, New Delhi.

Dr Manoj Majee has made excellent contributions in the area of Seed Biology. His research provides novel insights into the role of protein repairing enzymes in enhancing seed viability and storage.



Makharia, Govind K (b 10.06.1965), MBBS, MD, DM, Professor, Department of Gastroenterology and Human Nutrition, All India Institute of Medical Sciences, New Delhi.

Dr Govind K Makharia has worked extensively on celiac disease in India, contributing to studies on burden of this disease in India and Asia, helped develop a non-invasive biomarker assay for this disease which has the potential to obviate the need for endoscopy and biopsies for enteropathic diseases. In addition, he has worked on the treatment of intestinal tuberculosis, to demonstrate in a multicenter randomized controlled trial that a 6-month treatment regimen is adequate.



***Mazumdar-Shaw, Kiran** (b 23.03.1953), Executive Chairperson, Biocon & Biocon Biologics Limited, Bengaluru.

Under the leadership of Dr Kiran Mazumdar-Shaw, Biocon India became the first Indian company to manufacture and export enzymes to the U.S. and Europe within a year of its establishment. Through the Biocon Foundation, she extends

her impact, spearheading health and education initiatives to uplift economically disadvantaged communities.



Mukhopadhyay, Debdeep (b 31.10.1977), PhD, Professor, Department of Computer Science and Engineering, Indian Institute of Technology-Kharagpur, Kharagpur.

Dr Debdeep Mukhopadhyay for his fundamental contributions to cryptography and hardware security. His seminal works on fault attacks and micro-architectural security have exposed practical security issues and helped design stronger variants.



***Murthy, NRN** (b 20.08.1946) Amoghavarsha No 575, 21st Main, 35th Cross 4th T Block Jayanagar, Bengaluru.

Mr NR Narayana Murthy is one of the founder of Infosys and has previously served it in several capacities. Murthy has been listed among the 12 greatest entrepreneurs of our time by Fortune magazine. He has been described as the “father of the Indian IT sector” by Time magazine and CNBC for his contribution to outsourcing in India. In 2005, he co-chaired the World Economic Forum in Davos, Switzerland.



***Murty, Sudha** (b 19.08.1950) Former Chairperson, Infosys Foundation, Bengaluru.

Ms Sudha Murty is best known for her contribution on social work & education.

She has also well known for her philanthropy and her contribution to literature in Kannada and English. She is the first female engineer hired at India's largest auto manufacturer TATA Engineering and Locomotive Company. In 1996, she started Infosys Foundation and has been the Trustee of Infosys Foundation. She has written several books which include novels, non-fiction, travelogues, technical books, and memoirs and they have been translated into all major Indian languages.



Nagegowda, Dinesh Addihalli (b 21.03.1974), PhD, Chief Scientist & Scientist In-Charge, Professor (AcSIR), CSIR-Central Institute of Medicinal and Aromatic Plants Research Centre, Bengaluru.

Dr Dinesh Nagegowda's research has been focused on uncovering the molecular mechanisms associated with bio-synthesis of phytomolecules through integration of biochemical and molecular approaches combined with metabolomic engineering. His research on secondary plant products has great potential to boost secondary metabolite production through synthetic biology approach.



Narayanan, Rishikesh (b 05.06.1974), PhD, Professor, Molecular Biophysics Unit, Indian Institute of Science, Bengaluru.

Professor Rishikesh Narayanan has made outstanding contributions to cellular and network neurophysiology that recognize the utilities of complexity in attaining functional robustness using biophysical and computational tools. His work establishes a fundamental framework that

exploits ubiquitous, yet structured, plasticity in the heterogeneous brain that manifests degeneracy towards achieving precise function across scales.



Nataraj, Neela (b 31.05.1968), PhD, Institute Chair Professor and Dean (Faculty Affairs), Department of Mathematics, Indian Institute of Technology Bombay, Mumbai.

Dr Neela Nataraj for work on the finite element methods for Kirchhoff plate models and Von Karman equations, especially the discontinuous Galerkin method and new penalty method for the fourth order.



***Nilekani, Nandan Mohanrao** (b 02.06.1955), Co-Founder and Chairman, Infosys Technologies Limited, Bengaluru.

Dr Nandan Nilekani was the founding Chairman of the Unique Identification Authority of India (UIDAI) and has Co-founded and is the Chairman of Ek Step Foundation, a not-for-profit effort to create a learner-centric, technology-based platform to improve basic literacy and numeracy for millions of children. He won The Economist Social & Economic Innovation Award for his leadership of India's Unique Identification initiative (Aadhaar). Nandan Nilekani is the author of "Imagining India", co-authored his second book with Viral Shah, "Rebooting India: Realizing a Billion Aspirations" and co-authored his third book with Tanuj Bhojwani, "The Art of Bitfulness: Keeping Calm in the Digital World".



Patravale, Vandana Bharat (b 21.10.1965), PhD, Professor of Pharmaceutics, Department of Pharmaceutical Sciences and Technology, Institute of Chemical Technology, Mumbai.

Professor Vandana Patravale has been engaged in pharmacological research leading to translational work on several technologies to products that are in use, including coronary stents based on a biodegradable polymer, and diagnostic kits for detection of Brucella antibodies based on fluorescence silica nanosensors. More recently, she has been working on developing a targeted drug delivery system for malaria and a nasal vaccine against brucellosis for use in animals.



Rath, Sankar Prasad (b 03.02.1972), PhD, Professor (HAG), Department of Chemistry, Indian Institute of Technology Kanpur, Kanpur.

Dr SP Rath, for his substantial contributions in biomimetic study of the multiheme proteins primarily modulating structure and properties of the individual heme centre and structure-property correlation.



Sahoo, Akhila Kumar (b 18.01.1972), PhD, Professor, School of Chemistry, University of Hyderabad, Hyderabad.

Dr AK Sahoo for his pioneering contributions to the field of **C-H activation** by introducing the concept of reusable/transformable directing groups, especially for the design and development of

nitrogen, oxygen rich new energetic materials for Defense applications.



Sane, Sanjay Prafulla-chandra (b 12.09. 1970), PhD, National Centre for Biological Sciences, Tata Institute of Fundamental Research, Bengaluru.

Dr SP Sane has made seminal contributions to the biology of insect flight by integrating neural circuitry analysis, biomechanics and sensory physiology. His work transverses between sophisticated lab-based biology and field-based ecological research.



Saraswat, Vijay Kumar (b 25.05.1949), Former Director General, Defence Research and Development Organisation (DRDO) and Former Chancellor of Jawaharlal Nehru University, New Delhi.

Dr Vijay Kumar Saraswat is the key scientist in the development of the Prithvi missile and its induction into the Indian armed forces. Dr Saraswat is a forerunner in the development of several critical missile technologies that were under denial due to the Missile Technology Control Regime, thus making India self-reliant in Missile Technologies.



Sarma, Vedula Venkata Subrahmanya Srinivasa (b 15.06.1969), PhD, Senior Principal Scientist, CSIR-National Institute of Oceanography, Visakhapatnam.

Dr VVSS Sarma has contributed to the understanding of biogeochemical processes, biological production and biogenic fluxes in the Indian estuaries and surrounding marine regions.



Sen, Ellora (b 01.09.1969), PhD, Scientist VI, National Brain Research Centre, Manesar.

Dr Ellora Sen has made important contribution in epigenetics, biochemistry, immunology and cell biology which has provided mechanistic insight into the dynamic interactions between metabolic reprogramming and inflammation.



Shasany, Ajit Kumar (b 01.03.1967), PhD, Director, CSIR-National Botanical Research Institute, Lucknow.

Dr AK Shasany research developed into sequencing of *Ocimum tenuiflorum*, commonly known as holy basil and its genes functional characterization unraveling a novel aroenate pathway crucial for scent biosynthesis. Additionally, it elucidated virtual compartmentalization of gene activities with petunia petals and metabolic pathways directing eugenol synthesis of *Ocimum*. The comprehensive analyses encompassed over 900 plant accessories across various spices evolutionary connections and marker identification. Additionally, the initiative led the development and the release of 45 varieties with 22 patents.



Shukla, Vartika (b 14.02.1966), Chairman & Managing Director, Engineers India Limited (EIL), New Delhi.

Dr Vartika Shukla possesses extensive technical and consulting experience across the hydrocarbon value chain and has led the company to the successful completion of many prestigious projects in the Oil & Gas Refining, Petrochemical, and Fertilizers sectors both in India and overseas. She has been steering several new initiatives of the company in the areas of Bio Fuels, Digitization, Energy Efficiency, Make in India, and Start-up India. Ms. Shukla has made immense contributions to the development of National Policies, especially in the areas of biofuels and future road map for the refining and petrochemical sector.



Singh, Amit (b 18.03.1976), PhD, Associate Professor, Department of Microbiology of Cell Biology, Centre for Infectious Disease Research, Indian Institute of Science, Bengaluru.

Dr Amit Singh has made fundamental contributions in fundamental understanding of host-pathogen interactions underlying infections caused by human pathogens, *Mycobacterium tuberculosis* (Mtb), and human immunodeficiency virus (HIV). His work led to an understanding of the intricate connection between redox mechanisms conferring drug resistance.



Singh, Rajendra (b 06.08.1959), Indian Water Conservationist and Environmentalist, Tarun Bharat Sangh, Mansarovar.

Dr Rajendra Singh also known as “waterman of India”, runs the NGO ‘Tarun Bharat Sangha’ (TBS) since 1975. The NGO based in village hori-Bhikampura in Thanagazi tehsil, near Sariska Tiger Reserve, has been instrumental in fighting the slow bureaucracy, mining lobby. It has helped villagers take charge of water management in their semi-arid area through the use of johad, rain water storage tanks, check dams and other time-tested as well as path-breaking techniques. Over the years TBS helped build over 8,600 johads and other water conservation structures to collect rainwater for the dry seasons, has brought water back to over 1,000 villages and revived five rivers in Rajasthan, namely, Arvari, Ruparel, Sarsa, Bhagani and Jahajwali.



Sivarajan, Kumar N (b 23.10.1965), Chief Technology Officer, Tejas Networks Ltd., Bengaluru.

Dr KN Sivarajan has several years of experience in the field of electrical communication engineering. Dr Sivarajan worked on optical, wireless and telecommunication networks for ten years in academia and research labs before cofounding the optical networking company, Tejas Networks, Bengaluru, in 2000. He is an elected fellow of IEEE, 2021. He is an elected Fellow of the Indian National Academy of Engineering.



Somanath, S (b 30.07.1963), Chairman, Indian Space Research Organisation (ISRO), Bengaluru.

Dr S Somanath as the ISRO Chairman spearheaded the soft landing of Chandrayaan-3 on the South Pole of the lunar surface along with other notable senior ISRO scientists. He is known for his contributions to launch vehicle design, particularly in the areas of launch vehicle systems engineering, structural design, structural dynamics, and pyrotechnics.



Sundaram, Balasubramanian (b 05.06.1966), PhD, Professor, Chemistry and Physics of Materials Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru.

Dr S Balasubramanian for his innovative work on computational chemistry and supramolecular materials, especially for developing a novel force field for ionic liquids based on quantum density functional theory, enabling quantitative prediction of their physical properties.



***Sur-Kolay, Susmita** (b 16.07.1959), PhD, Professor (HAG), Advanced Computing and Microelectronics Unit, Indian Statistical Institute, Kolkata.

Dr S Sur-Kolay for her outstanding and fundamental contributions to several areas including (a) electronic design automation, in particular, physical design automation of ICs and FPGAs, (b) IC security and protection, and (c) synthesis of quantum circuits.



Sureshan, Kana Meethale-veetil (b 14.10.1973), PhD, Professor and Dean, Infrastructure and Planning, School of Chemistry, Indian Institute of Science Education and Research Thiruvananthapuram, Thiruvananthapuram.

Dr KM Sureshan, for his significant contributions in supramolecular chemistry and polymer science, especially, for the development of novel 'topochemical azide-alkyne cycloaddition' (TAAC) and 'topochemical ene-azide cycloaddition' (TEAC) reactions to synthesize diverse crystalline and topologically distinct polymers and their applications.



Suri, Ashish (b 08.04.1970), MBBS, MCh, Professor and Unit Head, Department of Neurosurgery, Neurosciences Center, All India Institute of Medical Sciences, New Delhi.

Professor Ashish Suri is a neurosurgeon par excellence with a deep aptitude for innovation and passion for breaking barriers and looking for out-of-the-box solutions. While being on the faculty of a medical institution, he is also an adjunct professor at an IIT, and has undertaken collaborative work across distinct fields to find solutions to important issues in the field of neurosciences. He has also mentored several students in both neurosurgery and engineering fields becoming one of the very few to accomplish a balance of excellence in academics, research, and neurosurgery skill, while continuously and consistently pushing the horizons.



Suwas, Satyam (b 30.09.1969), PhD, Professor and Chair, Department of Materials Engineering, Indian Institute of Science, Bengaluru.

Dr Suwas Satyam for his pioneering contributions to the fundamental understanding of the role of stacking fault energy on texture evolution in materials and, in turn, to the mechanical properties of materials, and for providing excellent scientific solutions to many of the engineering problems pertaining to the processing of various engineering materials for the defence, nuclear, and transportation sectors.



Talukdar, Pinaki (b 04.11.1975), PhD, Professor, Chemistry Department, Indian Institute of Science Education and Research-Pune, Pune.

Professor P Talukdar has made significant contributions in the area of Chemical Biology. His group has pioneered developing artificial ion transporters and utilizing them to induce programmed cell death in cancer cells by disrupting ion homeostasis. His group has made ion transporters activated by multiple stimuli for selective targeting of cancer cells.



Umapathy, Siva (b 10.06.1959), PhD, Professor, Department of Inorganic and Physical Chemistry and, Department of Instrumentation and Applied Physics, Indian Institute of Science, Bengaluru.

Professor Siva Umapathy for his pioneering contributions towards the development of (Raman) spectroscopy tools to study chemical, biological, and materials science phenomena.



Vidya, TNC (b 05.08.1976),
PhD, Professor,
Evolutionary & Organismal
Biology Unit, Jawaharlal
Nehru Centre for Advanced
Scientific Research,
Bengaluru.

Professor TNC Vidya has made original contributions in the sociobiology of Asian elephants comprising population genetic structuring, behavior and evolutionary aspects.

Besides Professor Rakesh Aggarwal, Dr Kalachand Sain, Dr Raghavan Krishnan, Professor Siddhartha Roy, Professor SK Barik, Dr Harini Nagendra, Professor GUR

Kulkarni, Professor Gobinda Majumder, Dr MS Chauhan, Fellows elected in previous years were also inducted to the Fellowship.

**Could not attend the induction ceremony*

Annexure-VII

FOREIGN FELLOWS ELECTED 2024

(Effective from January 1, 2025)



Badesha, Santokh Singh (b. 01.10.1947), Distinguished Professor of ECE – COE, Purdue University, Elmore Family School of Electrical and Computer Engineering, 501 Northwestern Ave. MSEE-155, West Lafayette, IN 47907, USA.

For international recognition of his invention of foundational technologies that have ushered in the era of digital printing on demand, transforming the communication and productivity of hundreds of millions of people around the world. He is the all-time Xerox recordholder for US Patents, having generated the patented technology that is used in nearly all major Xerox printing system families. Prof Badesha continues to drive innovation across Xerox's suite of printing systems, especially in the areas of solid and aqueous inkjet printing and the next generation of digital printing technology.



***Foster, Russell Grant** (b. 19.08.1959), Professor of Circadian Neuroscience and Director, Sir Jules Thorn Sleep and Circadian Neuroscience Institute, Nuffield Department of Clinical Neurosciences, University of Oxford, Dorothy Crowfoot Hodgkin Building, South Parks Road, Oxford OX1 3QU, UK.

For his significant work that has redefined the understanding of how the eye detects light. His landmark discovery that the Fish possesses inner retinal photoreceptors, provided the first evidence for a non-rod, non-cone ocular photoreceptor in any vertebrate. Foster demonstrated that photoreceptors utilize a specialized photopigment

maximally sensitive to “blue” light (λ_{max} 480nm). Further, by employing calcium- imaging on the isolated rd/rd cl retina, he identified these photoreceptors in mice as endogenously photosensitive retinal ganglion cells (pRGCs) that utilise the photopigment melanopsin (OPN4). More recently, he demonstrated the mechanism by which pRGCs regulate the molecular clockwork.



***Hahn, Horst Werner** (b. 10.08.1952), Professor, Karlsruhe Institute of Technology, Institute of Nanotechnology, Hermann-von-Helmholtz-Platz1, 76344 Eggenstein Leopoldshafen, Germany.

For his highly accomplished research in the field of Materials Science. His primary focus lies in the investigation of nanostructures, encompassing nanoparticulate systems, thin films, and bulk structures. Notably, his groundbreaking work has advanced the understanding of nanocrystalline ceramics, pioneered the development of metallic nanoglasses and high entropy oxides, and significantly propelled the field of materials with tunable functional properties.



***Jain, Jainendra Kumar** (b. 17.01.1960), Evan Pugh University Professor & Erwin W. Mueller Professor of Physics, 104 Davey Laboratory, Physics Department, Penn State University, University Park, PA 16802, USA.

Professor Jain predicted a new class of exotic particles, which he named “composite fermions,” and explained the fractional quantum Hall effect as the integer quantum

Hall effect of composite fermions. In doing so, he accomplished a unification of the fractional and the integer quantum Hall effects, two Nobel prize winning phenomena. His discovery of composite fermions is recognized as a singular and transformative development in the realm of condensed matter physics.



***Khosla, Pradeep Kumar** (b. 13.03.1957), Chancellor, University of California, 9500 Gilman Dr. #0005 San Diego, CA 92093, USA.

For his significant contributions in robotics, embedded software and cybersecurity which had a tremendous impact on research directions and practice in the world. He has made seminal contributions in the design, sensor-based control, and software for robot systems and surgical instruments. His experimental work forms the basis for algorithms in high performance commercial robots. The

intelligent surgical instrument called 'Micron' is currently in field trials for use in eye surgery.



***Pingali, Prabhu** (b. 12.02.1955), Professor of Applied Economics & Director, Tata-Cornell Institute (TCI), Cornell University 375J, Warren Hall, Ithaca, NY 14853-7801, USA.

For his highly acclaimed research and policy accomplishments in agricultural development and food security. His comprehensive review of the Green Revolution impacts (PNAS, 2012) is a standard reference for students of agricultural development. His research on adverse health impacts of pesticides received multiple international awards and led to safer use policies in the Philippines. His work on agricultural mechanization and technology adoption in Africa won him the Research Discovery Award from the American Association of Agricultural Economists in 1988.

**Could not attend induction ceremony*

Annexure-VIII

RECIPIENTS OF INSA YOUNG ASSOCIATES (IYA)

(For the year 2024)



Dr Gaurav Ahuja (24.09.1987), PhD, Associate Professor, Indraprastha Institute of Information Technology, New Delhi.

Dr Ahuja is a computational biologist who using a variety of approaches including AI/ML to identify alternative functions of cellular metabolites. His group has developed many tools, especially in the areas of olfaction and structure-activity relationships. His collaborative work in identifying human carcinogens using a multiparametric approach is noteworthy.



Dr Mrinmoyee Basu (17.08.1985), PhD, Assistant Professor, Department of Chemistry, Birla Institute of Technology and Science Pilani, Pilani.

Recommended for her outstanding work on semiconductor, especially on nanomaterials for photoelectrochemical reactions like water splitting, CO₂ reduction, and sensing, and vertically grown nanomaterials to enhance light-matter interaction and charge carrier properties.



***Dr Sayantani Bhattacharyya** (04.09.1981), PhD, Reader-F, National Institute of Science Education and Research Bhubneswar, Khurda.

Pioneering work on fluid-gravity correspondence.



Dr Pankaj Chauhan (08.04.1984), PhD, Associate Professor, Department of Chemistry, Indian Institute of Technology Jammu, J&K.

Recommended for his outstanding work in the field of organocatalysis especially on enantioselective reactions, photochemical and electrochemical organic synthesis, synthesis of new polycyclic frameworks, atrop-/enantio-selective synthesis of medium-sized bridged biaryls, generation of remote stereogenic centers, photochemical generation of triplet carbene intermediates, and electro-organic synthesis of valuable building blocks and heterocycles, as well as the merger of chiral organocatalysis with photoredox catalysis and electrochemical synthesis to develop relay catalytic transformations.



***Dr Ved Vivek Datar** (13.11.1987), PhD, Assistant Professor, Department of Mathematics, Indian Institute of Science, Bengaluru.

For fundamental contributions to the differential geometry of Kähler manifolds that explore their connections to mathematical physics and complex algebraic geometry.



Dr Sourav Dutta (05.03.1984), PhD, Reader, Department of Nuclear and Atomic Physics, Tata Institute of Fundamental Research Mumbai, Mumbai.

Outstanding contribution to the understanding of cooling of trapped ions and experiments with strongly coupled atom-cavity systems.



Dr Kalikrishna Hazra (20.09.1984), PhD, Senior Scientist, Crop Production Division, ICAR-Indian Institute of Pulses Research, Kanpur.

Dr Hazra developed sustainable phosphorus management modules. He has also carried work on mechanistic comprehension of c-sequestration and strategies for enhanced c-storage.



Dr Neha Jain (06.09.1981), PhD, Associate Professor, Department of Bioscience and Bioengineering, Indian Institute of Technology, Jodhpur.

Dr Jain has been working on understanding neurodegenerative disease, in particular on understanding the role of microbial amyloids in these diseases, deciphering the role of immune activation by hetero-amyloids and identifying strategies to combat the formation of amyloid.



Dr Md Iqbal Raja Khan (15.01.1987), PhD, Assistant Professor, Department of Botany, School of Chemical & Life Sciences, Jamia Hamdard, New Delhi.

Dr Khan has worked on GABA as a new significant plant signaling molecule. They have elucidated its role in mitigating salt and ER stress in wheat plants.



Dr Veda Krishnan (23.03.1986), PhD, Scientist (Senior scale), Division of Biochemistry, ICAR- Indian Agricultural Research Institute, New Delhi.

Dr Veda investigated the effect of genetic variability in staple crops like rice and pearl millet on carbohydrate quality and their glyceric potential using various invitro digestion models.



Dr Gaurav Majumdar (07.08.1984), PhD, Assistant Professor, Department of Zoology, University of Allahabad, Prayagraj.

Dr Gaurav Majumdar has made significant contributions to the area of chronobiology in avian system. Notable findings include photoperiod impact on peptides in retinas, with which birds can differentiate between summer and winter seasons. Dr Majumdar studies on neuroplasticity have implication in neurodegenerative diseases.



***Dr Surendra Kumar Makineni** (27.06.1986), PhD, Assistant Professor, Department of Materials Engineering, Indian Institute of Science Bangalore, Bengaluru.

For pioneering contribution to the development of lightweight cobalt-base superalloys for high-temperature applications and advanced correlative microscopy techniques to study the atomic-scale structure and composition of defects, grain, and phase boundaries that control the overall properties of engineering alloys.



Dr Awadhesh Narayan (19.10.1988), PhD, Assistant Professor, Solid State and Structural Chemistry Unit, Indian Institute of Science Bengaluru, Bengaluru.

Recommended for his outstanding work in the field of quantum theory of materials, especially, on predictions of electrically tunable Berry curvature dipole in graphene analogs, discovery of a new two-dimensional structure of WS₂ with topological properties and a Berry curvature dipole, development of the theory of high critical temperatures in two-dimensional magnetic materials, demonstration of strain as a control parameter over polar metallicity, innovative approaches to control exceptional points in non-Hermitian quantum systems, machine-learning method for identifying non-Hermitian topological phases, and a new framework to classify exceptional points using techniques from tropical geometry.



Dr Ratna Pal (04.06.1987), PhD, Assistant Professor, Department of Mathematics, Indian Institute of Science Education and Research Mohali, Mohali.

For contributions to the area of higher dimensional complex dynamics, specially the relation between Hénon maps with bi-holomorphic escaping sets.



Dr Bahni Ray (26.04.1982), PhD, Associate Professor, Department of Mechanical Engineering, Indian Institute of Technology Delhi, New Delhi.

For her outstanding contributions to understanding micro-scale mechanisms of absorption of hydrophilic and hydrophobic particles through droplets for pollution mitigation.



Dr Sriparna Saha (19.01.1982), PhD, Associate Professor, Department of Computer Science and Engineering, Indian Institute of Technology Patna, Bihta.

For her significant contributions to multimodal information processing through deep-learning architectures, covering diverse applications, including sentiment and emotion-aware dialogue systems, disease prognosis, hate speech detection, depression detection, recommendation systems, and task-oriented dialogue systems in sales and healthcare domains.



Dr Jogender Singh (28.03.1988), PhD, Assistant Professor, Indian Institute of Science Education and Research Mohali, Mohali.

Outstanding work unveiling mechanistic underpinnings associated with reductive stress using *C. elegans* as a model system. Discovered the interplay between hyoxia and reductive stress.



Dr Swatantra Pratap Singh (15.08.1985), PhD, Associate Professor, Environmental Science and Engineering Department, Indian Institute of Technology Bombay, Mumbai.

For his significant contributions to water and waste water treatment and pollution control research, leading to cost-effective novel membrane technology and environmental nanotechnology-based solutions.



Dr Rishitosh Kumar Sinha (21.10.1987), PhD, Scientist/Engineer SE, Physical Research Laboratory, Ahmedabad.

Rishitosh Sinha has conducted detailed investigation of the morphology and topography of the landing sites of Chandrayaan-2 and 3. The Chandrayaan-3 Pragyan rover traverse map around the landing site was designed by him.



Dr Surendra Nadh Somala (20.08.1986), PhD, Associate Professor, Indian Institute of Technology Hyderabad, Sangareddy.

For his significant contributions to earthquake engineering, including seismic hazard assessment and performance assessment of critical infrastructure such as bridges and offshore wind turbines.

**Could not attend the induction ceremony.*

Annexure-IX

RECIPIENTS OF INSA ASSOCIATE FELLOWS (IAF)

(For the year 2024)



Dr Tanushree Bhattacharya (30.04.1979), PhD, Associate Professor, Department of Civil and Environmental Engineering, Birla Institute of Technology, Mesra, Ranchi.

Tanushree Bhattacharya contributed significantly to the monitoring, assessment and remediation of environmental pollutants that led to the appraisal of metal contamination in ground water and soils, and provided implications on health hazards.



Professor Parag Ratnakar Gogate (30.06.1975), PhD, Professor of Chemical Engineering and Controller of Examinations, Chemical Engineering Department, Institute of Chemical Technology, Mumbai.

For his significant contributions to the fundamental understanding of the governing mechanisms and the design of cavitation reactors for process intensification of different chemical, physical, and biotechnological applications.



Professor Chidambaram Gunanathan (05.06.1977), PhD, School of Chemical Sciences, National Institute of Science, Education and Research Bhubaneswar, Jatani.

Recommended for his outstanding work on catalysis and sustainable chemistry, especially on

efficient and selective catalytic transformations using bio-renewable alcohols and industrial feedstocks with no hazardous waste, chemo selective hydro elementation reactions, amine-amide metal-ligand cooperation in pincer catalysts for sustainable catalytic transformations, direct catalytic cross-coupling of secondary alcohols, alpha-alkylation and olefination of nitriles, ketazine synthesis, a-alkylation of ketones and b-naphthol, N,N-dialkylation of acylhydrazides, selective hydrogenation of epoxides, self-coupling of secondary alcohols, alkenylation of organic compounds, cross-coupling of silanes and silanols, and selective reduction of esters, demonstrating his significant contributions towards advancing sustainable chemical transformations.



Dr Anzar Ahmad Khuroo (26.10.1974), PhD, Associate Professor, Centre for Biodiversity and Taxonomy, Department of Botany, University of Kashmir, Srinagar.

Dr Khuroo made extensive contributions to ecology of invasive alien species causing change in biodiversity pattern, and spread of exotic species as impacted by climate change in Kashmir mountains of the Western Himalayas.



Dr Girdhari Lal (09.08.1978), PhD, Scientist F, National Centre for Cell Science, Pune.

Dr Lal's laboratory is working on cellular and molecular mechanisms of inflammation and tolerance in relation to inflammatory

diseases, autoimmunity and tumours. Further, they are investigating the role of chemokine receptors and their therapeutic importance in inflammation and autoimmunity.



Dr Biswanath Maity (26.12.1982), PhD, Associate Professor, Centre of Biomedical Research (CBMR), SGPGI Campus, Lucknow.

Dr Maity has made significant contributions towards understanding the impact of G-protein regulation in chemotherapy-induced heart complications, drug-induced liver injury, non-alcoholic fatty liver disease and disease, etc and on synthesis/ characterization of nanostructures that can help cell-selective delivery of drugs.



Professor Sukhendu Mandal (31.03.1977), PhD, Indian Institute of Science Education and Research Thiruvananthapuram, Trivandrum.

Recommended for his significant contributions in the field of metal nano-clusters, inorganic materials, and solid-state chemistry with especial focus on synthesizing new stable metal clusters and cluster-assemblies and exploring their physical and chemical properties; for example stabilization of Cu in a zero-oxidation state, synthesis of a new silver nanocluster with a hexagonal close-packed Ag₁₄ unit containing S₂- templated Ag₂S quantum dot-like core and a 2D cluster-assembled material, developing a nickel-based thiolate complex for electrochemical ammonia production from dinitrogen, and synthesizing a phosphine and halide-protected Au nanocluster useful for efficient Ullmann coupling reactions.



Professor Supriyo Mitra (12.11.1976), PhD, Department of Earth Sciences, Indian Institute of Science Education and Research Kolkata, Nadia.

Supriyo Mitra's seismological study revealed flexural underthrusting of India beneath Himalaya, thinned-continental crust beneath Shillong Plateau, and continent-oceanic transitional crust beneath Bengal Basin, and entire Indian crust seismogenic.



Professor Vineeth N Balasubramanian (29.11.1978), PhD, Department of Computer Science and Engineering, Indian Institute of Technology Hyderabad, Sangareddy.

For his outstanding contributions to the fields of deep learning, computer vision and explainable AI, especially in the development of fundamental methods for learning robust and reliable deep learning models in continually evolving environments.



***Dr Dimple Notani** (02.08.1976), PhD, Associate Professor, National Centre for Biological Sciences, TIFR Bangalore, Bangalore.

Outstanding contribution towards 3-D organization of genome that dictates spatio-temporal control of gene expression. Pioneering work identifying novel mechanisms that control enhancer - promoter interactions.



***Professor Ajith Parameswaran** (27.05.1980), PhD, Professor (H), International Centre for Theoretical Sciences, Tata Institute of Fundamental Research Bengaluru, Bangalore.

Outstanding contributions on gravitational lensing of gravitational waves.



Dr Manas Ranjan Sahoo (12.06.1983), PhD, Associate Professor, School of Mathematical Sciences, National Institute of Science Education and Research Bhubaneswar, Khurda.

For contributions to study the initial boundary value problems extending earlier results for the pure initial value problem in the area of partial differential equations.



Professor Raghunath Sahoo (28.02.1976), PhD, Indian Institute of Technology Indore, Simrol.

Outstanding work in field of QGP & phenomenology specially in small systems with application of ML

techniques.



Professor Neelima Satyam (06.08.1979), PhD, Department of Civil Engineering Indian Institute of Technology Indore, Simrol.

For her significant contributions to the field of geotechnical and earthquake engineering, including landslide hazard assessment, liquefaction studies, and

seismic microzonation. The liquefaction hazard assessment tool developed by her has become an industry standard for assessing liquefaction susceptibility.



Professor Kamal Priya Singh (13.07.1979), PhD, Indian Institute of Science, Education and Research Mohali, Mohali.

Pioneering work on novel electronic, optical and magnetic properties of silk and implications on

understanding proteins.



Professor Kashmir Singh (24.01.1976), PhD, Department of Biotechnology, Panjab University, Chandigarh.

Prof Singh has made significant contribution in the field of plant functional genomics and metabolic engineering with a special focus on important medicinal plants of Himalayan region.



Professor Neetu Singh (20.06.1979), PhD, Center for Biomedical Engineering, Indian Institute of Technology Delhi, New Delhi.

For her significant contributions to the development of new-age materials and technologies for healthcare, including a simple drug screening platform to monitor cancer cells and bacteria and a drug delivery platform with RBC membrane towards personalized medicine.



Dr Sudhir Pratap Singh (15.12.1977), PhD, Scientist-D, Center of Innovative and Applied Bioprocessing (CIAB), NABI, Mohali.

Dr Singh generated metagenomic resources from thermal spring, cold lake, ethnic fermented food products, and acidic mine, and discovered novel genes encoding enzymes with superior catalytic properties of high-value to agriculture biotechnology.



Dr Surya Prakash Singh (15.04.1978), PhD, Principal Scientist, Department of Polymers and Functional Materials, CSIR-Indian Institute of Chemical Technology, Hyderabad.

Recommended for his significant contributions in the field of materials and molecules, especially for the development of photonic devices such as

Besides Dr Sandeep Anand, Dr Aditya Gopalan, Dr Kasturi Saha, Dr Haripada Sau, Dr Mahak Sharma, Dr Arjun Srivathsa, Dr Vikram Vishal, INSA Associate Fellows selected in previous year (2023) were also inducted to the Fellowship.

organic thin-film solar cells (OPV), dye-sensitized solar cells (DSSC), and perovskite solar cells, design and development of new light-harvesters like small molecule electron donors, soluble fullerene and non-fullerene electron acceptors, photosensitizers, and hole-transport materials, resulting in power conversion efficiencies over 10% for non-fullerene acceptors, over 13% for DSSCs, and over 22% for perovskite solar cells, as well as indoor solar cells with a remarkable efficiency of 38%.



Professor Timir Tripathi (28.01.1981), PhD, Department of Zoology, School of Life Sciences, North-Eastern Hill University, Shillong.

Dr Tripathi is a molecular biophysicist interested in understanding protein function through its interactions and dynamics. He has published good quality work in multiple areas with a special emphasis on redox proteins from *Fasciola gigantica*, a disease causing organism in ruminants.

*Could not attend the induction ceremony.

Annexure-X

RECIPIENTS OF INSA DISTINGUISHED LECTURES-1**(for current INSA Associate Fellows and INYAS only)****(For the year 2024)****Sectional Committee - II : Physics**

Astronomy, Astrophysics, Nuclear and High Energy Physics, Atomic, Molecular and Optical Physics, Statistical Physics, Theoretical Physics, Mathematical and Computational Physics, Condensed Matter including Soft, Liquids and Nano Materials, Cosmic Radiation, Cosmology, Space Physics, Basic Planetary Sciences, Lasers and Optoelectronics, Plasma Physics, Solar Physics, Atmospheric Physics

Sharma, Veerendra Kumar (b 09.08.1985), PhD, Scientific Officer (G), Solid State Physics Division, Bhabha Atomic Research Centre, Mumbai.

Outstanding contribution on the understanding of dynamical process in soft materials. Developed a model that captures the crossover from non Gaussian to Gaussian sub-diffusion in glass.

Sectional Committee - III : Chemistry

Analytical Chemistry, Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Theoretical and Computational Chemistry, Structural Chemistry, Chemistry of Materials, Medicinal and Pharmaceutical Chemistry, Bio-organic, Bio-inorganic and Bio-physical Chemistry

Dey, Ramendra Sundar (b 14.03.1983) PhD, Scientist-D, Institute of Nano Science & Technology, Mohali.

Recommended for his outstanding work on self-sustainable and low-cost energy storage and conversion systems, especially on O₂ electrocatalysis, biofuel cells, CO₂ and N₂ fixation, super capacitors and developing highly efficient catalysts for ammonia production, solving the problem of microsupercapacitors with laser-irradiated graphene.

Sectional Committee - IV : Earth & Environmental Sciences

Surface and Solid Earth Science, Applied Atmospheric Chemistry and Physics, Climate Sciences, Meteorology, Geo Engineering, Ocean Sciences, Geo Sciences and Applied Planetary Sciences

Vikram, Vishal (b 12.07.1985), PhD, Associate Professor, Department of Earth Sciences, Indian Institute of Technology Bombay, Mumbai

Vikram Vishal built geologic CO₂ storage potential map based on basin-specific know-how; formulated new protocols for pore size estimation, and developed FEM-based volume correlation model for quantification of 3D strain in rocks.

Sectional Committee - V : Engineering & Technology

Electrical Engineering, Telecommunication Engineering, Electronics and Optoelectronics, Chemical Engineering, Civil Engineering, Environmental Engineering, Mechanical Engineering, Aeronautical Engineering, Metallurgical Engineering, Computer Science and Engineering including Software and Data science, Information Science and Technology, Advanced Materials (such as Bio-materials, Hybrid Materials and Nano Materials), Polymer Science & Engineering

Tanveer, M (b 18.04.1983), PhD, Associate Professor, Optimization for Machine Learning (OPTIMAL) Research Lab, Indian Institute of Technology, Indore.

The nominee has made outstanding contributions to machine learning research by developing novel shallow and deep learning algorithms for classification, regression, and clustering problems. The developed algorithms have been implemented for the diagnosis of

Alzheimer's disease, Schizophrenia disease, Parkinson's disease, and Epilepsy.

Sectional Committee - VIII : Biomolecular, Structural Biology and Drug Discovery

Biochemistry, Biophysics, Molecular Biology, Pharmacology, Structural Biology, Bioinformatics, Computational Biology, System Biology

Panda, Jiban Jyoti (b 10.05.1982) PhD, Scientist E, Institute of Nano Science and Technology, Punjab.

Dr Panda works in the area of nanomedicine wherein her group develops biomolecular self-assembled nanostructures for therapeutic applications. Her work effectively combines a variety of tools including biochemical, biophysical, molecular and cell biological approaches for potentially treating Brain/CNS associated disorders.

Sectional Committee - IX : Health Sciences

Basic and Clinical Medical Sciences–Communicable and Non-communicable Diseases, Epidemiology, Anthropology, Psychology, Cognitive and Neurosciences, Medical Genetics and Genomics, Public Health, Nutrition, Immunology

Sharma, Tarun Kumar (b 08.09.1985) PhD, Associate Professor and Head of Medical

Biotechnology Department, Gujarat Biotechnology University, Gandhinagar, Gujarat.

Dr Sharma has been working in the field of aptamer technology, diagnostics and biosensing. He has developed a panel of aptamers that can accurately diagnose pulmonary and extrapulmonary TB, leading to several patents. In addition, he has developed an aptamer and paper-based microfluidic assay for the point-of-care detection of krait envenomation, and another assay that can differentiate the venoms of elapids (Cobra and Krait and vipers) and of vipers (Russell's and saw-scaled viper). In addition, he has been working on developing a novel biosensing strategy based on peroxidase-like activity of nanoparticles.

Sectional Committee - X : Agricultural Sciences

Agriculture, Horticulture, Forestry, Fisheries, Food Science, Veterinary Science, Pathogen Biology and Host Pathogen Interaction Both Plant and Veterinary Importance

Rai, Amit Kumar (b 20.07.1984) PhD, Scientist-D, National Agri-Food Biotechnology Institute, Mohali

Dr Rai has contributed in the area of Food Science and Biotechnology for the development of functional fermented products rich in bioactive peptides and isoflavones.

Annexure-XI

RECIPIENTS OF INSA DISTINGUISHED LECTURES-2**(for INSA Fellows only except those covered under IDL-1)****(For the year 2024)****Sectional Committee - II : Physics**

Astronomy, Astrophysics, Nuclear and High Energy Physics, Atomic, Molecular and Optical Physics, Statistical Physics, Theoretical Physics, Mathematical and Computational Physics, Condensed Matter including Soft, Liquids and Nano Materials, Cosmic Radiation, Cosmology, Space Physics, Basic Planetary Sciences, Lasers and Optoelectronics, Plasma Physics, Solar Physics, Atmospheric Physics

Gopakumar, Rajesh (b 14-12-1967), PhD, Senior Professor and Centre Director International Centre for Theoretical Sciences (ICTS-TIFR), Bengaluru.

Outstanding work on gauge string/gravity duality and quantum field theory

Sectional Committee - III : Chemistry

Analytical Chemistry, Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Theoretical and Computational Chemistry, Structural Chemistry, Chemistry of Materials, Medicinal and Pharmaceutical Chemistry, Bio-organic, Bio-inorganic and Bio-physical Chemistry

Natarajan, Srinivasan (b 27.05.1960) PhD, Solid State and Structural Chemistry Unit, Indian Institute of Science, Bengaluru.

Recommended for his outstanding and consistent contributions in the area of Inorganic Materials Chemistry, especially on the basic understanding of framework structured compounds, identifying new intermediates and pathways for the synthesis of metal-organic frameworks (MOFs), investigating the role of kinetic and thermodynamic factors in their formation, pioneering the use of MOFs for applications in metal-centered luminescence, solvent-dependent room temperature ferroelectric

behavior, heterogeneous catalysis, and as precursors for the synthesis of ceramics, work on Li-cathode battery materials, inorganic pigments, new electrocatalysts, and non-linear optical materials, and stabilization of transition metal ions in tetrahedral environments.

Sectional Committee - IV : Earth & Environmental Sciences

Surface and Solid Earth Science, Applied Atmospheric Chemistry and Physics, Climate Sciences, Meteorology, Geo Engineering, Ocean Sciences, Geo Sciences and Applied Planetary Sciences

Gupta, Harsh Kumar (b 28.06.1942), PhD, CSIR- National Geophysical Research Institute, Hyderabad.

Harsh Gupta discovered enormously thick (65-70 km) crust below the Himalaya and Tibetan plateau, and identified common characteristics of water reservoir triggered earthquake sequences, discriminated from the normal earthquake sequences.

Sectional Committee - V : Engineering & Technology

Electrical Engineering, Telecommunication Engineering, Electronics and Optoelectronics, Chemical Engineering, Civil Engineering, Environmental Engineering, Mechanical Engineering, Aeronautical Engineering, Metallurgical Engineering, Computer Science and Engineering including Software and Data science, Information Science and Technology, Advanced Materials (such as Bio-materials, Hybrid Materials and Nano Materials), Polymer Science & Engineering

Pal, Sankar Kumar (b 13.09.1950) National Science Chair, GoI Indian Statistical Institute, Kolkata.

The nominee has made fundamental

contributions to machine intelligence research by developing various modern and classical approaches. He pioneered the development of fuzzy set theory, and neuro-fuzzy and rough-fuzzy computing and their applications in pattern recognition, image/video processing, machine learning, case-based reasoning, granular computing, data mining, machine-mind development, and knowledge-based systems.

Sectional Committee - VI : General Biology

Taxonomy, Structure, Ecology, Environmental Biology, Evolution and Behaviour of Plants, Animals and Microbes including Unicellular Eukaryotes

Sharma, Eklabya (b 11.05.1958), Strategic Advisor and Distinguished Senior Fellow, Ashoka Trust for Research in Ecology and the Environment (ATREE), Bengaluru.

Dr Sharma has made highly impactful contributions to the biodiversity conservation, natural resource management, bio-geochemical cycling, climate change impact assessment leading to the development of policies for sustainable management of Himalayan ecosystem.

Sectional Committee - VII : Molecular and Cellular Biology

Cell Biology, Physiology, Development, Genetics, Genomics and other Omics of Plants, Animals and Microbes including Unicellular Eukaryotes

Vaidya, Vidita Ashok (b 15.11.1970), Professor (H), Department of Biological Sciences, Tata Institute of Fundamental Research, Mumbai.

Dr Vidita Vaidya for her path-breaking work towards understanding molecular, cellular, neurophysiological aspects of biology of anxiety and depression.

Sectional Committee - VIII : Biomolecular, Structural Biology and Drug Discovery

Biochemistry, Biophysics, Molecular Biology, Pharmacology, Structural Biology, Bioinformatics, Computational Biology, System Biology

Udgaonkar, JB (b 22.03.1960) Indian Institute of

Science Education & Research, Pune.

Professor Udgaonkar is an outstanding scientist who has contributed immensely to our knowledge on protein folding using a variety of biophysical approaches. His group has extensively characterized folding, unfolding and aggregation pathways of multiple proteins, including prion proteins and alpha-synuclein, with important implications for understanding protein misfolding-based diseases.

Sectional Committee - IX : Health Sciences

Basic and Clinical Medical Sciences–Communicable and Non-communicable Diseases, Epidemiology, Anthropology, Psychology, Cognitive and Neurosciences, Medical Genetics and Genomics, Public Health, Nutrition, Immunology

Somasundaram, Kumaravel (b 08.10.1962) PhD, Professor and Chair, Department of Microbiology and Cell Biology, Indian Institute of Science, Bengaluru.

Professor Somasundaram has made outstanding contributions to cancer genetics, particularly in relation to glioblastoma, the most common and aggressive brain tumor in adults, working in collaboration with clinicians. His work has led to identification of certain sub-types of this tumor with distinct characteristics and a better understanding of the genetic and biological mechanisms underlying the occurrence of this tumor.

Sectional Committee - X : Agricultural Sciences

Agriculture, Horticulture, Forestry, Fisheries, Food Science, Veterinary Science, Pathogen Biology and Host Pathogen Interaction Both Plant and Veterinary Importance

Lal, Rup, (b 27.09.1953), PhD, INSA Senior Scientist, University of Delhi, New Delhi.

Dr Ruplal explored physiology, genetics & Biochemistry of hexachlorocyclohexene (HCH) degradation (first to discovered associates in genes with IS6100). He is currently developing bioremediation tech for the remediation of HCH residues.

Annexure-XII

FELLOWS DECEASED

(During 2024-25)

The Academy, with great sorrow, informs of the sad demise of the following esteemed fellows during the year 2024-25:

Fellows

1. **Professor Smriti Narayan Chatterjee**, Formerly Senior Professor of Biophysics & Director, SINP, Kolkata
2. **Professor Mihir K Chaudhuri**, Advisor, Chancellor's Secretariat, Raj Bhavan, Guwahati
3. **Dr Rajagopala Chidambaram**, Chairman (Honorary), School for Advanced Studies in Nuclear Science and Technology, Bhabha Atomic Research Centre, Trombay, Mumbai
4. **Professor Rohini Madhusudan Godbole**, Centre for High Energy Physics, Indian Institute of Science, Bengaluru
5. **Professor Suraj Narayan Gupta**, Distinguished Professor of Physics, Wayne State University, Michigan, USA
6. **Professor Arun Mallojirao Jayannavar**, Senior Professor, Institute of Physics, Bhubaneswar
7. **Professor Hiriyaikkanavar Junjappa**, Research Professor, Chemistry Research Unit, Reva Institute of Science and Management, Bengaluru
8. **Professor Narayan Panicker Kochupillai**, Director, Endocrinology Metabolism & Diabetics, SRM Medical College, SRM University, Tamil Nadu
9. **Professor Anil Kumar**, INSA Emeritus Scientist, Department of Physics and NMR Research Centre, Indian Institute of Science, Bengaluru
10. **Professor Rajinder Kumar**, Department of Chemical Engineering, Indian Institute of Sciences, Bengaluru
11. **Professor Satya Priya Moulik**, INSA Emeritus Scientist, Centre for Surface Science, Department of Chemistry, Jadavpur University, Kolkata
12. **Professor Mangalore Anantha Pai**, Professor Emeritus, Department of Electrical and Computer Engg, University of Illinois, Urbana-Champaign, USA
13. **Professor Balasubrahmanyam Ramachandran**, Formerly Professor, ISI, New Delhi
14. **Professor Chandrasekharan Ramakrishnan**, Formerly Professor Molecular Biophysics Unit, Indian Institute of Science, Bengaluru
15. **Dr Borra Madhava Reddy**, Formerly Head, Radio Science Division, CSIR-NPL, New Delhi
16. **Dr Girish Sahni**, CSIR Bhatnagar Fellow, Institute of Microbial Technology, Chandigarh
17. **Dr Satinder Kumar Sikka**, Formerly Scientific Secretary, Office of the Principal Scientific Adviser to the Govt. of India
18. **Professor Mahendra Singh Sodha**, Visiting Professor in Physics and Education, Department of Education Building, Lucknow University, Lucknow

19. **Professor Sukh Dev**, Visiting Professor, Dr B.R. Ambedkar Centre for Biomedical Research of Delhi University
20. **Professor Martanda Varma Sankaran Valiathan**, National Research Professor, Manipal School of Life Sciences, Dr TMA Pai Planetarium Complex, Manipal Academy of Higher Education, Manipal
21. **Professor Kailasam Venkatesan**, Formerly Professor, Department of Organic Chemistry, Indian Institute of Science, Bengaluru
22. **Professor Mohan Ramachandra Wani**, Director, National Centre for Cell Science, University of Pune, Pune

Foreign Fellow

1. **Professor Edward Solomon Ayensu**, Chairman, Presidential Advisory Council on Science, Technology and Innovation (PACSTI), Ghana
2. **Professor Alan Baker**, Emeritus Professor of Pure Mathematics, University of Cambridge, UK
3. **Professor Cornelis De Jager**, Emeritus Professor, Space Research University of Utrecht, Molenstraat, Netherlands

Annexure-XIII

INSA DISTINGUISHED PROFESSOR

Quantum dynamics of molecular rate processes

N. Sathyamurthy, FNA

Indian Institute of Science Education and Research (IISER) Mohali

We have undertaken a quantum dynamical study of rotationally inelastic collisions between C_7N^+ , $C_{10}H^+$ and H_2 , treating them as rigid rotors under interstellar conditions (temperatures 1-100K). Ab initio computed potential energy surfaces in four dimensions were fitted using artificial neural network (ANN) methods and used as input for the scattering dynamics. The results have been published in the prestigious journal MNRAS[1].

For the $C_2^+...H_2$ collisions, some ion trap experimental results are available at low temperatures on the vibrationally inelastic process in the ground electronic state. For this system, we consider the vibrational coordinate of C_2^+ but treat H_2 as a rigid rotor. The computed five-dimensional ab initio potential energy surface is fitted using the ANN method. Quantum close-coupling calculations reveal that the theory agrees with experiment only if we consider that the vibrational inelastic process is accompanied by slight rotation in C_2^+ [2].

In another collaborative study, we have treated nonadiabatic coupling terms as frictional terms and carried out quasi-classical trajectory studies, which show that such an approach is meaningful and can reproduce experimental results wherever available for the D^+ , H_2 system.

[1] Rotationally inelastic rate coefficients for C_7N^+ and $C_{10}H^+$ anions in collision with H_2 at interstellar conditions, K. Giri, L. González-Sánchez, F. A. Gianturco, U. Lourderaj, A. Martín Santa María, S. Rana, N. Sathyamurthy, E. Yurtsever, and R. Wester, MNRAS, **534**, 1950-1962 (2024).

[2] Ro-vibrational quenching of C_2^+ in collision with H_2 , K. Giri, B. Mant, F. A. Gianturco, R. Wester, J. Franz, R. Biswas, U. Lourderaj, and N. Sathyamurthy, Phys. Rev. A **111**, 032817 (2025).

[3] Quasi-classical trajectory calculations on a two-state potential energy surface including nonadiabatic coupling terms as friction for $D^+ + H_2$ collisions, S. Mukherjee, S. Saha, S. Ghosh, S. Adhikari, N. Sathyamurthy, and M. Baer, J. Phys. Chem. A **128**, 7691-7702 (2024).

Studies on ecology and animal behaviour

Mewa Singh, FNA

Department of Studies in Psychology, University of Mysore, Mysore

Several studies were carried out, and nine research papers were published in prestigious international journals last year. Briefly, these results reveal that the endangered lion-tailed macaques are found in some new areas in the Coorg region of the Western Ghats, and that in several places, groups of this forest-dwelling arboreal species have started to interact with humans on the roadsides, which poses threats to their existence. Personality traits in bonnet macaques are related to their behaviour profiles. The bonnet macaques are occasionally observed to eat meat. The Nilgiri and Hanuman langurs are sympatric in some specific forest types in the Western Ghats. The Indian giant squirrel uses elaborate methods to remove latex before eating a jackfruit leaf. The time-activity budgets of the Nicobar long-tailed macaques have been reported for the first time. In addition, 20 talks/lectures were delivered at various national/international conferences, symposia, and workshops.

Theoretical studies in statistical physics

Deepak Dhar, FNA

International Center for Theoretical Sciences, Tata Institute of Fundamental Research, Shivakote, Hesarghatta Hobli, Bengaluru

This project is in theoretical statistical physics and condensed matter physics. Exact entropy per site of coverage of a kagome lattice by straight rigid trimers was determined. It was shown that the distribution of waiting times in biased diffusion of hard-core particles on percolation networks has a very fat tail. Layered posets were studied as a simple toy model of causal sets in causal sets. Transience and freezing were studied in a model of many sokobans and boxes on a line.

In this period, there were two journal publications, four lectures at national and international conferences, and 11 seminars at Indian universities and colleges.

Optimisation and control of wireless access networks

Anurag Kumar, FNA

Indian Institute of Science, Bengaluru

In 5G wireless networks, we have developed a new two-time-scale stochastic approximation scheduler for utility optimal scheduling with rate guarantees for bulk elastic flows. The scheduler is also loss-adaptive. Based on a constrained average cost Markov decision process (C-AC-MDP) formulation, we have developed scheduling algorithms for the joint scheduling of full-buffer elastic flows (such as TCP bulk data transfer) along with flows with packet deadlines (such as packetized voice). For Wi-Fi wireless access networks, we have been developing the ADWISER system for overlay control of multi-access Point Wi-Fi networks. We have now shown how ADWISER can be used to manage uplink UDP packet flows with tight delay requirements. We have developed

a deep learning and graph approximation-based technique for reducing the complexity of scheduling in ADWISER.

One journal paper and one conference paper have been published during this period. One journal paper is under minor revision. Two journal papers have been submitted, and two are prepared for submission. Three patents have been filed based on the work reported above.

In addition to the above scientific work, I chaired the review committee of DST's National Mission on Interdisciplinary Cyber Physical Systems, a Rs. 3600 cr. National mission, from April 2024 to November 2024.

Comprehensive clinicopathological and molecular analysis of tumors of the central nervous system.

Chitra Sarkar, FNA

All India Institute of Medical Sciences (AIIMS), Ansari Nagar, New Delhi

Central nervous system (CNS) tumors are among the most biologically aggressive malignancies, contributing significantly to cancer-related morbidity and mortality across all age groups. In the pediatric population, they represent the most common solid neoplasms, with gliomas accounting for approximately 45% of cases. Increasing evidence supports that these tumors arise through a cascade of somatic genetic and epigenetic alterations that activate oncogenes or inactivate tumor suppressor genes. These molecular events are frequently specific to tumor subtypes, offering critical insights for diagnosis, prognosis, and targeted therapeutic strategies.

Pilocytic astrocytomas (PAs) are the most frequent pediatric gliomas and are now recognized as distinct molecular entities with oncogenic drivers primarily involving activation of the MAPK signaling pathway. The most common alteration involves tandem duplications at chromosome 7q34, leading to gene fusions. We analyzed 60 formalin-fixed, paraffin-embedded (FFPE) samples using a

comprehensive NanoString nCounter CNS fusion panel to investigate the broader landscape of fusion-driven oncogenesis in PAs.

Fusion events were identified in 91% of cases. *KIAA1549-BRAF* fusions were the most prevalent (74%), with exon 16:9 (28%) and 15:9 (22%) junctions being the most common. Other variants included 16:11 and 18:10. Notably, rare fusion events were also detected, including *FGFR1-FGFR1b* internal tandem duplications (16%), *RNF130-BRAF_e3-e9*, and *YAP1-FAM118B_e7-e3* in one case each. Notably, *FGFR1* alterations were mutually exclusive with *BRAF* fusions.

Anatomical mapping of fusion events revealed that 100% of posterior fossa tumors harbored detectable fusions, predominantly *KIAA1549-BRAF_e16-e9*. In contrast, *FGFR1-FGFR1b* and *YAP1-FAM118B* fusions were restricted to tumors predominantly located in the cerebral hemispheres, linking them to supratentorial PAs and potentially more aggressive biology. Correlation with imaging morphology revealed statistically significant associations: *KIAA1549-BRAF_e16-e9* was enriched in tumors with radiologically (MRI) solid-enhancing (SE) morphology, while *KIAA1549-BRAF_e15-e9* was associated with non-cystic, non-enhancing (NCWE) tumors. *YAP1-FAM118B_e7-e3* and *RNF130-BRAF_e3-e9* were observed exclusively

in CWE and NCWE morphologies. This is the first study correlating radiological morphology with transcriptomic profiles in PAs.

The NanoString nCounter platform demonstrated high diagnostic accuracy, with a sensitivity of 97% and specificity of 100% for *BRAF* fusions. Compared to conventional methods like FISH or RT-PCR, NanoString offers a robust, scalable, and multiplexed approach that is well-suited for comprehensive molecular characterization in clinical and research settings. Its ability to identify frequent and rare fusion variants highlights its value in pediatric PAs' diagnostics and therapeutic stratification.

To conclude, this study revealed that over 70% of PAs harbored therapeutically actionable alterations, reinforcing the clinical relevance of molecular profiling for personalized therapy, including targeted therapy with MEK inhibitors.

Publication

Dandapath I, Singh J, Das S, Jangir H, Roy C, Dan Charan B, Manjunath N, Garg A, Suri A, Kedia S, Sharma MC, Khonglah Y, Ahmed S, **Sarkar C***, Suri V. Comprehensive transcriptomic profiling of fusions and abnormal variant transcripts in pilocytic astrocytoma using NanoString nCounter technology. *Pathol Res Pract*. 271: 156024, 2025.

(*Corresponding Author)

Annexure-XIV

**LIST OF INSA SENIOR SCIENTISTS AND HONORARY SCIENTISTS
(DURING 2024-25)**

Senior Scientists

1. Professor G Parthasarathy, NIAS, Indian Institute of Science Campus, Bangalore
2. Professor UC Lavania, Department of Botany, Lucknow University, Lucknow
3. Dr SR Yadav, Department of Botany, Shivaji University, Kolhapur
4. Professor Surendra Prasad, Department of Elect. Engg. IIT Delhi, Hauz Khas, New Delhi
5. Professor S L Chaplot, Physics Group, Bhabha Atomic Research Centre, Trombay, Mumbai
6. Dr Swaminathan Kailas, UM-DAE Centre for Excellence in Basic Sciences, University of Mumbai, Mumbai
7. Professor KB Sinha, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangaluru
8. Professor Gopal Krishna, UM-DAE Centre for Excellence in Basic Sciences, University of Mumbai, Mumbai
9. Professor TN Guru Row, Solid State & Structural Chemistry Unit, IISc, Bengaluru
10. Professor Sourabh D Rindani, Theoretical Physics Division, PRL, Ahmedabad
11. Professor Pijush K. Das, Indian Institute of Chemical Biology, Jadavpur, Kolkata
12. Professor RK Saxena, South Asian University, Akbar Bhawan, Chanakya Puri, New Delhi
13. Professor Naba K Mondal, ANP Division, Saha Institute of Nuclear Physics, Kolkata
14. Professor T Ramamurthy, National Institute of Colera and Enteric Disease, Beliaghata, Kolkata
15. Professor Somnath Dasgupta, Geological Studies Unit, Indian Statistical Institute, Kolkata
16. Professor Sudha Bhattacharyya, Ashka University Sonipat, Haryana
17. Professor Rajan Dighe, MRDG, Indian Institute of Science, Bangalore
18. Professor KC Gupta, Dept. of Chemistry, Univ. of Delhi, Delhi
19. Professor N Balakrishnan, Supercomputer Education and Research Centre, IISC, Bangalore
20. Professor Deevi Basavaiah, School of Chemistry, University of Hyderabad, Hyderabad
21. Professor AS Raghavendra, School of Life Science, University of Hyderabad, Hyderabad
22. Professor Bikas Chakrabarti, Saha Institute of Nuclear Physics, Kolkata
23. Professor Kanak Lata Dikshit, Dept of Biotechnology, Panjab University, Chandigarh
24. Professor Milan Kumar Sanyal, Saha Institute of Nuclear Physics, Kolkata
25. Professor Amit Basak, IISER Kolkata, Mohanpur, Nadia, West Bengal
26. Dr V Purnachandra Rao, Dept. of Civil Engineering, Vignan's University, Andhra Pradesh
27. Professor Dipankar Banerjee, Department of Materials Engineering, IISc, Bangalore

28. Professor J Padmanabhan, Physical Research Laboratory, Navrangpura, Ahmedabad
29. Professor Romesh K Kaul, Indian Institute of Science, Bangalore
30. Professor Akhil R Chakravarty, Dept. of Inorganic and Physical Chemistry, IISc, Bangalore
31. Dr Hemanta K Majumder, Indian Institute of Chemical Biology, Jadavpur, Kolkata
32. Dr Kulinder Pal Singh, IISER-Mohali, Mohali Knowledge City, Sector 81, SAS Nagar, Punjab
33. Professor Sunanda Banerjee, Indian Association for Cultivation of Science, Jaduvpur, Kolkata
34. Professor Amitava Raychaudhuri, Department of Physics, University of Calcutta, Kolkata
35. Professor MK Surappa, National Institute of Advanced Studies, IISc, Bangalore
36. Professor S. Chandrasekaran, Dept. of Organic Chemistry, IISc, Bangalore
37. Professor Surinder Mohan Sharma, Physics Division, Bhabha Atomic Research Centre, Mumbai
38. Dr Pradip Kumar Chakraborti, Dept. of Biotechnology, Panjab University, Chandigarh
39. Professor Tushar Kanti Chakraborty, Dept. of Organic Chemistry, IISc, Bangalore
40. Professor SR Gadre, Dept. of Scientific Computing, Modelling and Simulation, Savitri Phule Pune University, Pune
41. Professor S Thangavelu, Dept. of Mathematics, IISc, Bangalore
42. Professor Rup Lal, Acharya Narendra Dev College, University of Delhi, Kalkaji, New Delhi
43. Professor VA Raghunathan, Raman Research Institute, Bangalore
44. Professor K Muniyappa, Dept. of Biochemistry, Indian Institute of Science, Bangalore
45. Professor MS Sriram, Professor KV Sarma Research Foundation, Marundeesanarul, Chennai
46. Professor KN Ganeshaiah, Department of Plant Genetics and Breeding, Univ. of Agricultural Sciences, GKVK, Bengaluru
47. Professor Chanda Jayant Jog, Dept. of Physics, Indian Institute of Science, Bangalore
48. Professor Om Narain Bhargava, Geology Department, Punjab University, Chandigarh
49. Professor Maithili Sharan, Centre for Atmospheric Sciences, IIT, New Delhi
50. Professor Indranil Dasgupta, Dept of Plant Molecular Biology, University of Delhi South Campus, New Delhi
51. Professor Dinesh Kumar Srivastava, National Institute of Advanced Studies, IISc, Bangalore
52. Professor Rajender Singh Sangwan, Faculty of Life Sciences, Indira Gandhi University, Meerpur, Haryana
53. Professor Nirajan Chakraborty, National Institute of Plant Genome Research, New Delh
54. Professor HR Krishnamurthy, Department of Physics, Indian Institute of Science, Bengaluru
55. Professor Sudhakar Panda, NISER Bhubaneswar, Post Jatni, DistKhurda, Bhubaneswar
56. Professor JK Batra, ICMR-National Institute of Pathology, Safdarjung Hospital Campus, New Delhi
57. Professor Anil Grover, Dept. of Plant Molecular Biology, University of Delhi South Campus, New Delhi

58. Professor GC Anupama, Indian Institute of Astrophysics, II Block, Koramangala, Bangalore
59. Professor Uday Maitra, Department of Organic chemistry, Indian Institute of Science, Bengaluru
60. Professor Mustansir Barma, TATA Institute of Fundamental Research Hyderabad
61. Professor Harsh K Gupta, CSIR-National Geophysical Research Institute, Uppal Road, Hyderabad
62. Professor K V Rao, Centre for Plant Molecular Biology, Osmania University, Hyderabad
63. Professor A Jayakrishnan, Dept. of Chemistry, University of Kerala, Kariavattom Campus
64. Professor Talat Ahmad, Wadia Institute of Himalayan Geology, Dehradun
65. Professor Vinod Kumar, Dept. of Physiology, King George's Medical University, Lucknow
66. Professor M Sabu, KSCSTE-Malabar Botanical Garden & IPS, Calicut, Kerala
67. Professor Shyam Sundar Rai, Dept. of Earth and Climate Science, IISER, Pune
68. Professor YV Jhala, National Centre for Biological Sciences, TIFR, Bengaluru
69. Professor Anunay Samanta, School of Chemistry, University of Hyderabad, Hyderabad
70. Professor RK Shyamasundar, Dept. of CES, IIT Bombay, Powai, Mumbai
71. Professor Renee M Borges, Centre for Ecological Sciences, IISc, Bangalore
72. Professor Raghavendra Gadagkar, Centre for Ecological Sciences, IISc, Bangalore
73. Professor Chandrima Shaha, Indian Institute of Chemical Biology, Jadavpur, Kolkata
74. Professor Udaykumar Ranga, JNCASR, Jakkur, Bangalore
75. Professor Praramjit Khurana, Dept. of Plant Molecular Biology, University of Delhi South Campus, New Delhi
76. Professor Manmohan Sarin, Geosciences Division, PRL, Navrangpura, Ahmedabad
77. Professor Syamal Roy, Indian Association for the Cultivation of Science, Kolkata
78. Professor Arup Kumar Raychaudhuri, UMDAE Consortium for Scientific Research, Kolkata
79. Professor Nikhil Ranjan Pal, Indian Statistical Institute, Kolkata

Honorary Scientists

1. Professor Avinash Khare, Physics Department, Savitribai Phule Pune University, Pune
2. Professor A.N. Lahiri Majumder, Dept. of Microbiology & Biotechnology, Sister Nivedita University, Kolkata
3. Professor ML Munjal, Dept of Mechanical Engineering, Indian Institute of Science, Bangalore
4. Professor Shobhona Sharma, Dept. of Pharmaceutical Science and Technology, Institute of Chemical Technology, Mumbai
5. Professor BC Ranu, Indian Association for Cultivation of Science, Jadavpur, Kolkata
6. Professor G Marimuthu, School of Biological Sciences, Madurai Kamraj University, Madurai
7. Professor HS Balyan, Dept. of Genetic and Plant Breeding, Chaudhary Charan Singh University, Meerut
8. Professor SP Singh, Central Himalayan Environment Association (CHEA), Nainital, Uttarakhand
9. Professor Manju Bansal, Molecular Biophysics Unit, Indian Institute of Science, Bangalore

10. Professor Abhijit Sen, Institute of Plasma Research, Near Indira Bridge, Bhat, Gandhinagar
11. Professor Sudesh Kaur Khanduja, Indian Institute of Science Education & Research Mohali, Punjab
12. Professor TN Shorey, National Institute of Advanced Studies, IISc Campus, Bangalore
13. Professor SV Bhat, Department of Physics, Indian Institute of Science, Bangalore
14. Professor B Yegnanarayana, International Institute of Information Technology, Hyderabad
15. Professor SS Ramasesha, Solid State & Structural Chemistry Unit, IISc, Bengaluru
16. Professor T Subramoniam, Dept. of Zoology, University of Madras, Chennai, Tamilnadu
17. Professor Subrata Ghosh, School of Chemical Sciences, IACS, Kolkata
18. Professor Archana Bhattacharyya, Indian Institute of Geomagnetism, New Panvel, Navi Mumbai
19. Dr Durgadas P Kasbekar, Centre for DNA Fingerprinting and Diagnostics, Hyderabad
20. Professor VA Bapat, Dept. of Biotechnology, Shivaji University Kolhapur, MS
21. Professor Kailash C Upadhyaya, School of Life Sciences, Jawaharlal Nehru University, New Delhi
22. Professor M Sanjappa, Mahatma Gandhi Botanical Garden, University of Agricultural Sciences, GKVK Campus, Bengaluru
23. Professor Sushanta Dattagupta, Sister Nivedita University, Kolkata
24. Professor BLS Prakasa Rao, CR Rao AIMSCS, University of Hyderabad Campus, Hyderabad
25. Professor Somdatta Sinha, DBS, IISER Kolkata, Mohanpur, WB
26. Dr Premashish Kar, Devki Devi Foundation (Max Healthcare)
27. Professor Faizan Ahmad, Dept. of Biochemistry, School of Chemical & Life Sciences, Jamia Hamdard, Hamdard Nagar, New Delhi
28. Professor Kalidas Sen, School of Chemistry, University of Hyderabad, Gachibowli, Hyderabad
29. Professor Anil Kumar Bhatnagar, School of Physics, University of Hyderabad, Hyderabad
30. Professor RC Sobti, Dept. of Biotechnology, Punjab University, Chandigarh
31. Professor Shyam Lal, Physical Research Laboratory, Ahmedabad
32. Professor H Ila, New Chemistry Unit, JNCASR, Jakkur, Bangalore
33. Professor DC Srivastava, CSIR-CBRI, Roorkee, Uttarakhand
34. Professor Sampa Das, Dept. of Genetics, Calcutta University, Kolkata
35. Professor Swapan Kumar Datta, Dept. of Botany, Calcutta University, Kolkata
36. Professor M Palaniandavar, School of Chemistry, Bharathidasan University, Tiruchirappalli
37. Dr J Gowrishankar, School of Life Sciences, University of Hyderabad, Hyderabad
38. Professor TP Singh, Dept. of Biophysics, AIIMS, Ansari Nagar, New Delhi
39. Professor KB Sinha, Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru
40. Professor Utpal Sarkar, Dept. of Physical Sciences, IISER Kolkata
41. Professor Pinakpani Chakrabarti, Bose Institute, P1/12 CIT Scheme VIIM, Kolkata

INSA SENIOR SCIENTIST

Insights into the role of molecular chaperone ClpB1/Hsp100 in imparting heat stress tolerance in plants**Anil Grover, FNA***University of Delhi South Campus, New Delhi*

Global mean surface air temperature has increased by $\sim 0.5^{\circ}\text{C}$ in the 20th century and is projected to increase further by 1.5 to 4.5°C in the current century. Global warming has adverse effects on crop yield. Heat stress disrupts protein

homeostasis, leading to the accumulation of toxic aggregated proteins in living cells. We aim to understand how rice (*Oryza sativa* L.) and Arabidopsis (*Arabidopsis thaliana*) plants respond to heat stress at the gene expression level. Previous work has shown that ClpB1/Hsp100 (a form of core chaperone protein) is a critical component in the development of heat tolerance in plants. We wish to understand in detail the role played by the ClpB1/Hsp100 chaperone in imparting heat stress tolerance and seek the possibilities of using this gene for breeding heat stress tolerance in plants. To date, a high-resolution structure of canonical ClpB has not been determined. A recent study showed that ClpB1/Hsp100 of rice (*Oryza sativa* L.), the staple food for more than half of the world's population, has a unique heptameric organization. Our analysis is based on the cryo-EM structure of canonical rice ClpB1/Hsp100 at 4Å resolution (Fig. 1). ClpB forms a hexameric assembly for the disaggregate function in bacteria and yeast. Significantly, the ClpB1/Hsp100 structure differs from that reported for bacterial and yeast ClpB forms.

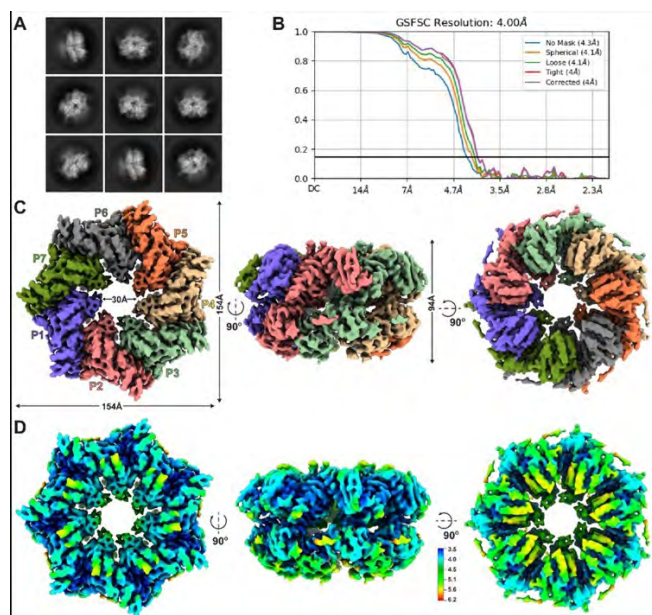


Fig. 1. Cryo-EM map of heptameric *Oryza sativa* ClpB1 (*OsClpB1*). (A) Selected 2D class averages showing the distribution of *OsClpB1* in multiple orientations (B) GSFSC curve showing the resolution of final 3D reconstruction of heptameric *OsClpB1* at 0.143 FSC cutoff. (C) The heptameric cryo-EM map of *OsClpB1* (contoured at RMSD4) is shown from the top (left), lateral (middle), and bottom (right), wherein each protomer is shown in a different color. The height and diameter of the heptameric ring and the central channel are illustrated. The map is illustrated at an RMSD value of 4.0. (D) The local resolution map of *OsClpB1* is shown from the top (left), lateral (middle), and bottom (right), estimated using Resmap

Petrogenesis of magmatic rocks from Ladakh Himalaya & Northern Indian Shield: constraints on the crustal evolutionary processes**Talat Ahmad, FNA***Wadia Institute of Himalayan Geology, Dehradun*

The Thasgam ophiolite clinopyroxenes have low Ti and Al contents and higher Mg and Ca, indicating a depleted mantle source typical of supra-subduction zone tectonic environments. The whole-rock geochemical study indicates a sub-alkaline tholeiitic nature, with enriched LILE and depleted HFSE, suggesting subduction-related geochemical magmatism. The Zircon U-Pb ages of TGC samples are 1506 ± 11 Ma, 1534 ± 26 Ma, 1675 ± 9 Ma, 1724 ± 11 Ma, 1730 ± 13 Ma, and

1960 $\pm$ 2 Ga, respectively, for the Tirodi Gneissic Complex (TGC) probably recorded the Columbia supercontinent assembly, growth, and breakup. Geochemical and geochronological results suggest that the TGC granitoids have a crustal/lithospheric origin and are formed by partial melting of felsic sources in dominantly VAG (volcanic arc granite) and, to some extents, WPG (within-plate granite) settings. The gabbroic melts could generate the TGC granitoid during 1506 $\pm$ 11 to 1730 $\pm$ 13 Ma by supplying heat and fluid flux. The zircon U-Pb ages (1534 $\pm$ 13 to 1454 $\pm$ 5 Ma) of Tirodi biotite gneiss from the northern and central domains of the CITZ are considered as the time of magmatic crystallization with two events of metamorphic recrystallization occurring at 1.57–1.56 and 1.42 Ga.

A critical analysis of climate change effects and re-emergence of leishmaniasis in India and a study on the contribution of Indian women in building scientific institutions

Chandrima Shaha, FNA

Indian Institute of Chemical Biology, Kolkata

Our studies use the *Leishmania* parasite, a unicellular organism and a challenging pathogen responsible for significant health problems worldwide. New or repurposed drugs are essential to combat leishmaniasis. Mitochondria are a drug target as their functional disruption results in cell death. Our current analysis demonstrates that multiple medicines of plant origin are used for parasites, target the mitochondria, and can potentially be used as repurposed drugs for leishmaniasis. Using a search strategy with two electronic databases, PubMed and Google Scholar, from 1985 to 2024, we identified 1718 results for 'plants' and 'mitochondria'. Subsequent analysis on a more granular scale identified artemisinin and chloroquine, two anti-malarial drugs that affect mitochondria, showing strong anti-leishmanial effectiveness. Quinolones, coumarins, and quercetin are additional compounds with leishmanicidal

properties that disrupt mitochondrial activity to eliminate parasites in animal models of the disease effectively. The evaluation is published (Shaha, C. Expert Reviews in Molecular Medicine, 27, e15, 1–15 (2025). <https://doi.org/10.1017/erm.2025.8>). For the other part of the project, a study into the creation of the Adyar Cancer Institute in Chennai has been carried out, and a chapter on how the Institute was built from scratch by Dr.Muthulakshmi Reddy is complete. The other chapters are in preparation.

Chemistry route to the synthesis of unusual Amino acids, peptides, triazole-fused heterocycles, and pseudodisaccharides

S Chandrasekaran, FNA

Indian Institute of Science, Bangalore

Conjugation of different molecular species using copper(I)-catalyzed click reaction between azides and terminal alkynes is among the best methods to prepare multifunctional compounds. The effectiveness of this method has provided wider acceptance to the concept of click chemistry, which is now widely employed to synthesize densely functionalized organic molecules. This report summarizes the contributions of our group in developing new methods for synthesizing functional molecules using copper(I)-catalyzed click reactions. We have developed efficient methods for synthesizing peptides and amino acids conjugated with carbohydrates, thymidine, and ferrocene. We have also developed an efficient strategy to synthesize triazole-fused heterocycles from primary amines, amino alcohols, and diols. Additionally, an interesting method for synthesizing pseudo disaccharides linked through triazoles, starting from carbohydrate-derived donor-acceptor cyclopropanes, has also been achieved. Further work is in progress. Twenty lectures (online/offline) were delivered in postgraduate colleges/universities nationwide on current and general interest topics. Delivered the Foundation Day lecture at IISER, Tirupati, and invited lectures at IIT Madras and the

University of Madras last year. The preparation of a perspective article on the topic- “Evolution of Organic Chemistry Research in India: A Glorious Past, A Vibrant Present, and A Promising Future” is still being pursued.

Characterization of anthropogenic seismic activity globally with special reference to Reservoir Triggered Seismicity (RTS) and its genesis at Koyna, India

Harsh K Gupta, FNA
CSIR-NGRI, Hyderabad

A significant effort from 1st April 2024 through 31st March 2025 has been preparing the manuscript of the book *Artificial Water Reservoir Triggered Seismicity -Focus on Koyna, India*. Springer shall publish this ~ 250-page book. The synopsis of the book is as follows: The creation of artificial water reservoirs that could trigger earthquakes was established for the first time by Dr D. S. Carder in 1945. He had studied earthquakes occurring in the vicinity of Hoover Dam on the Colorado River in the USA. He inferred that a correlation existed between the impoundment of the Hoover Dam and enhanced seismicity observed in the vicinity of Lake Mead, including the occurrence of magnitude five earthquakes on 4 May and 13 June 1939. Over the years, artificial water reservoir-triggered earthquakes have been reported globally. There are at least five sites where earthquakes exceeding magnitude six have occurred. The book shall provide an up-to-date account of sites where triggered earthquakes of magnitude four and above have occurred and discuss earthquakes of magnitude six and above. This book will also discuss how the RTS sequences are different from normal earthquakes, the RTS mechanism, and related issues. In 1972, it was established that RTS sequences differ from standard earthquake sequences. As the characteristics of RTS earthquake sequences differed substantially from the standard earthquake sequences, it was inferred that the filling of an artificial water reservoir affects the mechanical properties of the shallow

crust hosting the triggered earthquakes. The book also presents the unique experiments and studies carried out during the past 15 years at Koyna, India, for near-field studies of earthquake nucleation. Additionally, an editorial, “20 Years after the Great Tsunami”, and an autobiography entitled “Not A Day Different, My Life in Earth Sciences,” were published by Springer in 2024.

Publications

1. Gupta, H. K. (2024). “20 Years after the Great Tsunami”, Editorial, J-Geological Society of India, 100, 1467-1650.
2. Gupta, H. K. (2024). Not a Day Different, My Life in Earth Science. Springer, ISBN:2365-0621 (electronic), ISBN:978-3-63561-8 (eBook)
3. Gupta, H. K. (2025). Artificial Water Reservoir Triggered Seismicity -Focus on Koyna, India (manuscript of the book under preparation to be published by Springer in 2025).

Use of virus-inducible promoter of SLCMV to generate CRISPR-Cas mediated virus resistance in *Nicotiana benthamiana*

Indranil Dasgupta, FNA
University of Delhi South Campus, New Delhi

The current research aims to use a variant of CRISPR-Cas gene editing technology to make plants resistant to virus attacks. The model plant *Nicotiana benthamiana* and Sri Lankan cassava mosaic virus (SLCMV), a DNA virus infecting the cassava plant (*Manihot esculenta*) under natural conditions, are being used in this project. The novelty of this CRISPR-Cas system is that it has been designed to be activated by virus infection, using a virus-derived promoter element, IR1, thereby reducing the possibility of generating “editing-resistant” variants of viruses in plants. During the current period, to check the *planta* inducibility of IR1, transgenic *N. benthamiana* was generated, wherein the reporter gene “RUBY” (betalain, He et al., 2020, Horticulture Research, 7: 152, <https://doi.org/10.1038/s41438-020-00390-1>), was placed under the control of IR1. The expression levels of RUBY

were assessed following the inoculation of plants with SLCMV, one of the proteins responsible for activation, AC2, or some of its mutants. Expression of RUBY gives rise to a bright red pigment in the tissues, enabling simple visual assessment. Results indicated that, while the transgenic plants showed no expression of RUBY in the absence of SLCMV or its genes, its expression was stimulated about 8-fold following inoculation with AC2 and also significantly upon SLCMV infection. IR1 element was induced not only by infection of SLCMV but also by related viruses. These results reinforced the hypothesis that the IR1-driven CRISPR-Cas gene editing system is promising as a novel approach to generating virus-resistant crops.

To develop comprehensive geodynamic models of evolution of the Eastern Ghats Belt, the Dharwar craton, and the history of the early earth and supercontinental cycles

Somnath Dasgupta, FNA

Indian Statistical Institute, Kolkata

The contact between the Archean Bastar craton (BC) and Proterozoic Eastern Ghats Province (EGP), central India, is marked by a suture zone termed the Terrane Boundary Shear Zone (TBSZ). BC in this area is primarily composed of hornblende-biotite granite with some mafic dykes. Rocks in the TBSZ include quartzofeldspathic (leptynite) gneiss, garnet orthopyroxene-bearing granitoid, mafic granulites (Group A of cratonic affinity, and Group B of EGP affinity), Mg-Al granulite and an isolated exposure of orthopyroxene-bearing gneiss. Detailed geochemical analysis shows a remarkable similarity between Hbl-Bt granite and Grt-Opx-bearing granitoid, with A-type affinity, and between mafic dykes and Group A mafic granulites. However, the Opx-bearing gneiss is geochemically distinct and has an I-type affinity, similar to TTG gneisses described from BC. Metamorphic phase equilibria analysis and trace element modeling show that (i) melting of Opx-bearing gneiss would produce a ferroan granitic melt resembling the Hbl-Bt granite, (ii)

metamorphism at appropriate P-T conditions would convert the granite to Grt-Opx-bearing granitoid and the mafic dyke to Group A mafic granulite. U-Pb geochronology of zircon constrains emplacement ages of the magmatic precursors of Opx-bearing gneiss and Grt-Opx-bearing granitoid as ca. 2.73 and ca. 2.5 Ga, respectively. These rocks were subjected to an early granulite facies metamorphism, followed by an amphibolite facies metamorphism, shearing, and hydrous fluid flux. Geochronological data shows that the latter event occurred at ca. 0.52 Ga, while the earlier granulite facies event can only be tentatively suggested as the late Stenian/Tonian age. Collating all the evidence (including published geophysical and geochronological data), we recommend that the initial collision between BC and EGP took place during late Stenian/Tonian time as a consequence of the formation of the Greater Indian Landmass, a part of the Rodinia supercontinent. The TBSZ, probably initiated due to the late Stenian/Tonian collision, was reactivated and reworked tectonothermally at ca. 0.52 Ga, caused by the far field stress effect of the Kuunga orogeny, which was strong enough to obliterate most of the imprints of the late Stenian/Tonian orogeny.

Authigenesis of marine clay deposits: This is a new line of investigation initiated last year. The effort has already produced one major publication in an international medium, and the training of one student for a Ph.D. is in progress. The study demonstrated the coexistence of glauconitic mica and ferric illite (authigenic and forming on quartz and K-feldspar substrates) in one sandstone unit from the Proterozoic Chhattisgarh basin. Their coexistence has been explained as due to fluctuating redox conditions and induced marine transgression/regression cycles. This study has additionally thermodynamically computed phase equilibria involving the formation of the green clay minerals due to reverse weathering.

Dissection of abiotic stress-responsive proteins in rice and evolution of Riceorganelle protein atlas

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Water deficit stress or dehydration limits plant growth and development, affecting crop productivity more than other environmental risk factors. It is the most crucial ecological threat to crop yield losses, restricting sustainable agriculture. Consequently, during the past decade, water deficit stress or dehydration has received much focus from the research community because the most prevalent stresses affect water status in common. It is important to note that one of the determining components that decide the impact of dehydration on crop productivity, besides photosynthesis, is its effect on mitochondrial respiration. Rice, unlike other cereals, thrives on inundated soil, with over 50% of global rice-producing regions being rainfed, and is thus hypersensitive to dehydration stress. It has the lowest water use efficiency of all cereal crops. Owing to highly conductive cuticles, the water permeability of rice is high, resulting in high transpiration rates and making irrigation a prerequisite throughout its life cycle. The consequence of water deficit conditions, especially during key stages in the growth cycle, constrains rice production with severe economic implications. We initiated the present study by looking at the physiological reactions of rice seedlings to dehydration, such as changes in metabolism and adjustments to protein markers related to mitochondrial dynamics. We specifically focused on how cells respond to dehydration by stimulating their mitochondria and antioxidant defense system. Functional screening of the mitochondrial proteome of rice led to the identification of a novel protein harboring a domain of unknown function (DUF), hereafter designated OsDUF2488, amongst an array of differentially regulated proteins. We demonstrated that OsDUF2488 predominantly expresses under dehydration and oxidative stress. Significantly, overexpression of OsDUF2488 in dehydration-sensitive IR64 background could

maintain an appropriate redox homeostasis and promote stress resiliency to dehydration. Overexpression of OsDUF2488 under a stress-inducible RD29A promoter was able to drive its dehydration-induced expression. Plants generally develop dehydration resiliency through avoidance, tolerance, and recovery. While dehydration avoidance is achieved by reducing water loss, the tolerance mechanism is orchestrated by adjustment of osmotic and antioxidant capacities. The OsDUF2488 OE plants exhibited enhanced tolerance with improved antioxidant capacity. We demonstrated that OsDUF2488 interacts with a redox protein, OsPrx1.1, critical for regulating plant adaptive responses. Interestingly, when exposed to dehydration, the transcripts of both OsDUF2488 and OsPrx1.1 were increased severalfold in OsDUF2488-OE plants, suggesting that OsDUF2488 might act as a positive regulator of OsPrx1.1. The transcript abundance of several ROS catabolizing enzymes, viz., APX, catalase, and SOD, was also induced by OsDUF2488 expression. Our findings indicate that OsDUF2488 is highly promising for engineering improved stress tolerance in crops, in general, and rice, in particular.

Synthetic studies toward the total synthesis of scabrolide A

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Scabrolide A, a C₁₉ diterpene, contains a highly congested [5-6-7] carbocyclic scaffold decorated with intricate oxygenation patterns. It has six stereocenters, five of which are contiguously present on the central part of the molecule. Additionally, the presence of a synthetically challenging cycloheptanone ring comprising a dissonant 1,4-relationship with the cyclohexenone



ring ketone and remote stereocenter in the form of an isopropenyl substituent has reinforced the complexity of the molecule. A concise synthetic method was required to be developed for further biological evaluation.

As part of our ongoing interest in the total synthesis of bioactive natural products with unusual and challenging structural features, we sought to synthesize scabrolide A, getting inspired by the structural complexity of the molecule and its promising biological activities. In this work, we report a concise route to the [5-5-6] fused tricyclic core of scabrolide A and our efforts toward constructing the fourth cycloheptane ring of the molecule via a 7-*endo-trig* radical cyclization.

The [5-5-6] fused tricyclic cyclohexenone core was assembled using a Ti(III)-mediated radical cyclization protocol, earlier developed by us, as a key step and subsequently a ring-closing metathesis (RCM) reaction followed by oxidation and concomitant isomerization of the double bond furnished the tricycle. To construct the fourth seven-membered ring of the target molecule, a 7-*endo-trig* radical cyclization method was successfully developed and applied to build model [6-7]-fused bicyclic substrates with the seven-membered ring in one of them carrying an isopropenyl substituent as present in the target molecule. However, our initial attempts to attach the isopropenyl-containing sidechain onto the [5-5-6] fused tricyclic core failed to deliver the requisite precursor for the final ring-closing reaction. Difficulties associated with coupling two chiral fragments for an all-carbon skeleton of scabrolide A to build the final seven-membered ring can be resolved by revising our synthetic strategy. Further work is currently in progress. In summary, the promising results achieved so far have the potential implication for synthesizing similar tricyclic cores of many other congeners within this family of furanobutenolide-derived polycyclic cembranoids and norcembranoids.

Reference

1. Begum, S.; Chakraborty, T. K. *J. Org. Chem.* **2025**, 90, 5614-5631 (<https://doi.org/10.1021/acs.joc.5c00298>)

Mycobacterium smegmatis putative Holliday junction resolvases RuvC and RuvX play complementary roles in the processing of branched DNA structures

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Homologous recombination (HR) is a fundamental process associated with all organisms, from humans to viruses. To complete HR, a structure-specific endonuclease is required to bind and cleave a four-way branched DNA species, also known as Holliday junction (HJ), that occurs as an intermediate in HR. In eubacteria, Holliday junction resolvases (HJRs) are crucial for faithful segregation of newly replicated chromosomes, homologous recombination, and repair of stalled/collapsed DNA replication forks. However, compared with the *Escherichia coli* HJRs, little is known about their orthologs in mycobacterial species. A genome-wide analysis of *Mycobacterium smegmatis* identified two genes encoding putative HJRs, namely RuvC (MsRuvC) and RuvX (MsRuvX), but whether they play redundant, overlapping, or distinct roles remains unknown. Here, we reveal that MsRuvC exists as a homodimer while MsRuvX is a monomer in solution, and both showed a high-binding affinity for branched DNAs compared with unbranched DNA species. Interestingly, the DNA cleavage specificities of MsRuvC and MsRuvX were found to be mutually exclusive: the former efficiently promotes HJ resolution in a manner analogous to the *Escherichia coli* RuvC but does not cleave other branched DNA species, whereas the latter is a versatile DNase capable of cleaving a variety of branched DNA structures, including 3' and 5' flap DNA, splayed-arm DNA and dsDNA with 3' and 5' overhangs but lacks the HJ resolution activity. Point mutations in the RNase H-like domains of MsRuvC and MsRuvX pinpointed critical residues required for their DNA cleavage activities. Also, they demonstrated uncoupling between DNA-binding and DNA cleavage activities. Unexpectedly, we found robust evidence that MsRuvX possesses a double-strand/single-

strand junction-specific endonuclease and ssDNA exonucleolytic activities. Combined, our findings highlight that the RuvC and RuvX DNases play distinct complementary, and not redundant, roles in the processing of branched DNA structures in *M. smegmatis*.

Reference

1. Agarwal, A. & Muniyappa, K (2024) *J. Biol. Chem.* 300, 107732. doi: 10.1016/j.jbc.2024.107732

Comparative study of geo-and isotope chemistry of sediments in rivers of the east and west coast of India

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Mineralogy and major, trace, and rare earth element chemistry of recent sediments from the rivers along the west coast of India: The sediments of 90 rivers from five states along the west coast of India were analyzed for their mineralogy, primary, trace, and rare earth element chemistry to understand better the impact of weathering and source rocks on their distribution. The sediments from the Archean-Proterozoic (A-P) terrain are dominated by kaolinite, with minor illite and gibbsite and traces of goethite, and those from the Deccan Trap (DT) terrain are dominated by smectite with minor illite, kaolinite and chlorite. The sediments are depleted of Si, Ca, Mg, Na, and K relative to the Post-Archean average Australian Shale (PAAS). The primary element ratios of sediments suggest lateritic soils in Kerala, lateritic soils admixed with particulates weathered from Fe-Mn ores in Karnataka and Goa, and non-lateritic, chemically weathered soils in Maharashtra and Gujarat. The sediments from the A-P terrain are strongly weathered, while those from the DT terrain are intermediate to strongly weathered. The total trace element content ($\sum TE$) was higher in the silt fractions than in the clay fractions of all sediments, and peaks of high $\sum TE$ occurred in the silt fractions of Kerala and Maharashtra. The silt fractions exhibit relatively high Th, U, La, Zr, and Hf from A-P terrain and high Sc, Cr, Co, Ni, V, and

Ga from the DT terrain.

The Th/U and Rb/Sr ratios are controlled by the intensity of weathering and lithology of source rocks. On the other hand, the mean total rare earth element content ($\sum REE$) of sediments from the rivers of Kerala is much higher than that of different states. $\sum REE$ shows a strong positive correlation with oxides of Fe, Mn, and P from A-P terrain and Al, Fe, and Ti from DT terrain and a strong positive correlation with heavy metals (Zr, U, Hf, and Th) from both terrains. The low Sm/Nd and Y/Ho ratios corresponding to high chemical index of alteration (CIA) and high ratios corresponding to high and low CIA are typical. The PAAS-normalized REE shows LREE- and MREE-enriched patterns in the Kerala and MREE- and HREE-enriched patterns in other sediments. A distinct positive Ce anomaly occurs in the sediments of Karnataka, Goa, and south Maharashtra, and a weak positive to weak negative Ce anomaly occurs in the sediments of other states. The Eu anomaly is negative in the silts of south Kerala and positive in all other sediments. The primary sources for REEs are adsorbed onto secondary mineral phases, clay minerals, and heavy minerals. The change in REE patterns is primarily related to the source rock composition. Fractionation of REEs is associated with the intensity of chemical weathering, supply of REE, and transport processes. The studies further reveal that the average trace and REE composition of river sediments from peninsular India is more mafic than in upper continental crust (UCC) and World Rivers Average Clay. Since the mafic component-dominated clays are transported to the adjacent seas and oceans, it would be a challenge to identify the provenance of clays from granitic terrain in the oceans using trace element chemistry.

Cyber security and critical technologies: Challenges, role of fairness and ethics

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Towards challenges in blockchain security robustness conditions for XRPL (Ripple Consensus) was established. This was done using a notion of similarity metric called rand-index (RI), which is used for cluster analysis of networks. It was established that XRPL with 80% quorum (as per the XRPL original specifications) and UNLs satisfying 50% RI similarity is robust against 20% failures; i.e., the network will accept no fraudulent transactions. Further, it was shown that the network satisfies consensus correctness if the UNLs of the network are more than 50% RI similar, which would imply at least 80% quorum across all the UNLs. A language-based framework called SolidityD was proposed to build robust smart contracts. We demonstrated that SolidityD can be automatically transformed to pure Solidity, thus enabling effective debugging at the source level rather than at the byte or EVM level. Another important outcome of using SolidityD is that it can effectively assert coarse-grained declarations' coarse-grained properties. Such a feature leads to gaining trust in the usage of smart contracts. We are working on issues related to the problem of regulating MEV (maximum extractable value) in Decentralized Finance (DeFi). We have shown that the existing approaches have limitations and fall short of expectations due to the environment in which DeFi operates. We argue that mitigating MEV corresponds to the challenges of preserving information privacy and information disclosure and, thus, needs a practical regulatory approach with a good forensics methodology to instill confidence in DeFi.

Organized: ICISS 2024 (published as LNCS volume from Springer Nature) and organized a National Hackathon jointly with Ripple Inc. USA on FinTech Applications.

Using genomics to understand ancient demography, bottlenecks, and genetic load and to use this information to mitigate inbreeding depression in the last Asiatic lions

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1. Using Genomics to Understand Ancient Demography, Bottlenecks, Genetic Load, and to use this Information to Mitigate Inbreeding Depression in the last Asiatic lions: In collaboration with Dr Uma Ramkrishnan at NCBS, we have secured and sequenced lion samples from across their historic range (Asia, and Africa). Collaborations have been established with the Smithsonian Institution which had a large repository of Indian lion samples collected in the 1980's from Saurashtra. From our own sequences as well as published sequences we now have over 200 lion sequences that are ready for analyses.

2. Ecology and Demography of Large Carnivores (Tigers, Leopards, and Dhole) and their Correlates. One PhD's has been awarded and one submitted from this work during the current time period. Publications are in various stages of peer review.

Academics & Training: Four International Workshops in Nepal, Namibia, and India have been conducted on Population Viability Analyses of tigers in Nepal, Snow leopard research and conservation, Recent Advances in Conservation Genetics Course (CONGEN 2025), and one National workshop on future needs for wildlife management have been conducted.

Two PhD's have been awarded. Six Publications in International Peer Reviewed Journals including cover article in Science and Conservation Biology have been published.

Computational electromagnetics and information security

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The explanations of why and how the black-box algorithms used in detecting attacks make decisions come under explainable AI. Our study [1] delves into the prospect of formulating concepts to elucidate the identification of attacks. These concepts are articulated concerning the merger of features. In this paper, a novel method for uncovering concepts by combining features obtained from explainable AI techniques, specifically SHAP and CIU, has been proposed. A method for validating the concepts using TCAV is also proposed. This is used to prove that the concepts are valid to explain the identification of specific attacks. Various experiments conducted on the KDD Cup 1999 dataset yield consistent results. It is feasible to depict attacks using diverse concepts, and some concepts accurately portray the specified attacks. Examining the TCAV outcomes indicates that representing attacks is achievable through concepts comprising various feature combinations. One of the parameters applicable to detect low-observable stealth targets, specifically aircraft, is monitoring the Radar Cross Section (RCS) enhancement in the medium surrounding the plane due to the wake vortex generated during the flight. The acoustic wave induced by the wake vortex creates dielectric constant fluctuations because of compressions and rarefactions in the propagating medium. The subject matter of this work [2] is to develop a method to predict RCS in the presence of a wake vortex rigorously. First, the solution of flow over an aircraft is obtained. The permittivity of the medium is computed using flow parameters, providing the coupling term between the electromagnetic and acoustic phenomenon. Then, Electromagnetic (EM) scattering from the inhomogeneity due to the flow in the vicinity of the aircraft and its wake region is computed for an incident plane wave in lateral and longitudinal directions. The scattering problem is solved using Integral Equation (IE). The scattered far-field is

interpreted using the conventional radar equation, and the enhancement in RCS and detectability are presented. It is believed that this is the first time that an IE method has been used to study the EM scattering problem from an aerodynamic flow and its detectability. It is shown in this paper that the presence of a wake vortex can enhance the detectable range by around 2 km at 250 MHz, giving an early warning advantage of around 15 seconds.

References

1. Rejimol Robinson R.R., Prasad R.R., Thomas C. and Balakrishnan N., "Validating network attack concepts: A TCAV-driven approach," *Journal of Computer Virology and Hacking Techniques*, (2024) 20:841-855 <https://doi.org/10.1007/s11416-024-00535-z>.
2. Padhy, V.P., Gope D., Rao S.M. and N. Balakrishnan, "Towards the Detection of Low-Observable Flying Object in the Presence of Wake Vortex Flow," in *IEEE Journal on Multiscale and Multiphysics Computational Techniques*, vol. 9, pp. 383-392, 2024, <https://doi.org/10.1109/JMMCT.2024.3454451>

Resourcing polyploidy for realization of heterosis with special emphasis on riploidy

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Development of a perennial, cold tolerant, Linalool-rich synthetic amphidiploid of Basil (*Ocimum basilicum* x *kilimandscharicum*): The basil (*O. basilicum*), with its great flavour and pleasant aroma, accounts for its essential oil rich in phenyl propanoids, mainly eugenol, methyleugenol, methyl chavicol, and linalool, is a much sought-after plant species in the genus. Its dried leaves and essential oil are in great demand owing to their extensive use in pharmaceutical and perfumery industries, herbal tea, mouth wash, bathing, etc. Whereas this plant was grown in India for many centuries, its cultivation could not be extended owing to fluctuating markets and lack of improved varieties. Although a crop of great economic importance, it is very susceptible and grows well, mainly in dry and hot environments. The synthesized inter-specific amphidiploids

hybrid *Ocimum basilicum* × *kilimandscharicum* is seed fertile endowed with perennial growth habit and cold tolerance, and as such, promises its cultivation in plains for Linalool-rich essential oil, befitting aromatic plant-based cropping systems. The improved variety holds the production potential of fresh herb yield of 460q/ha and essential oil yield of 177 lit./ha containing- 57-65% (-) linalool content. Besides, its leaves contain medicinally valued micro-metabolites: Rutin=0.034 mg and Gallic acid=0.125mg/g fresh weight. This variety of basil has been developed through intensive interspecific hybridization and polyploidy breeding. The variety promises high remunerative returns to growers and industries alike. Strategically, the utility of this interspecific hybrid fits well in the existing cropping system of the farmers cultivating other related crops.

This variety, christened as “CIM-Saraswati,” was released at CSIR-CIMAP, Lucknow, on the occasion of CSIR-CIMAP Kisan Mela on 31-01-2025

Characteristics of the Linalool rich variety of Basil and its pedigree of development

Attributes	Parameters
Growth habit	Tall Bushy
Days to 1st harvest after transplanting 100 days	2-3 cuttings, 60-70days
Days to flower (50 %)	120-125
Plant height (cm)	125-128
Colour of leaf	Dark green
Leaf surface	Undulated
Flower size	1.5 X
Peduncle	compact
Length of lamina (cm)	5.0-7.5
Width of lamina (cm)	3.0-5.0
Fresh herb yield (ql/ha)	460
Mean oil content in fresh herb (%)	0.40
*Bulk distillation	
Mean potential oil yield (lit./ha)*	177
Superiority over check (%)	~ 50
(-) Linalool content (%)	57-65
Mean camphor content (%)	8.00-8.52



Photoactive metal-based PDT agents

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Based on the objectives to design new metal-based anticancer agents, different red light active boron-dipyrromethene (BODIPY) dyes and their metal complexes were designed and prepared as photosensitizers and cellular organelle targeting agents for selective damage to the cancer cells over normal cells. Photo-/redox-responsive cobalt(III) prodrug chaperones were developed as new anticancer photodynamic therapy (PDT) agents for efficient cellular delivery of the BODIPY dyes

(*Inorg. Chem.*, **2024**, 63, 6822–6835, Impact Factor: 4.3). The complex displayed in vitro release of BODIPY on red light irradiation. It gave good singlet oxygen quantum yield and demonstrated sub-micromolar photocytotoxicity to HeLa cancer cells while being less toxic to HPL1D normal cells in red light. Cellular imaging showed mitochondrial localization and significant penetration into the HeLa tumor spheroids. The prodrug conjugates exemplified a new type of phototherapeutic agent with better efficacy than the organic dyes alone in the phototherapeutic window. Using the principle of “**Magic Bullet**,” a cisplatin-derived heterobimetallic **Pt(IV)–Ru(II)** complex, having two axial ligands, namely, biotin as water-soluble B-vitamin for enhanced cellular uptake and a BODIPY–ruthenium(II) photosensitizer was developed as a “**Platin Bullet**” for targeted PDT activity (*Inorg. Chem.*, **2024**, 63, 17249–17262, IF: 4.3). The complex on light activation generated singlet oxygen giving a high quantum yield of ≈ 0.64 and excellent PDT activity. A monofunctional “**Platin-BODIPY Bullet**” having a red-light active PEGylated distyryl BODIPY–terpyridine moiety is developed for mitochondria-targeted Chemo-PDT activity (*Chemistry Select*, **2025**, 10, e202404848, IF: 1.9). Due acknowledgement has been made to INSA for the Senior Scientist Fellowship in the publications.

The influence of amino acid polymorphism at specific positions of Tat on the ON/OFF decision-making of HIV-1 transcriptional silence

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Once infected, HIV-1 cannot be cured since the virus can establish a stable and silent latent reservoir. The genetic variation of Tat, the most crucial viral factor that regulates viral transcription, may significantly influence the stability properties of the latent reservoir. Earlier studies from our laboratory indicated that the identity of amino acid residue at position 47 of Tat can profoundly

influence latency kinetics. The study aimed to investigate the functional role of Tyr47 of Tat in regulating viral latency. To define the role of Tyr47 in sustaining viral gene expression, targeted amino acid substitutions were introduced at position 47 in various Tat constructs. These were tested in Jurkat and Sup-T1 T-cell models using a dual-reporter system with destabilized GFP under the HIV-1 LTR to monitor gene expression. Latency kinetics were compared, and transactivation capacity was assessed via reactivation assays. Structural modeling and assays in primary CD4⁺ T cells were used to validate the findings across different genetic contexts. Substitutions of Tyr47 with histidine (H), phenylalanine (F), tryptophan (W), aspartic acid (D), or alanine (A) consistently promoted rapid latency without affecting reactivation, indicating that Tyr47 is crucial for maintaining prolonged transcription. Structural models suggest that Tyr47 lies at the interface of the Tat:P-TEFb complex, potentially forming hydrogen bonds with Cyclin T1, and may also be a phosphorylation target of Src family kinases like Lck, facilitating interaction with cofactors such as PCAF. Its absence likely impairs these interactions, reducing Tat's ability to sustain transcription. This study is the first to demonstrate that Tyr47 is essential for maintaining active HIV-1 transcription and that its substitution drives rapid latency establishment.

Nuclear science and applications

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Continued collaboration with BARC colleagues on research related to frontier areas of nuclear physics. The primary focus was understanding heavy ion-induced atomic fusion using the Stelson model.

Lectures: (1) Special lecture for Teachers Day at Homi Bhabha National Institute Mumbai (2) Indian physics association DAE Sir CV Raman lecture. (2) Nuclear Radiation Science, Technology, and

Society, Vivekananda college of arts, science and commerce. Mumbai

Pub: S. Appannababu, V. V. Parkar, V. Jha and S. Kailas (2024). Stelston model for fusion of ^9Be on ^{169}Tm , ^{181}Ta , ^{187}Re , and ^{197}Au , *Eur. Physics Journal A*. 106,054612

Abiotic stress tolerance in plants

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Environmental factors and endogenous cues influence plant growth and development. Abiotic stresses impose a significant limitation on crop productivity. Climate change is the main reason for the different abiotic and biotic stresses faced by crops in agriculture and adversely affecting crop productivity. Advances in plant genomics are assisting various adaptive strategies such as physiological, biochemical, and molecular mechanisms to cope with harsh environmental conditions. The discovery of novel genes, the determination of their expression pattern in response to abiotic stress, and an improved understanding of their roles in stress adaptation (obtained by functional genomics) will provide the basis for effective engineering strategies leading to greater stress tolerance and management in agriculture. Thus, with the advent of genomics, a new era of plant sciences is beginning, which helps not only in gene discovery and functional analysis of novel genes but also in mining efficient alleles for introgression in desired plants for crop improvement and generation of agriproduct diversification.

Wheat is a temperate crop and is prone to various abiotic stresses. Tolerance to heat stress is a complex phenomenon controlled by multiple genes. Heat tolerance-related gene transcripts were identified based on their putative functions and validated by cDNA macroarray and northern/RT-PCR analysis in wheat. A typical response to high-temperature stress is the synthesis of Heat Shock Proteins (HSPs). HSP encoding genes

are found to be under the control of Heat Shock Factors (HSF), transcription factors that regulate the expression of HSP genes. Plant heat stress also disrupts protein folding, increasing the accumulation of misfolded proteins. Plants rely on chaperone proteins like Hsp90 and Hsp70 to maintain cellular homeostasis, which assists in proper protein folding. Characterization of gene structure and regulatory motifs of wheat Universal Stress Proteins (TaUSPs), followed by functional validation under diverse stress conditions (heat, cold, drought, and salt stress), has excellent potential. The coordination between chaperone Hsp90 and co-chaperone Hsp70 is further assisted via other co-chaperones like Hsp40 and Hops (Hsp90-Hsp70 organizing) proteins. Hops is a highly conserved class of proteins, and Hops homologues in yeast are known as STI (stress-induced) proteins. We have characterized the TaSTI proteins and the *TaSTI* promoter under normal and abiotic stress conditions. Our findings reveal key stress-responsive elements (HSE, STRE, CCAAT boxes) in the TaSTI promoter, highlighting its role in basal and heat-induced expression. Using a yeast-two-hybrid library, we found TaSTI interacting proteins. This work lays the foundation for exploring the functional roles of these proteins in the mechanisms of stress responses.

Therapeutic approaches in rare genetic diseases

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Ashoka University, Sonipat

I have been involved in initiating a natural history study, along with ongoing efforts to find therapies for neuromuscular diseases, notably GNE myopathy. I am working in collaboration with scientists and clinicians with the required expertise. Broadly, the work is in the following areas.

- 1) Development of mRNA-based therapy for GNE myopathy. This is being done at the Tata Institute for Genetics and Society (TIGS), Bengaluru. The expression of GNE mRNA has been optimized and will be tested in a cell-line model of

GNE myopathy. The delivery of mRNA to muscles using muscle-targeting lipid nanoparticles is being tested on mice. Simultaneously, another project is being carried out with Dr. Munia Ganguli, IGIB, New Delhi, to develop non-viral delivery methods for nucleic acids. A PBAE polymer-based method has been developed and successfully used to deliver GNE DNA to the cell line model. It will now be tested in mice.

2) Development of autophagy-inducing molecules as possible drugs for GNE myopathy. It has been shown that autophagy is defective in GNE myopathy, possibly hindering myoblasts' differentiation to myotubes. Small molecules that modulate autophagy may thus be promising drug candidates. For this study, a cellular model for GNE myopathy is being developed at TIGS by introducing GNE mutations in human iPSC cells using a CRISPR-based approach. The cell-line model will be used to test autophagy inducers by Dr. Ravi Manjithaya at the Indian Institute of Science, Bengaluru. Their focus is mainly on Urolithin A, a mitophagy inducer, obtained from fruits like pomegranate and certain berries. Urolithin A is non-toxic and is already consumed as a supplement to boost muscle health. Dr. Ravi's lab will test its efficacy in a disease model.

3) Conducting a natural history study of disease progression at the National Institute of Mental Health and Neurological Sciences (NIMHANS), Bengaluru. This study was initiated in November 2024 by Dr. Seena Vengalil in Dr. A. Nalini's group, which has seen the most significant number of GNE myopathy patients in India. GNE myopathy is a slowly progressive disease, and it is essential to obtain a quantitative estimate of disease progression, which can be modeled to test the efficacy of future drugs. Such data are not available for Indian patients of GNEM. It is a longitudinal study to be conducted for 3 years. Fifty patients are being recruited, of which thirty have already been tested at baseline. The strength of various muscle groups was recorded, and a muscle MRI was also performed. Each patient will be called to the hospital every six months to monitor their muscle strength and other tests.

In addition to collaborating on these studies, I am continuing my work to raise awareness of rare genetic diseases amongst scientists and other stakeholders through meetings and blogs. Apart from my work on rare genetic diseases, I am also publishing the data from my earlier *Entamoeba* studies and writing review articles.

High-pressure physics–Atreya

Surinder M Sharma, FNA

Bhabha Atomic Research Centre, Mumbai

Analysis of the abundance of stacking faults using plastic deformation under static high pressure. Analysis and writing of manuscript on isotropic melting in a single crystal under shock compression studied by real-time x-ray diffraction. After proof reading and corrections, the book that I was working on (in collaboration with the late Dr R. Chidambaram) has now been published by Springer-Nature, Singapore. The book was formally launched in the Program by NASI to commemorate the Golden Jubilee of the significant achievement of Indian scientists on '50 years of Pokhran-the Smiling Buddha', organized on May 18, 2024, at the Indian Institute of Technology (IIT) Delhi, New Delhi. This book provides in-depth basics of physics, current methodology, and experimental and theoretical investigations being carried out worldwide. Specifically, we have reviewed four areas of immense interest in the field. These are (1) Equation of state, (2) Phase transitions, (3) Hydrogen bonding in solids, and (4) Hydrogen and hydrides under pressure.

X-Ray diffraction data obtained using indigenously developed rotational diamond anvil cell was analyzed. The results show some systematic increase in the stacking faults during plastic deformation under high pressure. However, the abundance is far less compared to what I obtained earlier in gold under shock compression.

To gain insight into the microscopic origins of the observed melting anisotropy, *in-situ* x-ray

diffraction (XRD) measurements were obtained in aluminum (Al) single crystals shock compressed along $\langle 100 \rangle$ and $\langle 110 \rangle$ to peak stresses below and above the melting threshold for each orientation. XRD results and analysis for the two orientations showed significant microstructure differences before the melting thresholds stresses. These findings demonstrate the critical role of deformation-induced microstructure—in addition to that of temperature and pressure—on the melting transition. Our results make a strong case for reconsideration of the physics of melting, specifically for dislocation-mediated melting in shock-compressed solids. The manuscript has been submitted for publication in *Physical Review Letters*. I worked as a guest editor on a volume of *Physics News* of the Indian Physics Association of India. This volume gives an overview of the work carried out in Indian high-pressure physics. I also contributed two articles to this issue.

Contributions to the Himalayan geology

Om Narain Bhargava, FNA

Panjab University, Chandigarh

Work done on the Cambrian-Silurian of the Himalayas

1. Trace Fossils

A. A detailed study of the Cambrian trace fossils in Zaskar, Lahaul, Spiti, Kinnaur, and Uttarakhand enabled the establishment of ichno-biozones that can be used for regional correlation of strata lacking body fossils in these areas. These zones can now be tested in other parts of the Himalayas, lacking body fossil control.

B. The biostratigraphic and ecologic significance of the *Bergaueria* trace fossil was evaluated in the Lower Cambrian of the Lesser Himalaya; this trace fossil has not been encountered in the Tethyan part.

C. Trace fossils of Ordovician and Silurian sequences were utilized for ichnobiostratigraphy and interpreting the

environment of deposition in conjunction with the bedding features. It helps fix the lower age limit of the Takche Formation in the Spiti area.

2. Trilobites

A. *Oryctocephalus alberti* biozone (Wuliuan, Miaolingian) was identified in the Sumna Valley (Spiti), which could be used to correlate with the sequence in Kashmir.

3. Mollusks

Gastropods, cephalopods, and tentaculid were recovered from the Takche Formation (Kinnaur region), ranging in age from the Late Ordovician to Early Silurian. These fossils have been found helpful in fixing the sequence's age and palaeogeographic reconstruction.

4. Geochemistry

Geochemical studies of the Lower Cambrian sediments of the Tidong Valley (Kinnaur) indicate Continental Island Arc-type magmatism along the Northern margin of the Indian plate. It is supporting evidence for the Late Cambrian Kurgakh orogeny.

5. Regional Geology

A regional review of stratigraphy, paleontology, tectonics, and the environment of the deposition of sequences ranging in age from Proterozoic to Cenozoic in the Himalayas revealed anomalies and contradictions in various publications.

6. **Photomicrography** for the Carbonate microfacies was completed. The text for the book is under preparation.

7. **Delivered an invited talk on Climastratigraphy** at Amity University, Mohali, Panjab;

8. **Delivered a lecture to the Undergraduate and Post-graduate students** on techniques of mapping and construction of different types of cross-sections, Geology Department, Panjab University

9. Outreach Contribution

1. The book, "**Travails and Ecstasy of A Geologist Addicted to the Himalayas**," was

published. The book outlines the functioning and evolving culture of the Geological Survey of India and the ordeals and excitement of field life in the Himalayas, emphasizing the importance of fieldwork.

2. हिमाचल हिमालय का संक्षिप्त भूविज्ञान इतिहास और भूआकृतियाँ का विवरण एवं चित्रण. The manuscript was finalised, shall be submitted to the INSA for publication

Controlling charge carrier relaxation dynamics in lead halide perovskite nanocrystals

Anunay Samanta, FNA

University of Hyderabad, Hyderabad

Colloidal cesium lead halide (CsPbX_3 , $X = \text{Cl, Br, I}$) perovskite nanocrystals (NCs) hold promises in photovoltaic and optoelectronic applications – however, their poor long-term stability results in the degradation of optical properties under ambient conditions. Various methods have been explored to address these issues. In this study, we demonstrate that following the 3-precursor hot-injection method employing ethylenediammonium dihalide (EDAX_2) as an additional ligand/halide source, one can obtain phase-pure, monodispersed, stable, and highly luminescent CsPbX_3 NCs. Our violet-emitting CsPbCl_3 , blue-emitting CsPbClBr_2 , Green-emitting CsPbBr_3 , yellow-emitting CsPbBr_2I , and red-emitting CsPbI_3 NCs show PLQYs of 53%, 97%, 96%, 93%, and 95%, respectively. Moreover, the CsPbI_3 NCs, which are known for their phase instability, exhibit stability for up to two months under ambient conditions. The enhanced stability and photoluminescence are attributed to the strong binding of the bidentate ligand (EDA^{2+}) to the surface of the NCs and the effective removal of the halide-deficiency trap states by X^- . Ethylenediammonium Dihalide Assisted Direct Synthesis of Highly Luminescent and Stable CsPbX_3 ($X = \text{Cl, Br, I}$) Perovskite Nanocrystals, R.K. Gautam, S. Paul and A. Samanta, *ChemistrySelect* 9 (2024) e202402890 (<https://doi.org/10.1002/slct.202402890>)

Development of an air quality dispersion model in low wind conditions for the Indian region

Maithili Sharan, FNA

Indian Institute of Technology, Delhi

The focus of the research work has been on resolving mathematical issues and limitations of numerical and physical parameterization schemes in weather, climate, and air quality models, particularly in low wind conditions. The aim is to improve the surface layer parameterization schemes in the models through a better understanding of various near-surface small-scale physical processes in different regimes of wind and stability.

In the surface layer parameterization scheme used in the models, the classical Monin Obukhov similarity theory (MOST) is utilized for computing the surface fluxes and near-surface variables. The bulk flux algorithm based on MOST estimates surface turbulent fluxes using transfer coefficients for momentum (C_D) and heat (C_H). In convective conditions, C_D behaves non-monotonically with the stability parameter (ζ); however, MOST-based methods with commonly used similarity functions cannot capture this behavior. The similarity functions based on a three-sublayer model suggested by Kader and Yaglom (1990) can capture the non-monotonic behavior. Efforts have been made to incorporate these functions in the modeling framework in the surface layer scheme of the WRF model. The updated scheme is being evaluated over an Indian land site (Namdev P., Maithili Sharan, Piyush Srivastava, and SK Mishra. An updated parameterization of the unstable atmospheric surface layer in the Weather Research and Forecasting modeling system, *Geosci. Model Dev.*, 17, 8093–8114, <https://doi.org/10.5194/gmd-17-8093-2024>, 2024).

The formulations for (φ_m) and (φ_h) ranging from linear to non-linear forms differ in their functional forms, the coefficients appearing in each form, and the extent to which they can be applied under moderately to strongly stable conditions. The applicability of these linear and non-linear functional forms is constrained by the values of

the bulk Richardson number (Ri_b) and the stability parameter ζ . A systematic mathematical analysis has been carried out in stable conditions to infer the extent of applicability of these formulations in atmospheric models by exploiting the monotonic nature of the transfer coefficients with ζ . Turbulence measurements from CASES-99 and Cabouw data set to support the analysis. This work has been published in *Boundary Layer Meteorology* (Namdev P., Maithili Sharan, and SK Mishra. On the extent of applicability of various nonlinear similarity functions for the computation of surface fluxes under stable conditions in numerical models. *Boundary Layer Meteorology*. 190, 29, 2024, <https://doi.org/10.1007/s10546-024-00869-7>). A parameterization for eddy diffusivities as a function of downwind distance from the source devised using a concept of effective wind speed is being included for modeling the dispersion of air pollutants in low wind conditions.

X-ray scattering studies of quantum materials

Milan K. Sanyal, FNA

Saha Institute of Nuclear Physics, Kolkata

In this Indian National Science Academy project, tuning of physical properties in **quantum materials** as a function of shape, size, and structures is being investigated by **X-ray scattering techniques**. The emergence of several novel two-dimensional (2D) quantum materials since the discovery of graphene has rejuvenated the interest in order-disorder phase transitions, including ultrathin films' melting and thermal properties. Implications of reduced dimensionality in order-disorder transitions have always been essential to understanding fundamental physics. The applications of various 2D materials in several technological areas, from electronics and photonics to phononics, have made thermal management an important topic. Kinetics of order-disorder transitions, including melting in low-dimensional systems, are theoretically predicted to be heterogeneous and start with nucleation in defect sites at lower than homogeneous bulk-

melting temperatures requiring substantially lower energy barriers. We probed (*Physical Review B* 111, 024105, 2025) kinetics of such transition in thin multilayered films using x-ray scattering and in situ atomic force microscopy (AFM) studies. X-ray results show a linear increase with time in the in-plane separation of ordered domains, while in situ AFM measurements show a linear increase in the height of disordered domains with time (t). We have observed a t^2 decay of the structure factor of the multilayer Bragg peak as the ordered-to-disorder phase transition evolves, and the decay rate increases with an increase in temperature. This time dependence of the intensity decay during phase transition differs from the Arrhenius-type exponential decay observed in the melting transition.

The emerging class of hybrid organic-inorganic perovskites (HOIPs) has exhibited fascinating properties for a wide range of technological applications. With halide ions, HOIPs have provided novel optoelectronic devices, including efficient solar cells, and with pseudohalide anions-like formate (HCOO^-), enigmatic electromagnetic properties have been obtained in HOIPs. The large-scale synthesis of such 2D HOIP films is of immense importance in advancing their application as solar materials. We have shown (*Scientific Reports* 15, 6216, 2025) using in-situ X-ray measurements that the Langmuir monolayer of perovskite can be formed at the air-water interface by spreading stearic acid molecules on the water subphase having $(\text{C}_4\text{H}_9\text{NH}_3)_2\text{PbBr}_4$ molecules. The 2D lead formate perovskite films are formed at the air-water interface through a self-initiated reaction. The in-situ X-ray scattering and ex-situ Raman spectroscopy measurements revealed this reaction process. The spreading of lipid molecules having positive and negative head-group charges as surfactants over the water surface shows that the formation of perovskite nanofilms at the air-water interface requires the explicit presence of HCOO^- head-group of stearic acid. In this room-temperature interfacial reaction, formate anions come from the stearic acid monolayer present on the water surface and completely replace bromines

in the perovskite present in the water subphase to form $(\text{BA})_2\text{Pb}(\text{HCOO})_4$ at the air-water interface. Our results show an easy route for large-scale synthesis of 2D pseudohalide perovskites.

Applications of molecular tailoring and electrostatics & chemistry resource material generation

Shridhar R. Gadre, FNA

Savitribai Phule Pune University, Pune

(A) A summary of research papers published during this period

1. S. S. Khire, T. Nakajima, and S. R. Gadre, *J. Phys. Chem. A* **128**, 3703 (2024). Cluster-in-Cluster Approach for Computing MP2-Level Vibrational IR of Large Molecular Clusters. (Published: May 02, 2024)

Here, a cluster-in-cluster (CIC) procedure is reported for efficiently evaluating the Hessian in Matrix (HM) and dipole derivatives for large molecular clusters by employing the second-order Møller-Plesset perturbation (MP2) theory. It is also tested on several hydrogen-bonded molecular clusters.

2. M. B. Ahirwar, S. R. Gadre, and M. M. Deshmukh, *J. Phys. Chem. A* **128**, 6099 (2024). Molecular Tailoring Approach for Direct Estimating Individual Noncovalent Interaction Energies in Molecular Systems. (Published: Aug 15, 2024)

This article summarizes the development and application of our MTA-based method for estimating the energies of individual intra- and intermolecular non-covalent interactions in various systems. It also provides a perspective on future applications.

3. A. Shivhare, B. Dehariya, S. R. Gadre, and M. M. Deshmukh, *Phys. Chem. Phys.* **26**, 21332-21336 (2024). On the Synergetic Effects of Cyclic Cooperativity in Water Clusters (Published: July 24, 2024)

This work demonstrates that the sum of cooperativity contributions (CCs) of two or

more cyclic structures common to a reference HB, when added to its energy in the isolated dimer, provides the energy of this HB in the actual large water clusters W_n ($n = 6-20$).

4. A. Shivhare, B. Dehariya, S. R. Gadre, and M. M. Deshmukh, *Phys. Chem. Phys.* **27**, 3661-3672 (2025). Cyclic Cooperativity Contributions Determine the Hydrogen Bond Strengths in Molecular Clusters (Published: January 17, 2025).

It is demonstrated that our earlier developed method of synergetic cyclic cooperativity contributions (CCs) also accurately estimate the energy of HBs common to two or more cyclic structures in any hydrogen-bonded molecular clusters such as $(\text{NH}_3)_n$, $(\text{HF})_n$, $(\text{CH}_3\text{OH})_n$, etc.

(B) Chemistry resource material generated during this period

As mentioned in the previous report, I have made short, popular-level, audio episodes (typically 13 to 15 minutes each) on the life and scientific contributions of the Nobel laureates in chemistry. The series is made in Marathi, considering the strong emphasis on education in Indian languages in the NEP. The series is aimed at any science student at H. Sc. or higher levels. About 40 of these episodes have been recorded till March 31, 2025. Our university's audio channel, Vidyavane, has started broadcasting one episode per week w.e.f. February 28, 2025 (the Science Day in India). Five episodes have been aired till March 31, 2025.

Studies in Indian Astronomy

MS Sriram, FNA

Professor K.V. Sarma Research Foundation, Chennai

Two chapters (9 and 10) of the Malayalam text 'Drkkarana' (1606 CE) (edition, translation, and explanatory notes) were finalized (coauthor: Venkateswara Pai, IISER, Pune). Work on preparing an undergraduate-level book on Indian astronomy has been initiated. Preliminary drafts of 6 units of the book are ready. A set of 12 lectures on

Indian astronomy have been delivered by a group of scholars working in Indian astronomy and mathematics. They have been recorded (only audio). A revised manuscript of a book on 'Grahaganitādhyāya' part of 'Siddhāntaśiromani' composed by Bhāskarācārya (1150 CE) (with coauthors) has been submitted to the publishers (the manuscript is based on the work done during two projects funded by INSA).

Papers published

1. 'Obituary to Professor S.M.R. Ansari, Indian Journal of History of Science, Vol.59, No.3, pp.314-318, 2024.
2. 'Professor R.C. Gupta (14 August 1935 – 5 September 2024)', The Mathematics Consortium Bulletin (TMC Bulletin), pp.26-29, October 2024.
3. 'Book Review of 'The Buddhivilāsinī - Commentary of GaṇeśaDaivajña on the Līlāvati of Bhāskarācārya II, by Ramakalyani, GaṇitaBhāratī, Vol. 45, N0.1, Issued in December 2024.

Going beyond the standard model of particle Physics

Amitava Raychaudhuri, FNA

University of Calcutta, Kolkata

During the past year, the research has focussed on physics issues, compel us to look beyond the Standard Model of Particle Physics. In this category, the questions examined are models with more than a single Higgs boson multiplet and the question of neutrino mass and decay. Lectures were delivered at conferences and outreach events. Administrative responsibilities, which central and state agencies assigned, were also carried out.

Studies on mycobacterial proteins for the development of new drug targets

Pradip K Chakraborti, FNA

Panjab University, Chandigarh

Peptide deformylase (PDF) is an essential bacterial metalloenzyme that catalyzes the first step of the N-methionine excision (NME) pathway during bacterial protein synthesis, wherein the N-formyl group from nascent polypeptide chains is removed. The present study's PDF from *Salmonella typhimurium* (sPDF) was cloned, expressed, and biochemically characterized. The recombinant sPDF was found to be a mononuclear iron-containing enzyme exhibiting optimal catalytic activity in vitro in the presence of catalase, suggesting susceptibility to oxidative inactivation. To investigate the role of the metal ion and its influence on oxidation sensitivity, surrogate sPDF variants incorporating Ni²⁺ and Co²⁺ were generated (sPDF-Ni²⁺ and sPDF-Co²⁺, respectively). Both metal-substituted forms also displayed catalase-dependent activity, indicating that the oxidative sensitivity of the enzyme is not specific to the iron cofactor but is an inherent feature of the protein structure. Mass spectrometric analysis of the enzyme was performed to assess the oxidation status of the active-site cysteine residue. The results revealed that oxidation or over-oxidation of this residue led to enzyme inactivation, establishing the critical role of this cysteine in maintaining catalytic functionality.

Furthermore, comparative sequence analysis of PDFs from various Gram-negative bacterial species demonstrated the strict conservation of the active-site cysteine across the lineage. These findings collectively indicate that sPDF and related enzymes from Gram-negative bacteria share a common vulnerability to oxidative inactivation due to the oxidation-sensitive cysteine at the active site. The dependence on catalase for maintaining enzymatic activity underscores the functional significance of protecting this residue from oxidative damage. This study not only elucidates the structural and functional features underlying sPDF activity but also highlights a potentially

exploitable target for antimicrobial intervention based on oxidative inactivation mechanisms. (Work carried out in this project has already been accepted for publication in the *Biochem Biophys Res Commun*, 2025; DOI:https://doi.org/10.1016/j.bbrc.2025.151675)

Dynamics and evolution of galaxies

Chanda J Jog, FNA

Indian Institute of Science, Bangalore

I have been invited by the Journal “*Physics Reports*” (published by Elsevier) to write a review article titled “Vertical structure and dynamics of a galactic disk.” The review aims to provide comprehensive and timely coverage of this critical topic and discuss the theoretical development in this active field while keeping track of the observations. A realistic multi-component disk plus halo model of a galaxy has been developed and studied by us in detail. This considers both stars and interstellar gas, which are gravitationally coupled, and the disk, which is in the gravitational field of the dark matter halo. The review focuses on this model and its results for various physical cases. The main finding is that the stellar distribution in the coupled case is vertically constrained and has a steeper profile than in the standard stars-alone case. The results from the model naturally explain various modern observations. The observed gas scaleheight is used as a constraint on the model to obtain an important property, namely, the shape of the dark matter halo. Several key questions will lead to a better understanding of this topic. The above review has been submitted for publication and is undergoing refereeing. The review is broad in scope and has taken a substantial amount of work. To give an idea, the review size is about 100 journal pages and has over 375 references.

The Astronomical Society of India (ASI) is bringing out a “Vision Document” prepared by the Indian astronomy community. This document summarizes the wide variety of topics in this field studied in India. It provides a guideline for planning significant research for the next

decade. It is hoped that this document will help set science policy goals at the national level. The final document will be published in “*The Journal for Astrophysics and Astronomy (JApA)*” (published by Springer/ Indian Academy of Sciences), where each chapter will cover a different field of astronomy. I have contributed to the following two chapters in the ASI Vision Document: (a). “Stars and stellar populations in Milky Way and the nearby galaxies” by Sivarani, T. et al. (including **Jog, C.J.**) 2025, **JApA**, **46**, 15 (b) “Galaxies, Clusters, and Intergalactic Medium” by Kale, R., Sowgat, M., et al. (including **Jog, C.J.**), 2025, **JApA**, accepted for publication, in press.

Targeting of bleomycin to brain tumor using polysorbate-80-bleomycin conjugates

A. Jayakrishnan, FNA

University of Kerala, Kerala

In one study, Doxorubicin-Polysorbate 80 (DOX-PS80) conjugate was synthesized and characterized by different spectroscopic techniques, such as FTIR, UV-visible, and NMR. An in vitro BBB permeability assay was carried out using bEnd. Three cells and DOX-PS80 conjugate showed a 3-fold increase in BBB permeability compared with controls. Cell uptake studies revealed that DOX-PS80 was effectively taken up (90%) by the bEnd.3 and U251 cells and localized in the cytoplasm at the end of 24 h. Tumor spheroid assay and in vivo experiments in Swiss albino mice demonstrated the possibility of DOX-PS80 conjugate crossing the BBB and delivering the drug molecules to the target site for treating CNS disorders. It was published in *RSC Pharmaceuticals*, 2024, 1, 412-429 and appeared on the cover page.

In another study, functional carbon dots (CDs) were synthesized using citric acid, thiourea, and doxorubicin. DOX was loaded on CDs with an efficiency of $88.67 \pm 0.36\%$. In vitro drug release studies confirmed pH-dependent biphasic drug release. The cytotoxic effect of DOX-CDs showed a concentration-dependent effect after 48 h with Glioblastoma U251 cells. Flow cytometry revealed

a maximum intake of 75% at 24 h in L929 and U251 cells. This study showed these functionalized CDs may find application in drug delivery for CNS disorders. It was published in *Biomedical Materials* 2024, 19, 065018.

Both these studies were a continuation of the work done in collaboration with the Rajiv Gandhi Centre of Biotechnology, Trivandrum, since no Research personnel, such as a PDF or a Junior Research Fellow, is supported by INSA. Since bleomycin is too expensive, we could not buy the drug within our contingency budget, and therefore, DOX was the drug employed.

Meanwhile, we have been doing *in silico* studies to screen doxorubicin (DOX) derivatives against seven tumor proteins. The DOX ligands were modeled and optimized using Density Functional Theory (DFT). Modified DOX ligands-Polysorbate-80 conjugated structures were made using Semi-empirical methods. All compounds' *in silico* pharmacokinetic parameters were analyzed using the ADMET AI server. These studies showed that attaching to Polysorbate 80 could potentially decrease the overall toxicity of DOX ligands. This work is under consideration by Chemistry Select for publication.

Two major project proposals, namely, "Evaluation of Stat3 Inhibitor WP1066 Using Carbon Nanospheres as a Carrier for Treatment of Glioblastoma Multiforme" was submitted to DBT for funding in collaboration with RGCB, Trivandrum and another proposal, namely, "Evaluation of STAT3 inhibitor WP1066 as a Liposomal Formulation for Treatment of Glioblastoma Multiforme" was submitted to ICMR for possible funding.

Studying social evolution using paper wasps

Raghavendra Gadagkar, FNA
Indian Institute of Science, Bangalore

My research group has investigated the social biology of the Indian paper wasp *Ropalidia marginata* for over 40 years. In a new study, we



compare our state of knowledge of the division of labor in *R. marginata* with what is known about other species. Division of labor is of prime importance in the success of social insects in various ecosystems and benefits their colonies by increasing efficiency and productivity. This study utilizes more than three decades of experimental evidence to understand the emergence and maintenance of the division of labor in *Ropalidia marginata*. This primitively eusocial species provides an interesting variation between newly founded and mature colonies regarding the behavioral mechanisms regulating the division of labor. Newly founded colonies rely on physical dominance behavior to establish a division of labor. Workers in mature post-emergence colonies continue to implement physical dominance to regulate the non-reproductive division of labor in a decentralized manner. At the same time, the queens switch to chemical regulation of worker reproduction. We are poised to establish *R. marginata* as an essential model for understanding the origin and maintenance of the division of labor.

Harmonic analysis

Sundaram Thangavelu, FNA
Indian Institute of Science, Bangalore

Using the Littlewood-Paley-Stein theory, we have proved a sharp multiplier theorem for the Dunkl

transform when the multiplier is radial. We have also proved an optimal multiplier theorem for the general case when the action is restricted to radial functions from L^p for $p > 2$. The condition on the multiplier is in terms of the Dunkl derivatives. For certain convolution-type operators on the twisted Fock space, we have found a necessary and sufficient condition on the kernel φ for the operator to be bounded. This is achieved by considering a family of subspaces of entire functions inside the Fock space. We have also introduced and studied the fundamental properties of twisted modulation spaces. Using them, we have introduced modulation spaces on the Heisenberg groups.

Plan for the work next year: (i) To continue the study of modulation spaces on the Heisenberg groups with applications to unimodular Weyl multipliers in mind (ii) Initiate a study of Toeplitz operators on twisted Fock spaces.

Research papers published/written: Published: 2 Preprint: 1

Visits abroad: (i) University of Aveiro, Portugal (24-28, March 2025) (ii) Ghent University, Belgium (31st March-5th April 2025) (iii) Wroclaw University, Poland (7-9, April 2025)

Atmospheric deposition of chemical constituents to the Indian Ocean: Impact on biogeochemistry of surface waters

Manmohan Sarin, FNA

Physical Research Laboratory, Ahmedabad

The long-range transport of anthropogenic and mineral aerosols from the continents to the ocean dominates the aerosol burden and influences the chemical composition in the marine atmospheric boundary layer. The presence of particulate matter in the aquatic environment could, thus, affect the climate through radiative effects directly by scattering/absorbing the incoming/outgoing short- and long-wave radiation and indirectly by modifying the microphysical properties of the clouds. The real-time data on the chemical

composition of aerosols from the continental and oceanic regions is crucial to constrain their impact on regional and global climate change. The north Indian Ocean is a region of relatively high atmospheric deposition driven by mineral dust and industrial and biomass burning emissions (BBEs) from the Indo-Gangetic Plain and southeast Asia. Our study demonstrates a distinct atmospheric outflow associated with the mineral dust and BBEs, which bring N, P, Fe, and atmospheric pollutants to the Bay of Bengal. In addition, the air-sea deposition of N and Fe to the surface waters influences the biogeochemical cycles of carbon and nitrogen. Our study highlights that dust fraction dominates the total particulate load (~50%) in the pre-NE monsoon over the Arabian Sea and the Bay of Bengal. However, mineral dust contributes only ~10% of particulate matter (PM_{10}) during winter over the Bay of Bengal, supported by the dust fraction from the satellite-based observations (10-13%). Thus providing helpful information to international scientific programs (Future Earth core projects: Surface Ocean Lower Atmosphere Studies (SOLAS), International Global Atmospheric Chemistry (IGAC), and Integrated Marine Biosphere Research (IMBeR). As chairman of the ISC-INSA Committee for SCOR, I organized the workshop on "Biogeochemical Cycling in the Indian Ocean" for MSc and early PhD students.

Towards discovering strategies for utilization of arenes as electrophiles in the Baylis-Hillman reaction

Deevi Basavaiah, FNA

University of Hyderabad, Hyderabad

We have been working on the Baylis-Hillman reaction for the past 41 years to develop this fascinating reaction as a valuable and essential powerful C-C bond-forming reaction. This reaction represents a facile C-H (less acidic proton) functionalization process involving the coupling of the α -position of an activated alkene with electrophiles under the influence of an organic catalyst such as tertiary amines

or trialkylphosphines to provide a variety of beneficial compounds containing proximal densely functional groups. Although several electrophiles such as aldehydes, tosyl-imines, α -keto esters, and allyl bromides were successfully employed for coupling with various activated alkenes, arenes were not used as electrophiles in this reaction. Therefore, we have directed our efforts to utilize appropriately substituted arenes as electrophiles in the Baylis-Hillman reaction. Accordingly, we prepare the required starting materials 2,4-dinitrobromo /iodo/fluorobenzenes and related derivatives. After obtaining the required starting materials, we will systematically study optimizing the reaction conditions. This work is in progress in our research group.

Cooperative effects in equilibrium and nonequilibrium systems

Mustansir Barma, FNA

Tata Institute of Fundamental Research, Hyderabad

Spin Cones in a Random Field were found in an XY model with all-to-all interactions in quenched randomly oriented magnetic fields and, separately, in crystal fields. Spins were shown to lie within a cone for small fields. With random magnetic fields, the cone disappears beyond a critical field, while with random crystal fields, the cone angle smoothly approaches 180° as the field increases.

Transport in a Disordered Medium is an essential problem with many applications. The motion of a single particle on the percolation backbone, with hard-core interactions between particles, is punctuated by a sequence of waiting times in side branches. Interestingly, it was shown that the fraction of particles in the same side branch decays more slowly over a considerable time than any power law.

Condensate in Systems with Aggregation and Input refers to forming a large localized cluster with many particles found in the one-dimensional Takayasu model of mass aggregation with input. Condensate diffusion has a strong effect:

it reorganizes the mass profile on a macroscopic scale. Exiting condensates from an open system leads to strong temporal fluctuations of the total mass and strong intermittency in the steady state.

Research Publications

- (1) Iyer, Chandrashekar, Barma, Mustansir, Singh Hunnevir and Dhar Deepak, (2025) Asymmetric Simple Exclusion Process on the Percolation Cluster: Waiting Time Distribution in Side Branches' *Phys. Rev. Lett.* 134, 027102
- (2) Pereira, Rajiv G., Janardhanan, Ananya and Barma, Mustansir, (2024). Spin cones in random-field XY models, *Phys. Rev. E*, 110, 014141
- (3) Negi Reya, Pereira Rajiv G. and Barma, Mustansir (2024). Condensate-induced organization of the mass profile and emergent power laws in the Takayasu aggregation model, *Phys. Rev. E* 110, 064132

Physics of Moiré and nanostructured materials

H R Krishnamurthy, FNA

Indian Institute of Science, Bangalore

Moiré materials obtained when two (or more) layers of 2-D materials are *twisted* or *strained* relative to each other display exceptional properties. We have carried out a sophisticated and ambitious calculation of phonon linewidths in twisted bilayer graphene (TBG) near the *magic angle* arising from electron-phonon and phonon-phonon interactions. We find a moiré potential induced splitting of the Raman active G mode near the magic angle, which occurs due to contributions from high symmetry stacking regions, which agrees with recent experiments. This work has been published in Physical Review B **110**, 125421 (2024).

In recent experimental work by the research group of Arindam Ghosh at IISc, *unprecedented enhancements* of electron-phonon interactions in systems of Ag nanoparticles dispersed in an Au matrix were discovered via resistivity and point contactspectroscopy measurements. We developed a theory for these systems using a simplified semi-phenomenological tight-binding model with Coulomb interactions regarding their electrons

and a simplified semi-phenomenological force constant model for the phonons. The mechanism responsible is the formation of (nearly) dipolar charge redistributions at the Au-Ag interfaces and their strong coupling via Coulomb interactions, with the breathing and other vibration modes of the lighter Ag atoms caged inside the heavier Au matrix. The paper presenting the experimental work and a brief account of our theory has been published in *Nature Communications* **16**, 61 (2025).

In another experiment-theory collaboration, we have conducted a comprehensive study of the link between the Superconductivity (SC) and the band structure, in particular the positioning of its van Hove singularities (vHs), in twisted bilayer graphene (tBLG) using an in situ band structure tuning of a near magic-angle ($\theta \approx 0.95^\circ$) tBLG device with a displacement field (D). Our study reveals that other broken symmetries compete with SC as D increases, leading to the eventual suppression of SC coincident with broken isospin symmetry near half-filling with lifted degeneracy ($g_d \sim 2$). Additionally, seemingly concomitant with the weakening of the SC phase with increasing D, the vHs shift to higher fillings. This work has been published in *ACS Nano* **19**, 5353 (2025).

Publication details

1. Mandal, S, Maity, I, Krishnamurthy, H R, Jain, M. (2004). Phonon Linewidths in Twisted Bilayer Graphene Near Magic Angle, *Physical Review B* **110**, 125421.

Building foundation of circadian medicine: A study of the prevalence of biological clock-disease association in humans

Vinod Kumar, FNA

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The larger goal of the proposal was to understand the principle of circadian medicine approaches in the context of the Indian population, for which very little data is available. This is concerning since circadian medicine has unambiguous health

benefits over standard medical care; therefore, it needs to be utilized more for our huge population. This year, my significant effort has been to educate medical practitioners to realize and contextualize the circadian pattern in health parameters from diverse socio-demographic and disease conditions based on known findings from other parts of the globe. Therefore, I conducted indoor and outdoor outreach activities to spread awareness about adopting a circadian clock-dependent lifestyle to minimize disease risks and, in turn, reduce massive personal and national expenditures on diseases. I wrote a few research papers and reviews: (i) N. A. Jha, S. K. T. Taufique, and V. Kumar (2024). Constant light and pinealectomy disrupt daily rhythm in song production and negatively impact reproductive performance in zebra finches. *Photochemical & Photobiological Sciences* Doi: 10.1007/s43630-024-00548-z. (ii) V. Tripathi, I. Mishra, and V. Kumar (2024) *Circannual Rhythms*. In: *Encyclopedia of Reproduction*, 3ed (Ed. M. K. Skinner) vol. 1, Academic Press: Elsevier (in press). (iii) T. Yoshimura and V. Kumar (2024). *Seasonal Reproduction: Circannual Rhythms and Photoperiodism, Birds*. In: *Encyclopedia of Reproduction*, 3ed (Ed. M. K. Skinner) vol. 1, Academic Press: Elsevier doi:10.1016/B978-0-443-21477-6.00017-1. In addition, I was involved in other academic activities, including honorary teaching of Chronobiology principles to master students and researchers, as well as organizing and participating in seminars and conferences.

Investigation of housekeeping proteins as drug targets against bacterial pathogens

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ICMR-National Institute of Pathology, New Delhi

Mycobacterium tuberculosis (*Mtb*) caseinolytic protease B (ClpB), a chaperone possessing a unique ability to renature the aggregated proteins *in vivo*, is essential for the survival of *Mtb* within the host. To explore *Mtb* ClpB as a drug target, we screened FDA-approved compounds *in silico* to identify inhibitors against it. In our screen, several

compounds were found to interact with ClpB. The top four compounds, namely framycetin, gentamicin, ribostamycin, and tobramycin, showing the highest binding energy, were selected for further investigation. MD simulations and tryptophan-based quenching of ClpB-drug complexes established that the chosen inhibitors stably interacted with the target protein through hydrogen bonding and hydrophobic interactions. All four compounds remarkably inhibited the protein resolubilization activity of ClpB without affecting the ATPase activity of the protein. Further, the compounds were found to be bactericidal as they potently inhibited the growth of *Mtb* H37Ra. The antimycobacterial activity of the compounds appears to be due to the inhibition of functional ClpB oligomer formation, affecting the chaperone activity.

Scale-up the production of 24-desmethyl and 17-Hydroxy (oxo) -rifamycin analogs effective against primary first-line drug (rifampicin) resistant strains of mycobacterium tuberculosis

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During the first and the second year, I confirmed the two mutant strains DCO34/36 and DH10 of *A. mediterranei* that produce 24-desmethyl rifamycin B and 17-hydroxy rifamycin B, respectively. This was followed by growing these mutants in the Shake flasks and subsequently in the 5 L fermenter, and the production of 24-desmethyl rifamycin B was thus increased from 20 mg/L to nearly 700 mg/L. However, the production was still very low. Therefore, we planned to mutate the *rifQ* gene from within the rifamycin biosynthetic gene cluster from S699, DCO36, and DH10. This work was done jointly with our collaborators in Germany (Professor Andreas Bechtholdt, Universitat Freiburg, Germany). To achieve this, we have adapted the conjugation system of *Streptomyces* and finally created *rifQ* deletion mutants of S699, DCO36, and DH10. These mutants are now grown in shake flask culture to check the production of

rifamycin B and rifamycin B analogs. However, from the Petri plate culture and initial HPLC data, it was evident that production substantially increased. In the current year of my tenure, I grow these mutant strains in the 10 L fermenter (FERMEX BioFMX15) at the CSIR-Institute of Himalayan Bioresources (CSIR-IHBT). Currently, I am carrying out further downstream processing and purification of the analogs extracted from the deletion mutants.

Affinity guided rapid inhibitor screening: Metallo-lactamase inhibitors' design, synthesis, and bioactivity

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From April 24 to March 25, we completed the development of an affinity-guided detection of primary amines, including the amino acids and neurotransmitters, by Label Assisted Laser Absorption Desorption Mass Spectrometry (LALDI MS). Towards that end, the use of a new label, *p*-methoxy cinnamaldehyde (PMC), in LALDI MS has been identified. Matrix-assisted laser desorption/ionization mass spectrometry (MALDI-MS), helpful in detecting macromolecules, is generally unsuitable for recording the mass spectrum of small molecules. To circumvent this problem, a matrix-free variant of MALDI-MS, namely Label-assisted laser desorption/ionization mass spectrometry (LALDI-MS), has been developed in recent years where analytes get covalently attached to a laser absorbing label which induces the desorption/ionization process thus facilitating the recording the mass spectra and avoiding the problem of formation of cluster peaks. In general, the probes used for such detections are all pyrene-based scaffolds, which, despite being a good laser-active chromophore, have both reactivity and solubility problems. Inspired by the right chromophoric nature, we have undertaken a systematic study to design and optimize cinnamaldehyde derivatives and have

found that p-methoxy cinnamaldehyde (PMC) as a simpler, cost-effective, less hydrophobic laser-active label, which can detect a series of primary amines, including the neurotransmitters and amino acids. The label PMC can also discriminate between aliphatic and aromatic primary amines. The manuscript has now been published in the *International Journal of Mass Spectrometry* 2024, 505, 117307. Besides this work, we have undertaken a pedagogical approach highlighting the application of rule EFGT (exchange in a Group of Three) as a mnemonic for assigning R/S configuration to a centrally chiral molecule drawn in any 2D-projection or 3D-wedge formula. The manuscript is under revision in the ACS education journal, *J. Chem. Educ.* I have also been teaching by taking half of one regular course lasting one semester (Autumn) for students of IISER Kolkata in an honorary capacity.

Seismic imaging of magma storage and understanding of the Deccan volcanism process

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The Deccan volcanism occurred around 65 Ma ago when India and Seychelles, moving northward, interacted with the Reunion plume, increasing temperature and melting at the upper mantle. The buoyant magma moved upward and ponded toward the crust-mantle boundary. When the overlying crust failed due to high overpressure and/or magma buoyancy, the magma ascended via dikes and assimilated into a shallow crust. The process will produce significant crust and upper mantle modifications due to increased heat transfer and chemical transformation during magma ascent. Existing geophysical knowledge of the Deccan traps does not provide the signature of a magma ascent path and evidence for crustal transformations. Using data from a recent 160 km-long broadband seismological experiment, we construct a detailed model of the crust and uppermost mantle, showing a complete magma

plumbing system.

An anomalous crust and lithospheric mantle in the Deccan Volcanic Province are imaged below the profile through the joint inversion of receiver functions and surface wave dispersion. The upper crust has an unusually low S-wave velocity (V_s , ~ 3.3–3.5 km/s) at 8–17 km depth, underlying a 4 km thick high-velocity layer (V_s , > 3.8 km/s). The low velocity possibly represents the frozen magma reservoir, the source for the magma eruption at ~65 Ma due to the interaction of the Reunion plume with India. The shallow, high-velocity layer could be basaltic mafic intrusions responsible for producing massive CO₂ degassing. The Moho deepens beneath the west coast to ~45 km due to 10–15 km of magma underplating. The mantle plume scar is seen as thinned lithosphere (80–100 km), with long-lived low-velocity layers in the shallow mantle attributed to sulfide melts. The result shows evidence for lithospheric thinning and well-preserved deformation in the shallow mantle in the form of sulfide melt, magma ponding at the crust-mantle boundary beneath the coastal basin, an extensive low-velocity layer in the upper/mid crust possibly representing the horizontally elongated frozen magma reservoir, and a densified high-velocity layer in the shallow crust (4–8 km depth) representing basaltic mafic intrusions.

The host-defense peptides and defensins: Their multifaced roles as anti-infectives

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Entry of SARS-CoV-2 into cells is initiated by binding the spike protein S to human receptor ACE2 via a contiguous stretch of amino acids in the receptor-binding domain (RBD). Our *in silico* docking and molecular dynamics simulation analysis indicates that melittin can associate with the ACE2 binding domain in RBDs of the spike trimer in the parent strain and virus variants in “open and “closed” configurations. Gramicidin S

could bind to the RBD and fusion peptide regions, suggesting multiple mechanisms that inhibit viral activity. Several host-defense microbial peptides characterized in my laboratories, such as pardaxin, delta lysin, seminalplasmin, its 27-residue active fragment, and a non-hemolytic variant of the frog skin peptide brewing, have shown to possess potent antimicrobial activity in my laboratory, could bind to the spike protein of the wild-type and omicron strains in the ACE 2 binding region. Some of the host-defense peptides are associated preferentially with the omicron RBD. Analogs of defensins could bind effectively to the omicron variant. Host-defense peptides from widely differing sources could be attractive for development as therapeutic agents against SARS-CoV-2 and its variants.

We formed hydrogels from simple amino acid derivatives. Gels were formed due to the self-assembly of amino acids into highly ordered nanostructures. Rheology indicated that the gels were “soft” and not rigid like poly acrylamide gels used for electrophoresis. Soft gels would help the incorporation of molecules and subsequent release. Antibiotics and antimicrobial peptides could be incorporated in the gels and slowly released into the aqueous medium. Hydrogels formed from simple molecules such as amino acid derivatives have the potential to formulate drugs and peptides for sustained release.

Derivation of trace formulae

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Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru

The envisaged multiple goals were: (i) Trace Formulae: These are a non-commutative version of “integrated Taylor’s theorem” where the Trace replaces the integral. The goal of extending these results to higher dimensions with non-trivial geometry remains a target in the future. (ii) The study of Dynamical semigroups, their stability, and the underlying Quantum Stochastic processes has been a continuing theme for my research. (iii) A relatively new area of building statistical tools in

the domain of Quantum probability (“Quantum Statistics”) is under development, which has applications in the Decision and Machine Learning theory, and a fair amount of progress has happened in this area as well.

Achievements in the Completed Project: (i)

A total of 15 articles were published during the project in international and national journals, (ii) Two Ph.D. students advised as Co-guides, (iii) Professor Emeritus of the Indian Statistical Institute and awarded the Ramanujan Medal, (iv) A series of lectures on advanced topics in operator theory were delivered at IITs, IISERs, MSRUAS, Bangalore, and Tech-Mahindra University Hyderabad.

Addressing key components of macrophage defense signaling targeted by *Leishmania* parasites for successful survival towards developing robust anti-leishmanial with drug delivery systems

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The work is centered on studying macrophage biology using visceral leishmaniasis as a model macrophage disease. The key question we try to address is how macrophage signaling pathways that produce robust defense molecules are hijacked by *Leishmania* parasites and, therefore, have tremendous potential for developing therapeutic targets for macrophage-associated diseases. Earlier, we showed the excellent potential of genepin as an effective anti-leishmanial agent. This is because of its inhibitory activity on UCP2 (uncoupling protein 2), an inner mitochondrial membrane protein upregulated by *Leishmania* infection. We are also trying to correlate inflammasome activation with antileishmanial activity and, in this context, trying to exploit GRA as a combination with genepin for a practical therapeutic effect. We have published Protocols for inflammasome study for the benefit of relevant researchers. We focus on translating these research areas into therapeutic strategies [Biswas A., Bhattacharjee A., and Das PK. (2024) Modulation and determination of the status of inflammasomes

in *Leishmania*-infected macrophages in Immune Homeostasis: Methods and Protocols, Methods in Molecular Biology, vol 2782, pp 137-146, Vijay Kumar (Ed) Springer Nature publications, USA]. We have also published a comprehensive review to summarize our current understanding of the mechanisms of apoptosis in parasitic infections and how this knowledge can be exploited as therapeutic strategies [Das, T., Roy, S., **Das, P.K.** and Ukil, A. (2024) Role of Apoptosis in Parasitic infections: Therapeutic targets and strategies in Apoptosis and Human Health: Understanding Mechanistic and Therapeutic Potential (Book Series) chapter, pp 305-323 Springer Nature publications, USA].

Dynamics in solids

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Bhabha Atomic Research Centre, Mumbai

We have investigated the dynamics of atoms in solids and related material properties using the techniques of neutron scattering, lattice dynamics, and abinitio molecular dynamics simulations. The project includes studying periodic vibrations and stochastic diffusion in various functional materials, such as lithium/sodium battery materials, solid-oxide fuel cells, thermoelectric materials, and ferroelectrics. Such studies help identify essential descriptors that enhance the thermal properties and may help design new materials. We have identified the critical role of anharmonic lattice vibrations, the nature of diffusion pathways, and their correlation with structural features in a few crystalline and amorphous materials. We also find that the anharmonic lattice vibrations of low energies have a vital role in leading to thermal expansion and thermal conductivity. An abstract of recent work on vanadium metal is given below.

Vanadium metal is extensively used in modern technology, especially in the alloy and steel industry; it exhibits anomalous thermal expansion behavior across the entire temperature regime. The machine-learned force-field-based molecular dynamics (MLMD) simulations, which include all the anharmonic effects, successfully explained the

anomalous expansion behavior up to the melting temperature. It is expected that the electronic entropy and the electron-phonon interaction would influence the thermal expansion, but their effect appears small. The MLMD also captures the melting and reproduces the experimental volume increase on melting. We have also calculated the lattice thermal conductivity using the MLMD-based Green-Kubo method. This highlights the vital contribution of the four and higher orders of phonon anharmonicity to the lattice thermal conductivity. The research is published as

Untangling High-Temperature Thermal Expansion and Lattice Thermal Conductivity Behavior of Vanadium using Machine-Learned Molecular Dynamics; S. Malgope, M. K. Gupta, S. Bag, R. Mittal, S. Bhattacharya, Ajay Singh, **S. L. Chaplot**; Physical Review B 110, 054301 (2024).

Holographic symmetry algebra and aspects of cosmology

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National Institute of Science Education and Research, Bhubaneswar

In **Holographic Symmetry Algebra**, we considered all OPEs invariant under the infinite symmetry algebra for gluons on the celestial sphere. S algebra is an infinite-dimensional Lie algebra, known as the symmetry algebra of some gauge theories. It is a “colored version” of the $w_{1+\infty}$ algebra, and we wrote down all possible S -invariant (celestial) operator product expansions between two positive-helicity outgoing gluons.

In **Aspects of Cosmology**, we investigated the issue of the abundance of primordial black holes in the early universe. For example, we considered the Primordial non-Gaussianity from ultra slow-roll Galileon inflation and can generate the non-Gaussianity amplitude of the order: $|f_{NL}| \sim O(10^{-2})$. Further, we considered the Regularized-renormalized-resummed loop corrected power spectrum of non-singular bounce with Primordial Black Hole (PBH) formation in the setup of having a contraction and then non-singular bounce

followed by inflation with a sharp transition from slow-roll (SR) to ultra-slow roll (USR) phase for generating primordial black holes. We also considered the scalar-induced gravity waves from ultra-slow-roll galileon inflation. Our studies reveal that the production of secondary gravity waves in Galileon inflation with an ultra-slow roll (USR) phase and show that the spectrum of scalar-induced gravitational waves (SIGWs) in this case is consistent with the recent NANOGrav 15-year data and with sensitivities of other ground and space-based missions. In addition to that, we analyzed Primordial non-Gaussianity as a savior for PBH overproduction in SIGWs generated by pulsar timing arrays for Galileon inflation. The result shows the explicit role of negative local non-Gaussianity, f_{NL} , in suppressing the abundance of primordial black holes (PBHs) in the single-field model of Galileon inflation. We also analyzed the Realisation of the ultra-slow roll phase in Galileon inflation and PBH overproduction. We demonstrated the explicit realization of the ultra-slow roll phase in the framework of the practical field theory of single-field Galileon inflation. Moreover, we showed that Obviating PBH overproduction for SIGWs generated by pulsar timing arrays in a loop corrected the EFT of bounce.

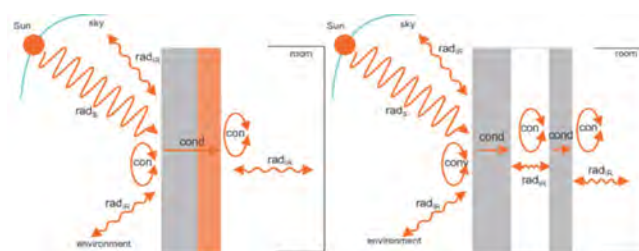
Vulnerability of endosymbionts to climate change

Renee M. Borges, FNA

Indian Institute of Science, Bangalore

Ectotherms are particularly vulnerable to climate change. Ectotherms such as insects can have their developmental stages affected by high temperatures or unprecedented humidity. We have studied the impacts of temperature on the internal nest temperatures of potter wasps. Insects are poikilotherms (i.e., they cannot regulate their body temperatures). They can only cope with temperatures outside their physiological tolerance limits by seeking refuge in colder or warmer areas within their habitats. The winged or otherwise mobile adults can move to more suitable habitats. Insects that raise larvae within earthen structures

are particularly vulnerable to temperature ranges outside their tolerance because they cannot move out of their nests and are captive within the structure until they can leave after they develop into adults. Moreover, larval development may be hampered by unsuitable temperatures within their enclosed earthen structures. This is why insect earthen nest structures must either be built in suitable microhabitats where temperature fluctuations are within tolerable physiological limits, assuming that the walls of the earthen structures are sufficiently porous to allow temperature equilibration between within and outside the nest, or the nest chambers must be adequately insulated from external temperature fluctuations so that metabolically generated heat can dissipate while there is a dampening of equilibration of heat within and outside the nest.



It is, therefore, essential to understand the relative contribution of radiation, convection, and conduction to heat transfer and temperatures within and outside the larval chambers of potter wasp nests. This can be examined empirically as well as modeled theoretically. Since potter wasps also build their earthen nests on different substrates, e.g., wood, concrete, stone, and glass, the contribution of the substrate to heat transfer is also essential. Therefore, the substrate and whether the nest is shaded or exposed to solar radiation should be considered to understand the nesting ecology and the appropriate location for the successful development of the larvae. It is possible that, given climate change, temperatures within nest chambers may reach lethal levels. Our preliminary studies show that the temperatures within potter wasp nests match ambient temperatures except at night when they are lower than ambient temperatures.

IUCN Red List assessment of selected wild Indian Gingers (Zingiberaceae) and Bananas (Musaceae)

M Sabu, FNA

Malabar Botanical Garden and Institute for Plant Sciences, Kozhikode

I have completed the IUCN Red List training (online course) conducted by IUCN and compiled a preliminary list of ginger and banana species to be assessed. Developed a working knowledge of IUCN Red List assessment protocols and data requirements. An initial list of 25 target species from both Zingiberaceae and Musaceae was compiled for assessment. So far, the PI has done 18 species from both Zingiberaceae and Musaceae. One species, *Boesenbergiameghlayensis*, has been tentatively classified as ENDANGERED (B1ab(ii-iii)+2ab(ii-iii)) and submitted to the IUCN site. IUCN assessment of four additional species has been initiated and will be completed by July 2025. All collected specimens will be housed and conserved at the Malabar Botanical Garden and Institute for Plant Sciences (MBGIPS), further strengthening its role as a national repository for ginger biodiversity. Three papers were published in international journals with a high impact factor. A tentative list of 25 taxa was prepared for the IUCN assessment in the forthcoming years.

Papers published

1. Ajith Ashokan, Mark F. Newman, Edakandiyil Sanoj, Mamiyil Sabu, and Vinita Gowda. 2025. Synonymizing Two Species Names, Designating Lectotypes, And Cataloging Intermediates in Two Hybrid Zones of *Hedychium*. Ann. Missouri Bot. Gard. 110: 128-137. doi: 10.3417/2025940
2. Rajeesh E.P., V.S. Hareesh & M. Sabu. 2024. Combining Morphological, Anatomical, and Phylogenetic Evidence to Resolve the Identity of *Musa kattuvazhana* (Musaceae) in the Andaman Islands, India. Japanese J. Bot. DOI: 10.51033/jjapbot.ID0133.
3. Axel Dalberg Poulsen, TomášFér, Lakmini Darshika Kumarage Marasinghe, **Mamiyil Sabu**, Mark Hughes, Eugenio Valderrama & Jana Leong-Skorničková. 2024. The cardamom conundrum resolved: Recircumscription and placement of

Elettaria in the only pantropically distributed ginger lineage. Taxon. 73(5): 1-27. DOI. <https://doi.org/10.1002/tax.13242>.

Statistical mechanics of quantum annealing, materials breakdown, and society

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The statistical physics research work in the Project was mainly divided into twoparts: **A)** Statistical Physics of Quantum Annealing (in the context of quantumcomputation) and materials failure (fracture/breakdown) in disordered solids. This part has been done mostly with my collaborators from the Saha Institute of NuclearPhysics. **B)** Application of statistical physics to social dynamics (Sociophysics), in particular to markets (Econophysics). This part has been done mostly with mycollaborators from the Economic Research Unit of the Indian Statistical Institute,Kolkata. I have been an Honorary Visiting Professor of Economics since 2007. Last year (April 2024 – March 2025), I and my colleagues had eightpublications (including two book chapters) in peer-reviewed journals and editedbooks. Some of the chosen publications in both the above categories are given below.

In category **A)**, my major publications in 2024-'25 have been: **1)** Q-factor: A measure of competition between the topper and the average inpercolation and in self-organized criticality, A Ghosh, SS Manna, BK Chakrabarti, *Physical Review E* 110 (1), 014131 (July 2024); **2)** Quantum Ising heat engines: a mean-field study,M Acharyya, BK Chakrabarti, *The European Physical Journal B* 97 (4), 45 (April 2024).

In category **B)** my major publications in 2024-'25 have been: **1)** Signature of maturity in cryptocurrency volatility, A Ghosh, S Biswas, BK Chakrabarti Physics A: Statistical Mechanics and its Applications, 130433 (February, 2025); **2)** Book Chapter: Kinetic Exchange Models of Income and Wealth Distribution: Self Organization and Poverty Level S Paul, BK Chakrabarti, pp79-

94, Select Topics of Econophysics, Ed. A. Sinha, Walter de Gruyter GmbH, Berlin/Boston (January, 2025) [<https://doi.org/10.1515/9783110987584-006>]; 3) Book Chapter: A Fiber Bundle Model of Systemic Risk in Financial Networks, S Biswas, BK Chakrabart, Systemic Risk and Complex Networks in Modern Financial Systems, Ed. V. Pacelli New Economic Windows Series, Springer, Milan (October 2024) [https://doi.org/10.1007/978-3-031-64916-5_10] (Online Open)].

Science and engineering of structural alloys with emphasis on titanium and science policy studies

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In the area of structure-property-relationships in titanium alloys, a significant contribution has been made to describe the relationship among the concentration modulations, α' nanodomains, and α'' nanodomains in The Ti-Nb systems by integrating CALPHAD modeling, first-principles calculations, phase field simulations and experiments (*Acta Materialia*, 246, 2023, 118697, 2023). This contribution expands our understanding of metastable phase transformations in Ti alloy systems. In other work carried out under two separate masters 'sses supported by post-doctoral research, an investigation on the critical engineering phenomenon of dwell fatigue in titanium alloys has been completed (Tirthesh Ingale, Master Thesis, Materials Engineering, May 2023) and prepared for publication. This study describes crack imitation and growth at room temperature and contributes to developing a physical and mechanistic basis for life prediction in titanium alloys. The temperature dependence of dwell fatigue is currently being investigated in collaborative research with Satyam Suwas in a follow-up master's thesis that is presently ongoing (Subham Chattoraj), supported by post-doctoral research (Girish Bojjawar). An unusual phenomenon of low-temperature creep underlies dwell fatigue behavior, and an understanding of this process has been developed through post-

doctoral research fellows (Atasi Ghosh, Shreya Mukherjee, and Girish Bojjawar). Collaboration with other faculty members in the department (Vikram Jayaram and Praveen Kumar) supports this study through rapid throughput tests on creep under cantilever bending (Submitted to the *Journal of Materials Research*). An understanding of crack initiation and propagation in low cycle fatigue and dwell fatigue in an engineering titanium alloy as a function of temperature is being developed. A Master's Degree in Materials Engineering, IISc (Subham Chattoraj), is ongoing in this area. Supported by post-doctoral fellow Girish Bojjawar. In a novel approach to high-temperature materials development, ultrafine multiphase-multicomponent eutectic alloys have been developed to very high strength and ductility, coupled with oxidation resistance to 1100C (*Intermetallics*, 168, 108228, 2024). Invited keynote presentations for the period in the international forum include: 'Dwell Fatigue in Titanium Alloys' at *Light Metal Technology*, 2023, 10th Jul 2023 - 12th Jul 2023, Melbourne Australia, 'Pathways to Titanium Martensite, 'Possibilities and Limitations of Quantitative Materials Modeling and Characterization 2023. Bernkastel, May 14th - May 17th, 2023, Germany, 'Exploring Multiphase Intermetallic Eutectics', *SFB/TR 103 Concluding Symposium*, 11th Sep-14th Sep, Bochum, Germany, *Alpha Growth and Branching in Titanium Alloys*, TMS 2024, Orlando USA, March 3-7, 2024 *Understanding Low-Temperature Creep in Titanium Alloys*, TMS 2024, Orlando USA, March 3-7, 2024. As chairman of the board of directors of the Center for Science and Technology Policy (CSTEP), I have made contributions to science policy. Contributions to the growth of science and technology in the country have been made as Chair of research council of CGCRI-CSIR till Aug 31, 2023, Chair of the research council of DYSL-SM, DRDO, Chair of the CSIR Monitoring Committee to review the progress of CSIR Fast Track Translation (FTT) and Fast Track Commercialization (FTC) projects under Mining, Mineral, Metals and Materials (4M), Chair the DST-Imprint monitoring committee on Defence and Security.

Effect of multiple transgenes pyramiding on durable disease resistance and yield potential in rice

K Venkateswara Rao, FNA
Osmania University, Hyderabad

The work aimed to develop pyramided rice lines harboring different transgenes for broad-based disease resistance against major pathogens and insects. The gene pyramiding method has been considered one of the essential techniques for introducing other combinations of genes to improve various agronomical traits of crop plants. Stable homozygous (T4 generation) pyramided transgenic rice carrying *asal* and *gna* (P-17-17 line), homozygous CNPR-1&NPR1-48-5 plants (T6 generation) harboring *BjNPR1* and S1-C9 plants (T6 generation) containing chitinase gene (*Chi11*) were selected for pyramiding the different transgenes. Seeds of the transgenic lines were germinated in pots and grown to maturity under controlled conditions for making required combinations of crosses. Reciprocal crosses were made inside the containment greenhouse under controlled conditions. When 50% of the panicle emerged from the flag leaf, plants were emasculated manually, and pollen from the male parents was collected and dusted on the emasculated florets of female parents. All the pollinated panicles were bagged to collect the F1 seeds. The F1 seeds collected were germinated on an MS medium containing 10 mg/l phosphinothricin (PPT). All the crosses were proved to be successful. Based on the PCR analyses, the germinated F1 plants were transferred to pots and grown to maturity to identify the plants carrying desired combinations of transgenes.

Is there a cost to increasing biodiversity in an ecosystem?

K N Ganeshaiah, FNA
UAS, Gandhi Krishi Vigyan Kendra, Bengaluru

This project aims to understand the negative impacts of increased biodiversity on species' survival in an ecosystem. The rationale is simple. Each ecosystem has a certain level of resources

that can sustain a given number of species. If the species number crosses this level, some species will likely face extinction owing to the reduced average population. This hypothesis was tested by compiling the available evidence from four taxonomic groups, such as plants and birds. The relation between the number of species (D, the diversity) and the number of rare, endangered, and threatened species (RET) was tested from different ecosystems using the available data.

Results indicated that the number of RET species increased with species diversity in an ecosystem. However, since such a relation may also arise even when the proportion of RET species is constant across the ecosystems, the non-linearity of this relation was tested by assessing the relation between the species richness and the proportion of RETs. In two of the four systems, the relationship was strong. In these systems, the proportion of RET species increased with the species richness. Thus, an uncontrolled increase in biodiversity in any ecosystem beyond a certain level may lead to enhanced species extinction. The features of the species that are likely to become vulnerable are being analyzed.

Compact Muon Solenoid experiment at the Large Hadron Collider

Sunanda Banerjee, FNA
Indian Association for the Cultivation of Science, Kolkata

Sunanda Banerjee taught a course at IACS on Computing Language (C++) and Numerical Methods to third-year BS/MS students. Four students from the institute are also doing projects with him. Sunanda continues participating in the CMS experiment at the Large Hadron Collider, CERN. He has taken four responsibilities there: (1) calibration of the hadron calorimeter; (2) design of the upgraded CMS detector for future high luminosity run of the CMS experiment; (3) geometrical description of the entire CMS detector, which is one of the essential ingredients of CMS simulation and reconstruction software; (4) improvement and testing of the CMS simulation

software. The CMS experiment received the **Breakthrough Award** in 2025, and Sunanda's work significantly contributed to this achievement. Sunanda is a member of the **Geant4** collaboration and the leading expert in the full simulation of the CMS detector. **Geant4** continuously improves the software kit and provides reference releases every month. Sunanda monitors the goodness of the shower generation part and continues to detect the compatibility of new versions of **Geant4** with the CMS simulation Program.

Sunanda gave several colloquia based on how colliders started in particle physics and how Indian groups got involved in these activities. He also gave a special seminar at IACS about special experiments proposed at the Large Hadron Collider. He gave an invited talk on "Experiments and Physics objects" at the PHANC 2025 conference in Puri in February 2025. He is a member of the analysis review committee for papers on Standard Model physics. He was invited to a conference in Dhaka, which celebrated 100 years of the phenomenal paper by Prof S N Bose. Sunanda summarized the discovery of Higgs Boson there. His work has gone into more than 100 publications on the CMS experiment during the last year, making him an author of these publications.

Challenges in variability and structure of active galactic nuclei

Gopal Krishna, FNA

UM-DAE Centre for Excellence in Basic Sciences, Mumbai

This report covers only the first 6 months of this Annual Report, as my Senior Scientist position ended on 30-09-2024. (I) Notes on the peer-reviewed research work published (April 2024 - Sept. 2024) > An enigmatic subclass of quasars (QSOs), called "Weak emission-line QSOs" is, for the first time, shown to exhibit systematically milder optical variability compared to the normal population of QSOs. In a novel interpretation, this difference is related to the clumpiness of the material accreting to the supermassive black hole [R. Kumar, Gopal-Krishna, H. Chand & V.

Negi (March 2025), Monthly Notices of the Royal Astronomical Society (Letters), vol. 538, L88]. > Blazars represent the most active, rare state of nuclei of galaxies. One of them, named OJ 287, has enjoyed a unique status for the past 3 decades, following the discovery of its outbursts of optical emission, which arrive with a periodicity of ~ 12 years, as recorded since 1888. This system has been modeled as a fast-precessing general relativistic binary of black holes with masses of ~ 10000 and 100 million Suns, which has been claimed to be the best-known source of nano-hertz gravity waves. Another unique aspect of the quasi-periodic optical outbursts is that for several decades, their emission has been interpreted as being of a thermal bremsstrahlung origin, particularly since the outbursts are not detected at radio frequencies. Based on a re-analysis of the extensive optical observations of the outbursts, Gopal-Krishna has recently demonstrated that the optical outbursts arise from the synchrotron mechanism. A key offshoot of this finding is that the orbital properties of this unique blazar would need fresh modeling and so also the prediction of the gravity waves from this system of supermassive black holes [Gopal Krishna (Aug. 2024), Astronomy & Astrophysics (Letters), Vol. 688, L16]. > The topic of in-situ re-acceleration of relativistic particles emitting synchrotron radio waves in the lobes of radio galaxies has recently been suspected to be triggered due to the global bending of their lobes of radio emission. The most striking example of such emerging evidence has been discovered in the radio trail of a radio galaxy moving inside the cluster of galaxies, Abell 1033 [Gopal-Krishna & P. J. Wiita (June 2024), Journal of Astrophysics and Astronomy, Vol. 45, Issue 1, article id.12] (II) Peer-reviewed publications during the period of this report (The symbol * refers to co-authors who are students or postdocs) 1. Weak emission-line quasars: a new clue from their optical variability Kumar, Ritish*; Gopal-Krishna; Chand, Hum; Negi, Vibhore* Monthly Notices of the Royal Astronomical Society (Letters), Vol. 538, L83 (March 2025) 2. Intranight optical monitoring of the rare quasar J0950+5128, the brightest known candidate for the transition from radio-quiet to

radio-loud state Chand, Krishan*; Gopal-Krishna; Chand, Hum Publ. of the Astronomical Society of Australia, Vol. 41, article id. e106 (December 2024) 3. Cosmic ray contributions from rapidly rotating stellar mass black holes: cosmic Ray GeV to EeV proton and anti-proton sources Allen, M.; Biermann, P. L.; Chieffi, A.; Chini, R.; Frekers, D.; Gergely, L.; Gopal-Krishna; Harms, B.; Jaroschewski, I.; Joshi, P. S.; Kronberg, P. P.; Kun, E.; Meli, A.; Seo, E. -S.; Stanev, T. *Frontiers in Astronomy and Space Sciences*, vol. 11, id. 1386305 (December 2024) 4. Clues on the nature of the quasi-periodic optical outbursts of the blazar OJ 287 Gopal-Krishna *Astronomy & Astrophysics (Letters)*, Vol. 688, L16 (August 2024) 5. In-situ acceleration of radio-emitting particles in the lobes of radio galaxies: Evolving observational perspective and recent clues Gopal-Krishna; Wiita, Paul J. *Journal of Astrophysics and Astronomy*, Vol. 45, Issue 1, article id.12 (June 2024).

Whole genome sequence analysis of *Vibrio cholerae* serogroup O139 (Bengal) associated with epidemic cholera in India and other Asian countries

Thandavarayan Ramamurthy, FNA

ICMR-National Institute of Cholera and Enteric Diseases, Kolkata

Vibrio cholerae O139, once considered a potential agent of the eighth cholera pandemic, has failed to sustain global transmission despite sharing key virulence traits with the pandemic O1 El Tor lineage. While cholera toxin (CT), encoded by *ctxAB* gene within the lysogenic phage CTX Φ , is central to classical cholera pathogenesis, emerging data suggest that non-toxigenic *ctx* gene-negative *V. cholerae* (NT-VC) strains may still cause cholera-like illness. In a previous study, 33 clinical O139 isolates lacking *ctxAB* were identified and characterized. Despite the absence of CTX Φ genes, these NT-VC strains retained critical virulence elements such as toxin-coregulated pilus (TCP), encoded by *Vibrio* Pathogenicity Island-1 (VPI-1), and displayed truncated versions of VPI-2, VSP-1, and VSP-2.

Phylogenetic analysis revealed that NT-VC strains were scattered across all three waves

(A, B, and C) of the seventh pandemic El Tor (7PET) lineage, suggesting independent and recurrent loss of *ctx* gene. Comparative genomic mapping showed partial or absent CTX Φ regions, with additional deletions of the genes *zot* and *ace* observed predominantly in Wave A. All isolates consistently carried *hlyA* (hemolysin, a type of cytotoxin), but lacked *genesto/stn* that encodes heat-stable enterotoxin and type III secretion system genes. Antimicrobial resistance determinants were frequently detected in Waves A and B but absent in Wave C. Comparison with the reference non-toxigenic strain 48853_F01 revealed genomic divergence, emphasizing that NT-VC isolates in this study are part of the 7PET lineage, unlike 48853_F01.

These findings support the hypothesis that NT-VC strains maintain virulence via alternative mechanisms independent of cholera toxin. Their ability to cause severe diarrhea, retain colonization factors, and carry resistance genes highlights their clinical and epidemiological significance.

Among over 100 serogroups of *V. cholerae*, the inclusion of both O1 and O139 in genomic investigations is of particular clinical significance, as these are the primary serogroups historically associated with epidemic and pandemic cholera. Based on the broad findings from the *ctx*-negative O139 isolates, we extended our investigation to *V. cholerae* O1 genomes. For this, over 8,000 publicly available genomes were screened from the EnteroBase database. Of these, 6,052 were confirmed as *V. cholerae* based on the presence of the *rfbV* gene that is involved in O antigen biosynthesis. Subsequent screening for the *ctxB* gene identified 553 genomes as *ctx*-negative (defined as <80% coverage). Further analyses are currently underway to characterize these *ctx*-negative O1 genomes in terms of their dominant ecological niches and genomic profiles. This comparative approach aims to assess whether similar patterns of *ctx* loss, virulence factor retention, and genomic adaptations exist across both O1 and O139 serogroups, underscoring the importance of continued genomic surveillance of atypical *V. cholerae* variants

INSA HONORARY SCIENTIST REPORT 2024-25

Collection, multiplication, and ex-situ conservation of selected critically endangered (CR) and endangered (E) legumes of Western Ghats

M. Sanjappa, FNA

Mahatma Gandhi Botanical Garden, University of Agricultural Sciences, GKVK, Bengaluru

Collected seeds and Seedlings of threatened tree species of *Humboldtia bourdillonii*, *Humboldtia vahliana*, and *Piliostigma foeveolata* were collected from the Western Ghats of Kerala and Maharashtra. The seed germination percentage, seed and seedling morphology, growth performance, and fungal and insect attacks, if any, were recorded. *Piliostigma foeveolata*. *Humboldtia bourdillonii* and *Humboldtia vahliana*, 20–45% of germination was observed. The field-collected seedlings showed slow growth. However, all seedlings have been established well in poly bags. After they attain about 60 cm in height, they will be transferred to the field in the threatened plants section of the

garden. The seedlings of *Cynometra travancorica*, *Humboldtia brunonis*, *H. sanjappae*, *H. vahliana*, and *Prioria pinnata* transferred to the field during the previous year have survived and performed well. It was observed that they perform better in shaded areas of the garden, a characteristic feature of moist evergreen forest species.



Plate 1: *Cynometra bourdillonii* Gamble. A&B. young twigs. *Cynometra travancorica* Bedd. C. Young branch. D. Germinating seeds, E. Single seedling. F. Seedlings transferred to polythene bags

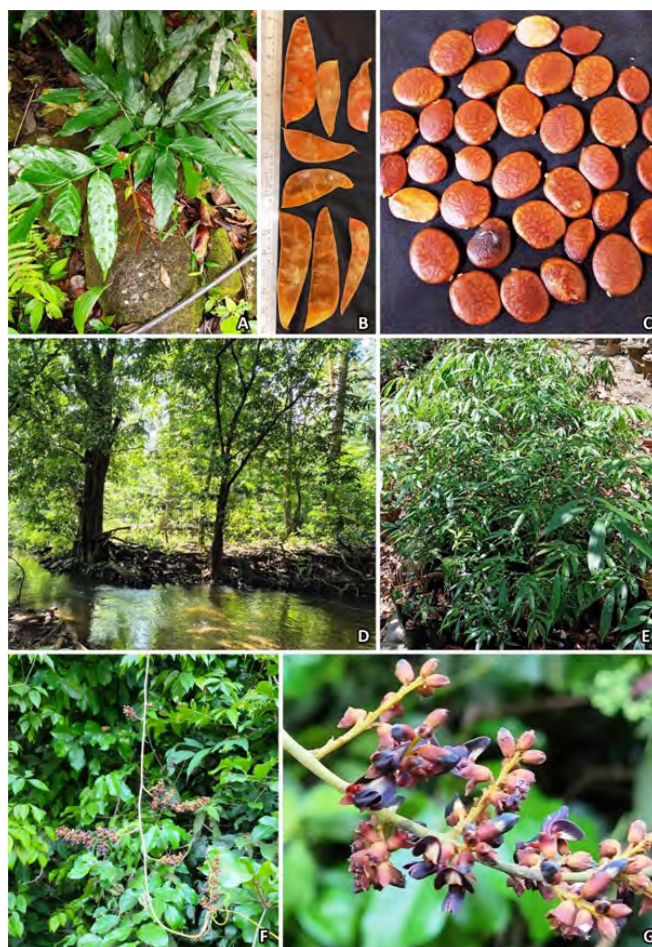


Plate 2: *Humboldtia bourdillonii* Prain A tree showing a young branch. B. Pods. C. Seeds. *Humboldtia vahliana* Wight. D. Trees in their habitat. E. Single tree. *Kunstleria keralensis* C.N. Mohanan and N.C. Nair, F. Flowering branch. G. Inflorescence enlarged

Synthesis of natural products containing α -Methylene- γ -butyrolactone unit

Subrata Ghosh, FNA

School of Chemical Sciences, Indian Association for the Cultivation of Science, Kolkata

Sarkomycin, a cyclopentanoid natural product, was isolated from the strain of the soil microorganism *S. erythrochromogenes*, *Shygelle species*, and *S. neyagawaensis*. It exhibits antibacterial and antiphage properties as well as antitumor activity. Because of its wide-ranging biological activities, it attracted the attention of synthetic organic chemists, leading to many syntheses. In connection with our continued interest in cyclopentanoid natural products, we have developed a simple protocol for synthesizing sarkomycin in an enantiomerically pure form. The key step in this approach is ring-closing metathesis of a dienol derived from D-mannitol to produce a cyclopentenol derivative having all the required functional groups present in sarkomycin. It is to be noted that sarkomycin itself is relatively unstable because of the presence of the carboxylic acid group. Thus, the cyclopentenol derivative was transformed to the more stable methyl ester of sarkomycin through many steps in overall good yield.

Making science public

D. P. Kasbekar, FNA

CDFD, Hyderabad

DPK published 16 popular articles to convey critical recent discoveries in Genetics to non-expert readers (15 in *The Hindu*, a newspaper, and 1 in *thewire.in*, an online magazine). As in previous years, Mr. Vasudevan Mukunth, Deputy Science Editor, *The Hindu*, Chennai, made many valuable suggestions to improve the pieces. Until now, DPK has published a total of 42 such articles.

DPK reviewed Projit Bihari Mukharjee's book "Brown Skins White Coats: Race Science in India 1920-66". The review (DOI: <https://doi.org/10.29195/DSSS.07.01.86>) appeared on Nov 25, 2024, in *Dialogue: Science, Scientists, and Society*. The Journal is published by the Indian Academy of Sciences (IASc).

Additionally, DPK taught the Research and Publication Ethics course to PhD students (with Dr. Rashna Bhandari, CDFD), served on the dissertation advisory committee of 2 PhD students of LVPEI (Hyderabad), refereed manuscripts for journals *G3* and *Environmental Epigenetics*, and mentored younger colleagues on how to prepare their research summaries for their nomination to Academies and the Guha Research Conference. Participated in the GRC 2024 meeting held in Kaziranga.

DPK continued serving as Editor of the Journal of Genetics (since 2021). He wrote a beginning-of-the-year editorial (<https://www.ias.ac.in/article/fulltext/jgen/104/0001>) and conducted the 2024 Editorial Board meeting and outreach in IIT-Guwahati. I have written a mid-year editorial to commemorate 2025 as the 40th year since the Journal was revived by the IASc (<https://doi.org/10.1007/s12041-025-01504-1>).

Finally, DPK continued to provide an 'extra pair of eyes' as 'coordinator' of the Laboratory of DNA Fingerprinting, CDFD, to check reports prepared by DNA examiners before they are sent to the Director for final signature.

The articles reported on a diversity of research areas. Such as DNA fingerprinting. Do genes determine whether someone will get tattooed? Yest model for a brain defect, DNA sequences conserved from mouse to humans, transmission of male-ness determining *SRY* gene through females, how new genes are created, why we lose muscle mass with age, privacy concerns raised by DNA studies, nickel toxicity and cholesterol, blood pressure gene in race horses, sex ratio skewing in wasps by endosymbiotic bacteria, discovering a face blindness gene, emergence of altruism, a microcephaly mutation, transgenerational inheritance of food preference in nematodes, and introgression of an immunity gene from Neanderthals into modern humans.

Tectonics and pore-fluid evolution of the main boundary thrust, Garhwal Himalaya

D. C. Srivastava, FNA
CSIR-CBRI, Roorkee

In the Garhwal Himalaya, the Main Boundary Thrust juxtaposes a series of Krol synclines in the hanging wall against the Cenozoic foreland sequences in the footwall. This project investigates a structurally critical sector in one of the Krol synclines, the Garhwal syncline. In the selected study area near the Rishikesh-Tapovan sector, the Blaini and Krol formations lie on a hanging-wall ramp of the Main Boundary Thrust. The three short field sessions partly completed the rocks' geological and structural mapping. Earlier studies have reported the occurrence of two diamictite units, the upper diamictite and the lower diamictite, and one dolostone band overlying the younger diamictite unit. A careful mapping in this project demonstrates the occurrence of two juxtaposed diamictite-cap dolostone couplets. The reason for the repetition of the diamictite-cap dolostone couplet is under investigation. The contact between the diamictite and cap dolostone is folded, faulted, and ductilely sheared at the outcrop scale. The results also show that the Blaini and Krol-A formations are deformed by two phases of co-axial folding and discretely distributed brittle faults and ductile shear zones. The high-resolution mapping brings the map-scale axial-plane folding in the Krol-A formation. Some observations on the structural fabric data have been made, but a more comprehensive data collection and analysis are needed to interpret the structural geometry. Several quartz and carbonate veins cut the slates and marlstones in the Krol-A formation. These veins are identified as potential candidates for fluid inclusion studies to understand the history of pore-fluid evolution.

A) Plant natural sources for drugs against neurodegenerating disorders

B) Induced mutations in non-basmati aromatic landraces of rice

Vishwas A. Bapat, FNA
Department of Biotechnology, Shivaji University, Kolhapur

Parkinson's and Alzheimer's are the two primary severe neurodegenerative disorders. Plants were screened for the presence of the drug molecules against these diseases. The drug, L-DOPA, extracted from the seeds of the *Mucuna* plant, has been commonly used in treating Parkinson's disease. The necessary biochemical characterization of the seed extracts of this plant showed the presence of L-DOPA and other nutritional and antinutritional components. *Crinum*, *Pancratium*, and *Dioscoria* plants for Alzheimer's disease were meticulously and methodologically screened for their standardization, including metabolic profiling of these plants. The extraction of metabolites, followed by related animal studies, confirmed the efficacy of these plants in treating Alzheimer's disease.

Induced mutation studies on two non-basmati aromatic landrace varieties (Ajara Ghansal and Kala Jirga) of rice have generated promising mutants. The properties and profiling of these rice mutants have been confirmed through seven successive generations. Mainly, dwarf mutants, early maturing mutants, high-yielding mutants, high tiller numbers, and lodging-resistant mutants were obtained, and these traits were stable in the seventh generation. The biochemical properties of all these rice mutants, such as mineral content and carbohydrate, protein, and lipid composition, were studied alongside this work. The cooking qualities were also assessed. The work was further extended to study their metabolomic behavior using the latest analytical instruments. The enhancement of lipids, anthocyanin conjugates, and derivatives of amino acids was observed. Mutants were also tested for biotic and abiotic stress tolerances. The field trials of these mutants were conducted across the state of Maharashtra.

Multiferroic and magnetoelectric properties of doped YbMnO_3 Manganite and properties of other compounds

Anil K. Bhatnagar, FNA

University of Hyderabad, Telangana

We have prepared compounds of YbMnO_3 doped with Eu and Gd at the Yb sites. The following compounds were prepared: $\text{Yb}_{1-x}\text{Eu}_x\text{MnO}_3$ ($x = 0.05, 0.10$ and 0.2); $\text{Yb}_{1-x}\text{Gd}_x\text{MnO}_3$ ($x = 0.05, 0.10, 0.2$ and 0.25). The X-ray diffraction (XRD) patterns of these doped polycrystalline samples confirmed that these samples were in a single hexagonal phase with space group $P6_3\text{cm}$ and no detectable impurities. The crystalline parameters, such as lattice parameters, cell volume, specific bond lengths, etc., have been evaluated. These samples' structural, morphological, magnetic properties, and relative cooling powers (RCP) were measured. The investigation employed X-ray diffraction (XRD), Field Effect Scanning Electron Microscope (FE-SEM), Raman spectroscopy, and magnetic measurements. It is found that the effective magnetic moments and Relative Cooling power (RCP) values of $\text{Yb}_{1-x}\text{Eu}_x\text{MnO}_3$ samples decreased with an increase in the Eu concentration.

In contrast, the magnetic moments and RCP values of $\text{Yb}_{1-x}\text{Gd}_x\text{MnO}_3$ samples increased with the Gd concentration. RCP values increase with the increase in the magnetic moment of a compound. A detailed analysis of all results is being carried out, and two papers will be written shortly.

We also carried out work on some oxide materials. We studied optical, thermal, and electrical properties of $[\text{50B}_2\text{O}_3\text{-30Li}_2\text{O-20BaO}]_{1-x}(\text{Sm}_2\text{O}_3)_x$ glasses [where $x = 0, 0.2, 0.4, 0.6, 0.8$, and 1.0 mol%]. The work has been published in the journal "Optical Materials." We also studied the doping effects of Sc at the Bi site of a lead-free piezoelectric ceramic $0.94(\text{Na}_{0.5}\text{Bi}_{0.5}\text{TiO}_3)\text{-}0.06(\text{BaTiO}_3)$ as $(1-x)(\text{Na}_{0.5}\text{Bi}_{0.5}\text{TiO}_3) \times x(\text{BaTiO}_3)$ material shows promising dielectric, ferroelectric, and piezoelectric properties. Samples $0.94(\text{Na}_{0.5}\text{Bi}_{0.5-x}\text{Sc}_x\text{TiO}_3)\text{-}0.06(\text{BaTiO}_3)$ ($x = 0.0, 0.05$, and 0.10) were synthesized, and their structural,

dielectric, and ferroelectric properties were studied. The paper on this work has been accepted for publication in the "Ceramic International" journal.

Further, the research works presented in an earlier DAE Solid State Symposium have been published in three AIP Proceedings during this period.

Electronic structure studies on the shell-confined multielectronic atoms

Kalidas Sen, FNA

University of Hyderabad, School of Chemistry, Gachibowli, Telangana

A summary of the research carried out¹⁻³ from April 2024 to March 2025 is presented below.

(1) The effect of impenetrable confinement on the information-theoretic measures of Shannon information entropy, Fisher measure, Onicescu energy, and entanglement measures, such as von Neumann and linear entropy, corresponding to H-, He, and Li+ in their ground electronic state. High-quality Hylleraas-like expansion and accurate numerical Hartree-Fock wave functions have been employed for the chosen set of two-electron *Zee* systems. The impenetrable confinement has been mimicked with a spherical cavity model potential of varying radius R , which, in turn, is used to quantify thermodynamic pressure within the adiabatic approximation. Some intriguing scaling laws related to von Neumann, linear, and Shannon entropy as a function of pressure are proposed. The influence of impenetrable confinement on the transition probability of $\text{He} \rightarrow \text{Li}^+$ during nuclear β decay is quantitatively assessed.

(2) The effect of impenetrable spherical confinement on alkali systems (H, Li) has been examined with a special focus on the distinctive high-momentum oscillatory behavior of the momentum space radial density. The computed electron momentum-space density has been

analyzed in four asymptotic limits ($R \rightarrow \infty$, $R \rightarrow 0$, $p \rightarrow \infty$, and $p \rightarrow 0$; R being the confinement radius and p being the radial component of linear momentum), and its oscillatory behavior in the strong spatial confinement region is critically investigated.

(3) The stability of a model two-electron system with tunable interelectronic repulsion has been explored concerning a scaling parameter κ . The complex scaling method within an orbital-based configuration expansion and the Ritz variational method with an explicitly correlated Hylleraas-type basis set are considered for this purpose. An estimation of the critical scaling parameter κ_c at which the bound state transforms into a shape resonance state is reported. The onset of quantum phase transition in the vicinity of κ_c is discussed by estimating geometrical properties such as radial moments.

References

1. Chakladar Koustav D., Mondal Santanu, Sen Kalidas, and Jayanta K. Saha (2024). Quantum-information-theoretic analysis of *Zee* systems under pressure confinement. *Physical Review A*, 110, 042819.
2. Chakladar Koustav D., Mondal Santanu, Bhattacharya Sukhmoy, Sen Kalidas, and Saha Jayanta K. (2025). On the high-momentum oscillatory distribution and related quantum information theoretical measures of confined alkali systems (H, Li), *Journal of Physics B: Atomic, Molecular and Optical Physics*, 58, 075003(16pp)
3. Pawlak Mariusz, Mondal Santanu, Sadhukhan Anjan, Sen Kalidas, Saha Jayanta K. (2025). Critical stability of a model two-electron system with tunable interelectronic repulsion. *International Journal of Quantum Chemistry*, 125, e70042 <https://doi.org/10.1002/qua.70042>

Study the influence of plant vascular microbiota on plants' health to defend against sap-feeding insect pests

Sampa Das, FNA

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I humbly submit that I could not perform the study according to the proposed title due to inadequate facilities. However, I am trying to continue the related aspects reflected in my publications. I am actively involved in various academic activities in the Genetic Department, Calcutta University, as and when requested by the Head of the department. A sincere effort has been extended to help the 4th Semester students of the 2024 academic session formulate and execute their respective project works as part of their curriculum.

Additionally, as a Coordinator, I have organized a One-day Symposium at Sister Nivedita University, Kolkata, in collaboration with Kolkata Nivedita Shakti on the topic "Women in Science, Technology, and Innovations, Challenges and Prospects" on Aug 27, 2024.

Dr N. Kalaiselvi, DG, CSIR, inaugurated the event with her inspiring remarks. Many women scientists participated as speakers and panelists. I am also involved in academic activities at nearby universities, such as Presidency University, Barasat State University, Burdwan University, etc.

List of Publications (April 2024-March 2025)

1. Nag, P., Supriya, Y., Datta, J., Bera, S., **Das, S.** (2024, November 11). Investigating microbial diversity in the endosphere and rhizosphere of three aromatic rice landraces: Implications for biological nitrogen fixation. *Current Microbiology*, 81(12), 454. doi: 10.1007/s00284-024-03978-1.
2. Bhar Anirban, Jain Akansha, Banerjee Debjyoti Bandhu, and Das Sampa. (2024, August). From cellular cleanup to defense: The stepwise

process of plant autophagy with special reference to their crucial role in biotic stress tolerance. *Nucleus*, 67(9).

3. Shriti Surbhi and **Das Sampa**. (2025). Navigating legume pathogen interactions: A biotechnological perspective. In Anirban Bhar (Ed.), *Plant-microbe interactions: A comprehensive review*. (Ch. 5, 78–102). Bentham Publications.
4. Nag Papri and **Das Sampa** (2025). Nitrogen-fixing bacteria: The friends in need. In Anirban Bhar (Ed.), *Plant-microbe interactions* (174–185). Bentham Publications.

Studies aimed at genetic improvement of Abiotic and Biotic Stress Tolerance and Grain Biofortification in Wheat

H. S. Balyan, FNA

Ch. Charan Singh University, Meerut

Professor H. S. Balyan is associated as a Co-PI with the following two research projects funded by USAID-BIRAC and DBT, Government of India, i.e. (i) an ongoing project 'Development of Heat Tolerant and Climate Resilient Wheat Cultivars by Utilizing Genomics, Molecular and Physiological Information and Resources,' and (ii) a recently approved project 'A Study of the Complex Genetic System for Developing a Package of R/S Genes to Breed for Spot Blotch Resistance in Bread Wheat.' Besides the above, the following research activities were also undertaken in wheat during the reporting period. (i) A Genome-wide association study (GWAS) for phytic acid content in wheat, (ii) Mining and characterization of SIZ1 genes across nine plant species and heat stress response of TaSIZ1 genes wheat genotypes, and (iii) Studies on pyramiding of alien genes for high grain Fe and Zn in bread wheat.

Publications

1. Kumar S, Kumar S, Sharma H, Singh VP, Rawale KS, Kahlon KS, Gupta V, Bhatt SK, Vairamani R, Gill KS, Balyan HS (2024). Physical map of QTL for eleven agronomic traits across fifteen environments, identification of related candidate genes, and development of KASP markers with emphasis on terminal heat stress tolerance in common wheat. *Theoretical and Applied Genetics*, 137, 235.
2. Singh, K., Balyan, H.S., & Gupta, P.K. (2024, November). Bioinformatics for analyzing the role of epigenetics in plant disease resistance. *Bioinformatics for Plant Research and Crop Breeding*, 22, 351–90.
3. Verma, A., Singh, R., Ahmed, S., Kumar, R., Sharma, S., Dhaliwal, H.S., Balyan, H.S., & Gupta, P.K. (2025). Further studies on the pyramiding of alien genes for high grain Fe and Zn in bread wheat. *Molecular Breeding*, 45, 1–20.

Atmospheric trace gases in the Indian region

Shyam Lal, FNA

Physical Research Laboratory, Navrangpura, Ahmedabad

We have analyzed observed surface-level CO at Ahmedabad from 2014 to 2021 to study long-term trends. Influenced by local emissions, CO levels exhibited substantial inter-annual variability without a clear linear trend from 2014 to 2018. However, post-2018, evening CO levels showed a consistent decline. This decline coincided with the nationwide adoption of measures to reduce vehicular emissions. The COVID-19 lockdown in 2020 resulted in a significant reduction in evening CO levels compared to the pre-lockdown (2014–2019) period. This highlights the potential for substantial CO reduction through stringent vehicular emission controls. Further details are given in Chandra et al. (2024)

I have been working with colleagues from ARIES and Nainital. Observations of NO₂, SO₂, HCHO, and CHOCHO were made at Pantnagar using a ground-based absorption Spectroscopy system. Comparison with satellite data shows an underestimation of satellite NO₂ column

densities, while SO₂ and HCHO column densities show nominal biases. These results have been published by Rawat et al. (2024). An ongoing study with these colleagues is to investigate the long-term variability of major air pollutants like nitrogen dioxide (NO₂), ozone (O₃), carbon monoxide (CO), and aerosols across six major urban sites in India. This study uses satellite-retrieved columnar data spanning nearly two decades (~2000 – 2020). Preliminary results show strong seasonality across all sites for all these trace gases.

Speech signal processing

Bayya Yegnanarayana, FNA

International Institute of Information Technology, Gachibowli, Hyderabad

One of the significant challenges in signal processing in general, and speech signal processing in particular, is understanding the phase component of the short-time spectrum since the phase cannot be computed accurately due to phase wrapping. I have proposed a method to overcome this problem using modified single-frequency filtering analysis. The resulting unwrapped phase function lets us see the speech production features in the phase spectrum, as in the magnitude spectrum. The wideband and narrowband equivalent group delay spectra were processed to obtain formant and harmonic contours for several types of voices, respectively. A paper on this work was published in JASA 2024. This study brings out an important issue regarding the significance of the phase in signal processing. The phase spectrum appears to contain more information than the magnitude spectrum. This means that the information in speech signals must be represented using the phase spectrum for most applications. I want to focus on this aspect in my future research effort.

I gave a 3-credit course at IIT Tirupati. I have given several invited talks and keynote addresses at conferences and workshops in India this year. I

am continuing as an Associate Editor for the Journal of the Acoustical Society of America. I am also a Distinguished Professor at IIT Hyderabad.

Reference

1. Yegnanarayana B. and Pannala Vishala. (2024). Processing group delay spectrograms for studying formant and harmonic contours in speech signals. *In The Journal of the Acoustical Society of America*, 156(4), 2422–2433.

Functionalization of useful aromatic and heteroaromatic molecules via C-H activation using benign and less expensive metals

Brindaban C Ranu, FNA

School of Chemical Sciences, Indian Association for the Cultivation of Science, Jadavpur, Kolkata

A feature article has reported the potential of ball milling in the synthesis of pharmaceutically important classes of molecules without using any solvent (solvent-free conditions) (*Chem. Commun.*, **2025**, 61, 247–265). The solventless reaction is of much interest as it contributes significantly to the cleanliness of the environment. This is an invited article for a special issue of Chemical Communications. Another review reports the various procedures for synthesizing oxygen- and sulfur-containing heterocycles of biological importance under visible light-induced reactions (*Curr. Top. Med. Chem.*, **2025**, 25, 124). The green aspects and mechanisms of each procedure have been discussed. Another review highlights the recent developments in visible-light-induced methods for the synthesis of some selected biologically active N- and S- containing heterocycles such as benzothiazoles, indoles, and triazoles and their functionalization (*Curr. Green Chem.*, **2024**, 25, 2025). These methods' advantages, aspects, and limitations have also been discussed. A book chapter reporting the use of green solvents such as water and alcohols for the synthesis of various carbohydrates has been contributed in a book, 'Carbohydrates in Chemistry and Biology' published by De

Gryuter, Germany (Carbohydrates in Chemistry and Biology, Eds. V. K. Tiwari and B. Banerjee, De Gryuter, Germany, Vol. 9, Ch.12, **2025**, pp 139-165).

A monograph on the ecology of the Himalayan oak (*Quercus*) and pine (*Pinus*) forest zone and trees in a changing world

S. P. Singh, FNA

Graphic Era (deemed to be) University, 566/6, Bell Road, Society Area, Clement Town, Dehradun, Bharu Wala Grant, Uttarakhand

Drought responses of pine and oaks: a global analysis

Pines (~113 species) and oaks (~435 species) are presumably the largest forest-forming trees of the Northern Hemisphere (pines are also planted extensively in the Southern Hemisphere). They co-occur in regions with sub-optimal growth conditions characterized by seasonal drought. Seasonal droughts are common in the areas where pine and oak co-occur. Because of climate change, droughts are intensifying, so understanding drought adaptation in pine and oak species is a matter of great ecological interest. The objective of this meta-analysis was to characterize the drought responses of pine and oak at the genus level, involving the studies conducted during the last three decades. Data on study location indicate that most of the studies were carried out in the USA, France, and recently in Canada, Spain, and Germany. Across the 104 major studies, 29 pine and 42 oak species of the 58 pine-oak combinations. The consistent basic strategy of pines and oaks to drought is: (i) The pines showed an isohydric trait with tighter stomatal control, while tree water potential was high; (ii) The oaks, on the other hand, kept their stomata open over a considerably lower water potential. Oaks resist drought and undergo a greater daily Ψ_{Δ} (mean, 0.79 MPa) than pines (0.5 MPa). The advantage of keeping stomata open at a low water potential is maintaining a high

carbon reserve in the oaks.

In comparison, the pines' carbon reserve is depleted to support respiration in dry conditions. Because of this, oaks recover more effectively after drought than pines. However, the early stomatal closure enables pines to maintain higher water use efficiency than oaks. This marked difference in drought responses enables pines and oaks to co-occur widely across all the continents of the Northern Hemisphere. This complementarity in drought responses in pines and oaks is a significant cause of their resilience, enabling them to co-occur for millions of years.

Meta-analysis of genomics in female uterine

R C Sobti, FNA

Department of Biotechnology, Punjab University, Chandigarh

During 2024, we continued to do an in-depth analysis of transcriptomic datasets related to **infertility** and **ovarian disorders**. This included preprocessing raw gene expression data, performing Differential Gene Expression (DEG) analysis, and Weighted Gene Co-expression Network Analysis (WGCNA) to identify key gene modules and hub genes involved in infertility and ovarian dysfunction. IPA analysis was also done for these datasets. Functional enrichment using **GO** and **KEGG** pathways was also done. The IPA revealed significant dysregulation in canonical pathways based on $-\log(p\text{-value})$ and Z-score thresholds, with a $\log(p\text{-value}) > 1.3$ indicating statistical significance and z-scores $\geq +2$ or ≤ -2 denoting pathway activation or inhibition, respectively. The analysis highlighted the activation of acute phase response signaling, LXR/RXR activation, and response to elevated platelet cytosolic calcium. In contrast, pathways like 3-phosphoinositide biosynthesis, adrenomedullin signaling, ion channel transport, the super pathway of inositol phosphate compounds, and mitochondrial dysfunction were significantly suppressed.

Publications

We have published six books by Springer/Elsevier/and CRC publishers, and three are under publication, two are under preparation.

We are also compiling a book for INSA **Blueprint For A Viksit Bharat: Thriving Minds, Fields Labs And Lives** to be submitted by Aug 31, 2025

Three papers have been published in international journals. Specifically focusing on the molecular basis, hormonal imbalances, and their potential

Characterization of folding intermediates

Faizan Ahmad, FNA

Department of Biochemistry, School of Chemical and Life Sciences, Jamia Hamdard, Hamdard Nagar, New Delhi

Ferroportin (FPN) is a transmembrane protein and is the only known iron exporter that helps maintain iron homeostasis in vertebrates. We have identified an alternatively spliced novel isoform of the human SLC40A1 gene, which encodes for the FPN protein, which is observed to be expressed in different tissues. Molecular modeling and molecular dynamics simulation studies revealed key structural features of the novel isoform (FPN-N).

Protein aggregation and misfolding are central factors in the pathogenesis of disorders such as neurodegenerative conditions. We explored the significance of different classes of osmolytes in modulating protein aggregation. Osmolytes can prevent protein aggregation and hinder protein misfolding. Our study provides valuable insights into their role in industries and their potential to develop novel treatments for various disorders.

One of the significant causes of death among men comes from prostate cancer. Surgery, radiation, and chemotherapy are often effective but can have adverse side effects on the patient's body. We screened phytocompounds of *Eleusine coracana* from the Indian medicinal

plants' database to investigate their ability as activators of HSP90AA1. We observed that isovitexin, vitexin, triglochinin, caffeic acid, and stigmasterol hold great potential in developing novel, less toxic therapeutic agents for prostate cancer management.

Quantum dissipative phenomena

Sushanta Dattagupta, FNA

Sister Nivedita University, New Town, Kolkata

I have continued to work on quantum phenomena of interest in condensed matter physics and non-equilibrium statistical mechanics. The assumed scenario is an 'Open Quantum System' in which a subsystem governed by unitary evolution is in dissipative interaction with a quantum heat bath held at a fixed temperature. The adopted methodology is based either on the Schrödinger picture of a time-dependent density operator or the Heisenberg picture of time-dependent dynamical variables. The work has led to the following publications during the period under consideration, appended herewith.

Appendix

1. *Independent-oscillator model and the quantum Langevin equation for an oscillator: a review*, A. Ghosh, M. Bandyopadhyay, S. Dattagupta and S. Gupta, *Jour Stat Mech: Theory and Experiment*, **074772**, 1, July 2024.
2. *Weak-coupling limits of the quantum Langevin equation for an oscillator*, A. Ghosh and S. Dattagupta, *Physica A* **648**, 129926, July 2024.
3. 'Opinion' on *Superfluidity*, S. Dattagupta, *Science and Culture*, **90**, 389, September - October 2024.
4. *Microscopic analysis of relaxation behavior in nonlinear optical conductivity of graphene*, B. Ghosh, S. Dattagupta, and M. Bandyopadhyay, *Physica Scripta* **99**, 115920, October 2024.
5. 'Opinion' on *Bose's letter to Einstein*, S. Dattagupta, *Science and Culture* **90**, 507,

November -December 2024.

6. *Stochastic-thermodynamics and the Ericsson nano engine – efficiency from equilibrium results*, J. Kaur, A. Ghosh, S. Dattagupta, S. Chaturvedi and M. Bandyopadhyay, *Physica A* **660**, 130327, January 2025.
7. *Brownian motion approach to statistical mechanics: Langevin equations, fluctuations and timescales*, S. Dattagupta and A. Ghosh, *Physics of Fluids* **37**, 027199, February 2025.
8. *Quantum transport under oscillatory drive with disordered amplitude*, V. Tiwari, S. Dattagupta, D. S. Bhakuni and A. Sharma, *Jour Phys: Condensed Matter* **37**, 135602, February 2025.

A non-destructive method to control damage to orchards by fruit bats

G. Marimuthu, FNA

Madurai Kamaraj University, Madurai

Even though megachiropteran bats in the Old-World tropics feed chiefly upon fruits, flowers, and nectar produced by wild plant species, the public frequently views these ecologically beneficial megachiropterans in a negative aspect due to the potential for damage to fruitcrops. Fruit bats and farmers in India are subjected to such conflicts. The short-nosed fruit bat, *Cynopterus sphinx*, is among the most common 14 megachiropterans on the Indian subcontinent. It feeds upon commercial fruits like mango, guava, sapota, and grape berries and non-commercial fruits such as *Ficus* spp., *Calophyllum inophyllum*, and *Coccinia indica*. In addition, *C. sphinx* feeds upon the leaves of *C. indica*, *Cassia fistula*, and *Mimusops elengi*. We observed the number of visits made by *C. sphinx* to four species of commercial fruits in orchards (*Mangifera indica*, *Achras sapota*, *Psidium guajava*, and *Vitis vinifera*) and four species of wild/non-commercial fruits (*Muntingia calabura*, *Ficus bengalensis*, *F. religiosa*, and *Bassia latifolia*) in suburban areas. The number of bat visits to *M. calabura* was significantly greater than all other fruit species. The range of

percentages of total nightly bat visits was from as low as 5.0 % (*V. vinifera*) to 47.0 % (*F. religiosa*), in comparison to the total nightly visits made to *M. calabura*. In addition, the number of mist-netted individuals of *C. sphinx* per hour near *M. calabura* was also significantly higher than near other fruit species. We suggest that if *M. calabura* is grown in and around orchards, damage caused by *C. sphinx* to commercial fruit crops may be decreased and, therefore, would serve as a non-destructive method for managing the removal of commercial fruits by bats.

Combining carvedilol and endoscopic variceal ligation is superior to carvedilol alone for primary prophylaxis of variceal bleeding in high-risk cirrhotics: A randomized controlled trial

Premashis Kar, FNA

Devi Foundation, Max Healthcare, Max Super Specialty Hospital, Saket, New Delhi

Primary prophylaxis against variceal hemorrhage in cirrhosis typically involves non-selective beta-blockers (NSBBs) or endoscopic variceal ligation (EVL). Carvedilol, a potent NSBB with α_1 -blocking activity, has shown superior portal pressure reduction compared to propranolol. However, its efficacy in combination with EVL in preventing first variceal bleed in high-risk cirrhotic patients remains inadequately studied.

This single-center, open-label, randomized controlled trial enrolled 80 cirrhotic patients (July 2022–July 2023) with large varices or red color signs and no history of prior bleeding. Patients were randomized 1:1 to receive either (1) carvedilol alone or (2) carvedilol plus serial EVL until variceal eradication. The primary outcome was the first variceal bleed within 1 year. Secondary outcomes included all-cause mortality, hospitalization for bleeding, and adverse events.

Seventy-two patients (n=36 per group) completed follow-up. First, variceal bleeding occurred in 8.3% of the EVL+carvedilol group versus 25.0% with carvedilol alone (p=0.041).

All-cause mortality was significantly lower in the combination group (11.1% vs 27.8%, $p=0.048$). Fewer hospitalizations due to bleeding were observed in the EVL+ carvedilol group (5.5% vs 22.2%, $p=0.031$). Adverse event rates were similar between groups.

Among cirrhotic patients with high-risk varices, combining EVL with carvedilol significantly reduces first variceal bleeding and mortality compared to carvedilol monotherapy. This dual-modality approach may represent a superior prophylactic strategy in selected high-risk populations.

Electron paramagnetic resonance (EPR) and magnetic studies on rare earth manganites and magnetic field-induced two-dimensionality in three-dimensional systems

S V Bhat, FNA

Department of Physics, Indian Institute of Science, Bengaluru

Samples of the robust charge ordering compound with narrow bandwidth $\text{Sm}_{0.42}\text{Ca}_{0.58}\text{MnO}_3$ ($T_{\text{CO}} = 275 \text{ K}$) were prepared ("**Minimising Size and Polydispersity of Nanoparticles: Role of Microwaves and Choice of Appropriate Surfactants**"; Pratheek, Balachandra G. Hegde, and Subray V. Bhat (2025); **Chapter in the book "Innovations in Electronic Materials: Advancing Technology for a Sustainable Future, Advances in Science, Technology & Innovation"**, https://doi.org/10.1007/978-3-031-73816-6_34 (S. K N et al. (eds.)). and characterized using XRD, TEM, SQUID magnetometry, XPS and X-band EPR. X-ray diffraction and transmission electron microscopy estimated the crystallite and particle sizes. The valence states of the manganese ions on the surface of the particles were determined by X-ray photoemission spectroscopy. EPR signals were recorded in the temperature range 350-130 K, and the observed broad featureless signals were fitted to appropriate lineshape functions to extract the parameters: a broad Lorentzian line

shape function perfectly fitted the signals from the bulk sample. However, the nanoparticle signals had an unusual kind of asymmetry, and a detailed analysis showed that the pseudo-Voigt lineshape modified by Doniach-Sunjic (S. Doniach and M. Sunjic J. Phys. C: Solid State Phys. 3 285 (1970)) was required to fit these signals. The near-total absence of the tell-tale signatures of CO, viz., the peaks in magnetization and EPR intensity and the minimum in the EPR linewidth at the CO temperature T_{CO} in the nanoparticle samples, points towards a complete disappearance of charge order in sufficiently small and monodisperse nanomanganites. ("**Electron Paramagnetic Resonance and Magnetization Insights into Size-Induced Charge Order 'Melting' in Nanoparticles of $\text{Sm}_{0.42}\text{Ca}_{0.58}\text{MnO}_3$** " Pratheek, Narmada Hegde, Balachandra G. Hegde, S. V. Bhat (2025). *Applied Magnetic Resonance*, 56, 631–647.

Transcriptional activation of retrotransposons

K. C. Upadhyaya, FNA

School of Life Sciences, Jawaharlal Nehru University, New Delhi

Transcriptional activation of the L1 retrotransposon was studied under induced epileptic conditions in rats. Epilepsy is a chronic neurological disorder characterized by recurrent seizures due to excessive electrical discharges in a group of brain cells. Studies have shown that LINE-1 is transcriptionally activated under various neurological conditions. Epilepsy in Wistar rats was induced both by iron (ferric chloride) and by pilocarpine. Between 2 and 5 days, 96% of iron-injected rats develop behavioural complex partial seizures associated with electrographic seizure activity that originated on the focal side and spread contralaterally. Pilocarpine, acting through muscarinic receptors, causes an imbalance between excitatory and inhibitory transmission, resulting in the generation of seizures. RNA from different rat brain tissues was isolated, and transcript levels were monitored by RT-PCR and real-time PCR.

Initial results indicate that under induced epileptic conditions, L1 retroelements get transcriptionally upregulated in the hippocampus. Besides L1 activation in experimentally induced epilepsy in rats, the FOXO3 gene was also studied. The FOXO3 gene serves as an indicator of oxidative stress in epilepsy. Oxidative stress plays a significant role in brain cell damage and the production of reactive oxygen species. The mRNA expression of FOXO3 is downregulated in both the cortex and the hippocampus of FeCl₃-induced epilepsy in epileptic rats. The mRNA expression in the cortex of LiCl-Pilo induced epileptic rats was observed to be downregulated. Still, in the hippocampus, the expression of FOXO3 mRNA was elevated compared to that of the control rats. It was observed that the mRNA expression of the L1 ORF1 was enhanced in the cortex and hippocampus of both induced models of epilepsy, as compared to their controls. Similar trends were also observed in the case of L1 ORF2, where its expression was also elevated in both the brain regions of epileptic rats compared to their control.

Role of DNA structure in transcription factor binding

Manju Bansal, FNA

Indian Institute of Science, Bangalore

Understanding the DNA Recognition Principles of Eukaryotic Transcription Factors. Transcription factors are proteins that regulate gene expression by binding to the DNA sequence of interest and then activating/inhibiting gene expression. Major pharmaceutical giants are currently involved in developing and marketing TF-targeting drugs. However, one area of potential drug targeting is unexplored, viz. TF:DNA interaction. This area faces a significant challenge due to which drugs are either failing at clinical trials and occasionally after being launched, due to cross-talk between TFs, or due to the complexity involved in finding a complementary binding surface, since the TF:DNA binding interface is relatively flat. We have focused on identifying various features of the TF:DNA binding interface. If the unique

interactions responsible for DNA interaction in each TF family are identified, then drugs could be synthesized to target these key interactions and not the entire interface.

Roadmap To Elucidate The Recognition Principles of TF:DNA Binding

Transcription factors (TFs) achieve high specificity in recognizing their target motifs despite the complexity of the genomic landscape. This specificity is primarily mediated by a coordinated network of hydrogen-bonded (HB) and non-bonded (NB) interactions involving DNA bases and the sugar-phosphate backbone. Among these, hydrogen bonds between protein side chains and DNA bases (PSC:DBR) are especially critical, providing the principal mechanism for sequence-specific recognition. To investigate the structural basis of this specificity, we systematically analyzed amino acid binding preferences and hydrogen bond interaction patterns across 38 transcription factor families. Each hydrogen bond was classified into one of seven distinct types, based on the number of hydrogen bonds formed between a single amino acid and a DNA base and the geometry of the interaction. The classification captures distinctions such as simple vs. complex, single vs. multiple bonds, bidentate vs. bifurcate interactions, and whether the contact occurs within a single DNA strand or across complementary strands. This analysis revealed family-specific preferences in the amino acids employed for DNA recognition and the modes of hydrogen bonding used to engage DNA bases. The diversity of interaction types highlights the structural specialization among TF classes and underscores the importance of contact geometry and DNA shape readout in defining binding specificity. Collectively, these patterns reflect how evolutionary pressures have shaped a range of recognition strategies across TF architectures to achieve precise and selective DNA binding and deliver the Prof M.Vijayan Award lecture at the 51st National Crystallography Symposium, held at Nagpur, during 27-29 November 2025.

Manuscript under preparation

1. D Ghoshdastidar, V Rangannan, K Takur, and M Bansal. Diverse DNA Recognition Principles of Eukaryotic Transcription Factors.
2. V Rangannan, D Ghoshdastidar, K Takur, and M Bansal. TFDB: A Comparative Structural Analysis Platform for DNA-transcription factor complexes.

A study of algebraic number fields

Sudesh Kaur Khanduja, FNA

IISER Mohali, Punjab

The discriminant is a fundamental invariant associated with an algebraic number field. The problem of the practical computation of discriminant, as well as an integral basis of an infinite family of algebraic number fields which are defined over the field $\mathbb{Q}$ of rational numbers by certain types of irreducible polynomials, has been tackled by several mathematicians. In this project, we have dealt with the above problem for the family of exponential Taylor polynomials:

$$T_n(x) = x^n/n! + x^{n-1}/(n-1)! + \dots + x^2/2! + x/1! + 1$$

whose irreducibility over $\mathbb{Q}$ was proved by Schur in 1929 for all natural numbers n . Let K_n denote the algebraic number field generated over $\mathbb{Q}$ by a root of $T_n(x)$. We have calculated the discriminant of the field K_n and explicitly constructed a p -integral basis of K_n for each prime number p . These p -integral bases quickly lead to constructing an integral basis of K_n . We have also extended Schur's Irreducibility result to a class of more general polynomials that contains the family of exponential Taylor Polynomials.

These results have been published in the following two papers:

1. A. Jindal and S. K. Khanduja, "Discriminant and Integral Basis of Number Fields defined by Exponential Taylor Polynomials," Proceedings of the Edinburgh Mathematical Society, 67 (2024), 528–541.
2. A. Jindal and S. K. Khanduja, "An Extension of Schur's Irreducibility Result," Journal of Algebra, 664(2025), 398–409.

Annexure-XVI

CONFERENCES/ SEMINARS/ SYMPOSIUMS/ WORKSHOPS SUPPORTED BY INSA DURING 2024-25

S. No.	Details of Convener	Details of Conference/ Seminar / Symposium etc.	Amount (in Rs.)
1	Dr Pragati Pramanik Maity Indian Society of Agrophysics, Division of Agricultural Physics, ICAR-Indian Agricultural Research Institute, New Delhi 110012	National Seminar on Smart Technologies for Sustainable Agriculture and Environment, 22/02/2024 to 23/02/2024	50,000/-
2	Professor S. H. Pawar NBNSCOE, Sinhgad Institutes, Kegaon, Solapur, Maharashtra 413255	2 nd Int. Conference on Silk Fibroin and Sericulture Resources: New Interface between Nano and Biological, 24/07/2024 to 26/07/2024	50,000/-
3	Dr Bedabati Chowdhury, Department of Botany, University of Science and Technology, Meghalaya, Meghalaya 793101	Emerging Frontiers in Biological Sciences: Focus on Climate Change, Agrotechnology and Entrepreneurship, dated 15/05/2024 to 17/05/2024	1,00,000/-
4	Dr Mudasir Ahmad, Division of Animal Biotechnology, SKUAST Kashmir 190025	Summit on Kashmir Science Vision - 2024, 22/08/2024 to 23/08/2024	2,00,000/-
5	Professor Jitendra Bera, Department of Chemistry, IIT Kanpur, Kanpur 208016	International Conference on Organometallic Chemistry, 14/07/2024 to 18/07/2024	1,00,000/-
6	Dr Sreenivasa Rao Amaraneni, East Point College of Engineering and Technology Virgo Nagar Post, Avalahalli, Bangalore 560049	International Conference on Pesticides and related emerging organic pollutants impact on the Environment and Human Health and Its Remediation Strategies 07/11/2024 to 09/11/2024	50,000/-
7	Dr Sunil P.S, School of Marine Sciences, Cochin University of Science and Technology, Cochin	International Conference on Frontiers in Marine Sciences - MARICON 2024, 08/04/2024 to 10/04/2024	50,000/-
8	Dr Himanshu Pathak, Indian Institute of Technology Mandi, HP 175005	Int. Conference on Composites Design, Processing, Manufacturing and Health Monitoring, 20/06/2024 to 21/06/2024	1,00,000/-

9	Dr Somnath Mukhopadhyay, Dept of Computer Science & Engineering, Triguna Sen School of Technology, Assam University, Silchar 788011 Assam	2nd IEEE CIS Summer School on Contemporary Advancement in Multi Objective Optimization (CAMOO), 16/08/2024 to 21/08/2024	1,00,000/-
10	Dr Lija Jacob, Department Of Data Science Christ University, Lavasa, Pune 412112	Capacity Building Workshop on Investigating the Intersection of Advanced Research Methodologies with Generative Artificial, 03/06/2024 to 07/06/2024	1,00,000/-
11	Dr M. Navaneethan, SRM Institute of Science & Technology, Kattankulathur, Chennai	International Conference on Advanced Functional Materials and Devices, 26/02/2024 to 29/02/2024	1,00,000/-
12	Professor Sujit Kumar Bhutia, National Institute of Technology, Rourkela, Odisha 769008	Techniques on Cell Death Signaling (TCDS-2024), 21/08/2024 to 25/08/2024	1,00,000/-
13	Dr K. M. Sakthivel, PSG College of Arts and Science, Dept of Biochemistry, Coimbatore 641014	International Symposium on Cardiovascular Sciences ISCS-2024, on 06/03/2024	1,00,000/-
14	Dr KuppusamyThangaraju, Department of Physics, NIT Warangal, Hanamakonda, Warangal, Telangana 506004	International Conference on Emerging Multifunctional Materials and Devices for Sustainable Technologies - IEMDST-2024, 04/07/2024 to 05/07/2024	1,00,000/-
15	Dr Sudhansu Sekhar Rout, Department of Mathematics, NIT Calicut, NIT Campus PO, Kozhikode 673601	International Conference on Lie Algebra and Number Theory (ICLANT - 2024), 10/06/2024 to 14/06/2024	1,00,000/-
16	Dr G N Hariharan, M S Swaminathan Research Foundation, Institutional Area, Taramani, Chennai 600113	International Conference on Hunger Free World: Professor M.S. Swaminathan's Vision for an Evergreen Revolution, 07/08/2024 to 09/08/2024	1,00,000/-
17	Dr. Vijay Kumar, College of Agriculture Punjab Agricultural University, Ludhiana 141004	Transforming Agrifood Systems in the Face of Climate Changes and Energy Transitions (IESIC-2024), 12/11/2024 to 15/11/2024	50,000/-
18	Dr. Kushagra Bansal, MBGU, JNCASR, Jakkur, Bengaluru 560064	6th International Chromosome Stability, 13/12/2024 to 17/12/2024	50,000/-

19	Dr Debjyoti Bhattacharyya, Dept. of Life Science and Bioinformatics, Assam University, Silchar 788011	XXXIV Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT) and International Seminar on Botanical, 23/11/2024 to 25/11/2024	1,00,000/-
20	Dr Prosenjit Daw, Dept. of Chemical Sciences, IISER Berhampur Berhampur, Odisha 760010	16th Int. Conference on Frontiers of Polymers and Advanced Materials (ICFPAM2024), 09/11/2024 to 13/11/2024	1,00,000/-
21	Dr Abhishake Mondal, SSCU, Indian Institute of Science, Bengaluru 560012	Int. Conference on Modern Trends in Molecular Magnetism & Spins in Molecular Systems (MTMM / SiMS), 05-08/11/2024	50,000/-
22	Dr Ashutosh Kumar Singh, Dept. of Geology, University of Delhi, North Campus, Delhi	29th Indian Colloquium on Micropaleontology and Stratigraphy, 17/10/2024 to 19/10/2024	1,00,000/-
23	Dr Jose Mathew, National Institute of Technology Calicut, Calicut 673601	13th International Conference on Precision, Micro, Meso and Nano Engineering, 13-15/12/2024	1,00,000/-
24	Dr Kankat Ghosh, Indian Institute of Technology Jammu, Jammu 181 221	24th International Conference on Numerical Simulation of Optoelectronic Devices, 23/09/2024 to 27/09/2024	1,00,000/-
25	Dr Ashish Kumar Kakkar, Dept. of Pharmacology, PGIMER, Chandigarh 160012	6th National Conference & Workshop on Antimicrobial Stewardship Practices, 22/08/2024 to 25/08/2024	50,000/-
26	Dr Dipankar Nandi, Department of Biochemistry, IISc, Bangalore 560012	IMMUNOCON-2024, 17/10/2024 to 20/10/2024	50,000/-
27	Dr Samir Kumar Sil, Dept. of Human Physiology, Tripura University, Tripura 799022	Emerging Health Issues and Challenges: Perspective from NorthEast India, 15/11/2024 to 17/11/2024	75,000/-
28	Dr Rekha Kumari, Miranda House, University of Delhi, Delhi 110007	Emerging Frontiers in Biomedical Research, 14/10/2024 to 16/10/2024	50,000/-
29	Dr Sarika Jalan, Indian Institute of Technology (IIT) Indore, MP 453552	International School and Conference on Network Science, NetSciX 2025, 14/01/2025 to 17/01/2025	1,00,000/-
30	Dr Anirban Roy, Department of Sciences and Humanities, CHRIST Bangalore	Annual Conference of the Ramanujan Mathematical Society, 27/12/2024 to 29/12/2024	1,00,000/-

31	Dr Rishi Sharma, Dept. of Physics, Birla Institute of Technology Mesra, Ranchi 835215	2 nd Indo-European Symposium on Surface Engineering (IESSE-2024), 11/12/2024 to 12/12/2024	1,00,000/-
32	Dr Ashwani K. Tiwari, IISER Kolkata, Mohanpur Nadia, WB 741246	Physics and chemistry of atomic, molecular, and condensed matter Systems, 11/12/2024 to 14/12/2024	1,00,000/-
33	Mr. Jai Shankar Sharma, IIT Kanpur Alumni Association Delhi Chapter and DST GK, New Delhi 110048	Startup Master Class (SMC), 23/10/2024	2,00,000/-
34	Professor Shobha Shukla, IIT Bombay, Powai, Mumbai, Maharashtra 400076	Women in Optics and Photonics in India 2024 dated: 06/12/2024 to 08/12/2024	2,00,000/-
35	Professor Hridayesh Prakash, Amity Centre for Translational Research, Amity University, Sector 125, Noida 201313	5th Global Cancer Consortium conference on Cancer and Cancer Immunotherapy cum workshop on Immunopharmacology dated: 28/01/2025 to 31/01/2025	1,00,000/-

Annexure-XVII

APPLICATIONS APPROVED FOR INSA VISITING SCIENTIST PROGRAMME 2024**(FY 2024-25)**

S. No.	Applicant's Details	Visiting Institute's Name & Address	Approved Duration
1	Aditi Buch Dept. of Biological Sciences, P D Patel Institute of Applied Sciences, Charotar University of Science and Technology, CHARUSAT Campus, Changa 388 421	National Centre for Cell Science, Pune NCCS Complex, SPPU campus, Ganeshkhind, Pune 411007	1 Month
2	Shashikumara P Division of Crop Improvement, ICAR-Indian Grassland and Fodder Research Institute, Jhansi, UP 284003	International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) Patancheru, Hyderabad, Telangana 502324	1 Month
3	Hemasundar Alavilli Dept. of Biotechnology, GITAM University, Visakhapatnam 530045	Biotechnology University, Gandhinagar 382355	2 Months
4	Murugadas Vaiyapuri ICAR-Central Institute of Fisheries technology (ICAR-CIFT), Kochi, Kerala 682029	National Institute of Animal Biotechnology (NIAB), Extended Q City Road, Gachibowli, Hyderabad 500032	1 Month
5	Rizwan Rashid Sher-e-Kashmir, University of Agricultural Sciences and Technology of Kashmir, Srinagar, J&K 190025	Punjab Agricultural University PAU- Ludhiana Punjab 141004	4 Months
6	Santosh Kumar Upadhyay Dept. of Botany, Panjab University, Chandigarh 160014	National Institute of Plant Genome Research, New Delhi 110067	2 Months
7	Sesha Kiran Kollipara Horticultural Research Station, Bayyappagaripalle, Annamayya Dt, Andhra Pradesh 517 325	Jawaharlal Nehru University New Mehrauli Road New Delhi 110067	2 Month
8	Shweta Singh ICAR-Indian Institute of Sugarcane Research, Raebareli Road, Lucknow	ICAR-Indian Agricultural Research Institute, Pusa Campus, New Delhi 110012	2 Months

9	J. Sivakamavalli Saveetha Dental College & Hospitals, Vellapanchavadi 600077	All India Institute of Medical Sciences (AIIMS), New Delhi	2 Months
10	Naveen Chandra Wadia Institute of Himalayan Geology 33, GMS Road, Dehradun 248001	Indian Institute of Technology, Indore 453552	1 Month
11	Rupa Mukherjee, Dept. of Chemistry, Rajendra College, Chapra 841301, Bihar	Physical Research Laboratory, Ahmedabad 380009, Gujarat	3 Months
12	Amrit Suman Sharda School of Engineering & Technology, Sharda University, Greater Noida 201 310	Indian Institute of Technology (Indian School of Mines) Dhanbad 826 004	1 Month
13	B. Vanavil Kalasalingam Academy of Research and Education, Krishnankoil 626126	Indian Institute of Technology- Madras, Chennai 600036	1 Month
14	Debapriya Mandal, Dept. of Chemical Engineering, IIT Jammu, Jammu 181221	Institute of Chemical Technology, Mumbai 400019	4 Months
15	Desh Deepak Sharma Dept of Electrical Engineering, MJP Rohilkhand University, Bareilly	Indian Institute of Information Technology & Management, Gwalior 474015	1 Month
16	Chinmaya Prasad Padhy GITAM Deemed to be University, Hyderabad, Telangana 502329	Indian Institute of Technology (IIT), Guwahati, Assam 781039	2 Months
17	Navneet Sharma Amity University Uttar Pradesh, Noida	Indian Institute of Technology Delhi, Hauz Khas, Delhi 110016	2 Months
18	Preeti Verma National Research Laboratory for Conservation of Cultural Property Lucknow 226024	CSIR National Metallurgical Laboratory, Jamshedpur, Jharkhand 831007	3 Months
19	S Janakiraman Indian Institute of Technology Indore, Madhya Pradesh 453552	Indian Institute of Technology Kharagpur, West Bengal	1 Month
20	A. Madan Kumar Sathyabama Institute of Science and Technology, Chennai	National Institute of Technology, Warangal 506 004	2 Months

21	Amit Nain Dept of Materials Engineering, Indian Institute of Science, Bangalore	Indian Institute of Technology Delhi, Hauz Khas, New Delhi,	1 Month
22	C Chandrasekhara Sastry IIITDM Kurnool, Kurnool, AP 518008	Indian Institute of Technology Hyderabad, Telangana 502285	2 Months
23	Nirmalendu Biswas Dept of Power Engineering, Jadavpur University, Kolkata 700106	Indian Institute of Technology Kharagpur, Kharagpur 721302	2 Months
24	Sathish Kumar R Centre for Waste Management, Sathyabama Institute of Science and Technology, Chennai 600119	Department of Chemical Engineering, Indian Institute of Science, Bangalore 560012	2 Months
25	Sourabh Sadanand Jogee Shree Guru Gobind Singhji Institute of Engineering and Technology, MH	Indian Institute of Technology Bombay, Mumbai, MH 400076	2 Months
26	Sumit Tripathi IITRAM, Ahmedabad, Gujarat 380026	IIT Gandhinagar, Gujarat 382055	1 Month
27	Swalpa Kumar Roy Alipurduar Government Engineering and Management College, Alipurduar, WB 736206	Indian Statistical Institute Bangalore Centre, Karnataka 560059	1 Month
28	Vikas R Bhat Dept of Biomedical Engineering, MIT, MAHE, Manipal, Karnataka 576104	IIT Gandhinagar Campus Palaj, Gandhinagar, Gujarat 382355	1 Month
29	Kankat Ghosh, Indian Institute of Technology Jammu, Jammu 181221	Indian Institute of Technology Bombay, Mumbai 400076	2 Months
30	Mandeep Singh Dept of ECE, NITK Surathkal, Mangalore 575025, Karnataka	Applied Photonics Lab, Indian Institute of Science Bengaluru 560012	2 Months
31	Mirza Khalid Baig NIT Rourkela, Rourkela	Indian Institute of Science Bangalore, Karnataka 560012	1 Month
32	Nandini J. Warriar IIIT Kottayam, Kottayam 686635	Indian Institute of Technology Palakkad, Palakkad 678623	1 Month

33	Nikhil Deep Gupta Visvesvaraya National Institute of Technology (VNIT), Nagpur 440010	CSIR - Central Electronics Engineering Research Institute, Pilani 333031	2 Months
34	Padmavathi S Thiagarajar College of Engineering, Madurai 625015	Defence Institute of Advanced Technology, Girinagar, Pune 411025	1 Month
35	Suman Sarkar IIT Jammu, Jammu 181221	Indian Institute of Science Bangalore, Bengaluru 560012	1 Month
36	Asha Srinivasan JSS Academy of Higher Education & Research, Mysore 570015	Indian Institute of Science, Bengaluru, Karnataka 560012	1 Month
37	Arindam Pramanik Amity University, Noida 201301	Indian Institute of Technology Delhi 110016	1 Month
38	K. Sindhu University of Calicut, Malappuram	Tata Memorial Centre, Kharghar, Navi Mumbai 410210	2 Months
39	Naveen Kumar ICAR- National Institute of High Security Animal Diseases, Bhopal	Indian Institute of Technology Roorkee, Roorkee 247667	2 Months
40	Indumathi Sathisaran NIT Calicut, Kerala 673601,	Indian Institute of Science, Bangalore 560012	1 Month
41	Madhulika Bhagat School of Biotechnology, University of Jammu, Jammu 180006	ICMR-National Institute of Virology, Mumbai Unit, Parel	2 Months
42	Sindhu S Manipal Institute of Technology, Bengaluru 560064	Indian Institute of Science (IISc), Bengaluru	1 Month
43	Sudeep Singh Sanga SVNIT Surat, Gujarat 395007	IIT Bombay, Powai, Mumbai 400076	1 Month
44	Avijit Ghosh ICAR-Indian Grassland and Fodder Research Institute Jhansi UP	National Centre for Cell Science, Pune, NCCS Complex, SPPU campus, Ganeshkhind, Pune	1 Month
45	Arun Kumar G Kannur University Dr Janaki Ammal Campus, P.O.Palayad, Kannur District, Kerala	Indian Institute of Science Education and Research Maruthamala PO, Vithura, Thiruvananthapuram 695551	2 Months
46	R. Murugan Ayya Nadar Janaki Ammal College, Sivakasi 626 124	CSIR-Central Institute of Medicinal and Aromatic Plants, Research Centre, Bengaluru	2 Months

47	Shivani Tyagi Galgotias University, Greater Noida, Gautam Buddh Nagar 203201	Birbal Sahni Institute of Palaeosciences, Lucknow, UP	1 Month
48	E. Kaarunya Thiagarajar College, 139 Kamarajar Salai, Teppakulam, Madurai 625009	Rajagiri College of Social Sciences, (Autonomous), Rajagiri	1 Month
49	Irfan Rashid Dept of Botany, University of Kashmir, Srinagar 190006, J&K	Indian Institute of Science, Bangalore 560 012	2 Months
50	Md Hamidur Rahaman Dept of Biotechnology, Manipur University, Manipur 795003	ACTREC Tata Memorial Centre Kharghar, Navi Mumbai 410210,	2 Months
51	Rupjyoti Gogoi Dept of Botany, Bhattadev University Pathsala, Bajali, Assam 782001	CSIR-National Botanical Research Institute, 436, Pratap Marg, Lucknow 226001	1 Month
52	Shachi Singh Botany Section, MMV, BHU, Varanasi, UP 221005	CSIR- Central Institute of Medicinal and Aromatic plants, Lucknow 226015	1 Month
53	Akanksha Upadhyay Lalit Narayan Mithila University Darbhanga, Bihar 846004	IIT PATNA, Bihta, Bihar 801106	2 Months
54	Arvind Kumar Yadav Baba Raghav Das Post Graduate College-Deoria UP 274001	Dept of Chemistry, IIT-Bombay, Mumbai 400076	2 Months
55	Dibya Yadav Presidency University, Itgalpur, Bengaluru -560064	Dept of Chemistry, Indian Institute of Technology, Kanpur UP 208016	2 Months
56	Shagufi Naz Ansari Presidency University Bengaluru 560064	Indian Institute of Science Bangalore	2 Months
57	Soumabha Bag Dept of Industrial Chemistry, Mizoram University, Aizawl Mizoram 796004	Dept of Chemistry Jadavpur University, Kolkata 700032	2 Months
58	Anindra Sharma A. P. Singh Memorial College, Barauni, Begusarai, Bihar 851112	Institute of Science, Banaras Hindu University, Varanasi 221005	3 Months

59	Jone Kirubavathy S PSGR Krishnammal College for Women Coimbatore 641004	Dept. of Chemistry, Indian Institute of Technology, Palakkad, Kerala 678623	1 Month
60	Kaushik Talukdar Bhattadev University, Bajali, Pathsala P.O. Pathsala, Assam 781325	Ashoka University, Sonipat, Haryana 131029	1 Month
61	MenaparaTusharkumar Ranchhodhbhai P. D. Patel Institute of Applied Sciences, CHARUSAT, Gujarat	CSIR-National Chemical Laboratory, Dr Homi Bhabha Road, Pune 411 008	2 Months
62	Poornima Vijayan P Dept of Chemistry, Sree Narayana College for Women, Kollam 691001	National Institute for Interdisciplinary Science and Technology, CSIR Industrial Estate Thiruvananthapuram 695019	1 Month
63	Rohit Singh Chauhan, K J Somaiya College of Science and Commerce, Mumbai 400077	Dept of Pharmaceutical and Technology, IIT Mumbai, Matunga, Mumbai 400019	2 Months
64	Soyebkhan Pathan Research and Development Cell, Parul University, Vadodara 391760	Indian Institute of Technology Indore, Simrol, Khandwa Road, Indore 453552 MP	2 Months
65	J. Anitha Kongunadu Arts and Science College Coimbatore 641029	National Centre for Nanosciences & Nanotechnology, University of Madras, Chennai	1 Month
66	R. Parameshwari SRM Institute of Science and Technology, Tamil Nadu 621105	CSIR-National Chemical Laboratory, Pune, Maharashtra 411008	2 Months
67	Zuhail K P Dept of Physics, University of Calicut Malappuram, Kerala 673635	Department of Physics, IISER Tirupati, Tirupati 517507	1 Month
68	Mithun Thudiyangal Dept of Atomic and Molecular Physics, Manipal Academy of Higher Education (MAHE), Manipal 576104	Indian Institute of Science, CV Raman Rd, Bengaluru, Karnataka 560012	3 Months
69	Muttanagoud N. Kalasad Dept Of Physics, Davangere University, Davangere 577 007	Centre for Nano Science and Engineering (CeNSE), IISc, Bangalore 560 012	2 Months

70	Ramesh Kumar Dept of Physics, GITAM, Gandhinagar, Rushikonda Visakhapatnam 530045	Tata Institute of Fundamental Research Mumbai Homi Bhabha Road, Colaba Mumbai 400005	2 Months
71	Sudeshna Samanta GITAM University, Nagadenehalli Doddaballapur, Bengaluru 561203	UGC-DAE Consortium for Scientific Research, University Campus, Indore (M.P.) 452001	2 Months
72	Vishal Singh Dept of Nanosciences and Materials Central University Jammu, Jammu	CSIR-Advanced Materials and Processes Research Institute Hoshangabad Road, Bhopal, MP	1 Month
73	Dr Bhuvaneshwari B, Department of Chemistry, IIT (BHU) Varanasi, UP 221005	Indian Institute of Technology Kanpur, Dept of Chemical Engineering, UP 208016	1 Month
74	Dr Ashima Bagaria, Department of Physics, Manipal University, Rajasthan	Department of Electrical Engineering, IIT Jodhpur, Jodhpur 342030	1 Month

Annexure-XVIII

COMPLETED PROJECTS 2024-25

A study on the paleo-channels of Dihing river and its impact on the pre-Ahom inhabitants of upper Assam**Raktim Ranjan Saikia***Jagannath Barooah College, Jorhat*

The Dihing River Valley in Upper Assam, India, holds significant archaeological evidence suggesting the existence of a pre-Ahom stratified state, predating the arrival of Shān Prince Sukāphā in 1228 CE. This study investigates the paleo-channels of the Dihing River and their influence on the pre-Ahom inhabitants through a multidisciplinary approach involving archaeometric and geochemical analyses of brick and soil samples from four key archaeological sites: Mouramora, Pratima Garh, PadumPukhuri, and Rukmini Garh. These sites, located along the Dihing River's paleo-channels and the Brahmaputra's north bank, reveal brick structures indicating a sophisticated civilization. Archaeometric techniques, including Fourier Transform Infrared Spectroscopy (FTIR), X-Ray Diffraction (XRD), and Scanning Electron Microscopy with Energy Dispersive Spectroscopy (SEM-EDS), were employed to analyze brick samples, identifying minerals such as quartz, kaolinite, feldspar, and iron oxides, and determining firing temperatures ranging from 650°C to 900°C. These analyses suggest two distinct technological groups: one on the north bank of the Brahmaputra (VII-X century CE) with advanced firing techniques (above 650°C, up to 830°C), and another on the south bank (XI-XIV century CE) with less advanced technology (below 650°C). Optically Stimulated Luminescence (OSL), Thermoluminescence (TL), and Infrared Stimulated Luminescence (IRSL) dating corroborate these temporal distinctions, aligning with the technological variations observed. Geochemical analysis of soil samples, using X-Ray Fluorescence (XRF) and XRD,

revealed major oxides (SiO₂, Al₂O₃, Fe₂O₃) and clay minerals (chlorite, smectite, montmorillonite), indicating varied paleoenvironmental conditions, from arid to humid climates and predominantly freshwater, oxygen-rich depositional settings. Paleoenvironmental proxies (Rb/Sr, Sr/Ba, V/(V+Ni)) suggest that the paleo-channel shifts of the Dihing River likely influenced settlement patterns and possibly contributed to the decline of this civilization. The study hypothesizes that the advanced technological group on the north bank, potentially linked to the Kamakhya Temple builders (circa 800 CE), was more adept at managing environmental changes compared to the later, less advanced southern group. The shift in the Dihing River's course may have disrupted agricultural and settlement systems, leading to the decline of this pre-Ahom civilization. This research underscores the interplay between environmental dynamics and human adaptation, providing insights into the technological and cultural evolution of Upper Assam's early inhabitants.

Nālandā and Bodhgayā: Understanding the past environment and the transnational networks of the World Heritage Sites**Sharmistha Chatterjee***Srikrishna College, Nadia*

The project, funded by the Indian National Science Academy, seeks to record the environmental context, ancient technologies, healthcare systems, ancient knowledge systems, and transnational networks of the World Heritage Sites at Nālandā and Bodhgayā. This project presents a holistic study of the two sites and their wider hinterland areas, encompassing essential features that facilitated their growth and expansion over time. To execute the project, extensive field surveys, GIS mapping, predictive

modeling, ethnographic studies, and reading of ancient literature were undertaken within the project's tenure. Findings highlight the strategic locations of both sites in the south Bihar plains, with optimal slope, water availability, and a vast agricultural hinterland, enabling long-term sustainability. The project also reveals ingenious hydraulic management and evidence of early agricultural practices in the surrounding areas, especially around Nālandā. These findings have been asserted through extensive field surveys, the collection of relevant information, and lab analyses, further combined through predictive modeling with the use of the Geographical Information System. Notably, the monastic complex at Nālandā featured sophisticated medical provisions and access to medicinal plants in the nearby areas of Rajgir. The specimens of medicinal plants have been identified according to their modern usage and corroborated through their references in the early Pāli texts. The final section of the project examines Nalanda's academic traditions and technological innovations within the monastic complex, which could have supported thousands of monks. It concludes by highlighting Nalanda's global networks and enduring cultural landscapes with traditional practices like sculpture and ceramic production in the nearby villages, which are systematically documented in the project. These continuing traditions offer insights into the functioning of these monastic establishments in their heyday and the broader global influences they may have generated.

History of cosmetology in ancient India

Pallavi G

*Ayurveda Interdisciplinary Minds Association,
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The History of Cosmetology through the ages reveals various concepts of beauty postulated by different experts. The earliest records of cosmetic substances and their application date to 2500 and 1550 B.C. in the Indus Valley

civilization. There is evidence of highly advanced ideas of self-beautification and an extensive array of various cosmetic usages, both by men and women, in ancient and Medieval India. The project broadly describes the History of cosmetology in different periods. Cosmetics have been classified broadly into Facial Cosmetics, Oral hygiene, Depilatories, Body Cosmetics, and Cosmetics for hair. A detailed description of each one has been dealt. A short review of Ayurvedic books with exclusive contributions to cosmetology has been done. Some of the important books include *Haramekhala Samhitā* (Mahuka), *Gandhasāra*, *Gandhavāda*, and many ancient erotic literatures such as *Kāmasūtra* of *Vātsyāyana*, *Ratirahasya* of *Kokkoka* etc. These books are a treasure trove of knowledge, and it seems that if they are employed practically, they can prove miraculous to mankind. A wide range of herbs have been used in the past for cosmetic purposes. Short monographs of exclusive and major herbs, metals, minerals, and *bhasmas* used in cosmetic preparations have also been done. The wide range of cosmetic preparations/Perfumes mentioned in these shastras reveals the luxurious lifestyle and glory of the people of ancient India. It also gives the thought that people of ancient days, in spite of the lack of technology, were still well equipped with abundant knowledge, which seems to be completely unknown to the current generation.

Traditional oral communication and scientific knowledge system in Assam with reference to 'Dakar Bachan'

Bharati Bharali

Gauhati University, Guwahati

'Dakar Bachan' (Maxims of Dak) in Assam is an oral literature that serves as a rich source of traditional knowledge in Assamese society. There is no consensus on the origin of the *Dak Purusha*, the imaginary person who developed the 'sayings' (*Bachan*). 'Dakar Bachan' consists of information and instructions for ordinary

people to follow for the ease of their livelihood. Several dimensions of human life, including agriculture, weather, health, hygiene, vastu, family life, cooking, and medicinal plants, are among the most significant maxims apart from political and socio-cultural ones; many of which are still practised by the people of Assam. Though many kinds of research are done from various perspectives, studies on *Dakar Bachan* as a repository of traditional scientific knowledge systems are rare. In such a context, an intensive study was undertaken to explore '*Dakar Bachan*' as a tool for disseminating traditional scientific knowledge in the pre-colonial era in Assam and to understand how a traditional knowledge system like *Dakar Bachan* can be considered a national knowledge repository. In this project, three units (agriculture, health and social life & ethos) were organised methodically to identify underlying patterns of meaning, resulting in a detailed analysis of *Dakar Bachan* texts. Additionally, content analysis of the collected ancient manuscripts was conducted to ensure a comprehensive examination of the *Dakar Bachan* texts and related literature. The selected manuscripts helped to identify 29 different ethnobotanical components, each deployed in specific healthcare-related uses, such as maternal care, immune boosters, gut health, and other conditions, including cough, fever, and colic. This study tries to establish how *Dakar Bachan* is part of the Indian traditional knowledge system, dating from the 6th to the 7th centuries, to the 16th to the 17th centuries. This project also seeks to unfold how the local adaptation of these maxims for message propagation was carried out through a process termed *de-sanskritization*, where terms and ideas are rendered in the regional language, style, taste, and lifestyle of the indigenous communities on appropriate healthcare practices, agricultural practices, ethnobotanical knowledge and others to serve the localised needs.

Traditional metal technologies in Assam: A study in archaeological, historical and ethnographic perspectives

Manjil Hazarika

Cotton University, Guwahati

Metal and metallic objects have played a vital role in the material culture of nearly every society worldwide, transcending both time and geography. In Assam, metal has also served as a fundamental material for crafting diverse artistic pieces alongside a multitude of utilitarian and household objects throughout its History. These items have been crafted from various materials, such as iron, bronze, brass, copper, gold, and silver. Iron, in particular, holds archaeological and cultural importance, being widely used in construction, religious rituals, and daily life. Historical chronicles like the *Buranjis* mention skilled artisans proficient in working with diverse metals, suggesting a rich metallurgical tradition in pre-colonial Assam. However, scientific analysis of remnants like iron slag has remained limited. Our recent field explorations identified slag-rich sites in Kamarpur (Kamrup), Murtiphram (West Karbi Anglong), and several other areas of Assam. Five slag samples from Kamarpur and Murtiphram were analysed using X-ray diffraction (XRD), X-ray fluorescence (XRF), thermogravimetric analysis (TGA), and Scanning Electron Microscopy (SEM) at Gauhati University. The samples from Kamarpur showed high iron oxide content, suggesting iron smelting, possibly for weapons, whereas samples from Murtiphram with dominant aluminum oxide likely indicate different metallurgical processes. The bloomery process involving small charcoal-fuelled furnaces was likely used in these smelting activities. One sample from Kamarpur, dated to 0.4 ± 0.0 ka (approximately 17th century CE), confirms historical iron production in the region. Assam continues to host vibrant metal working traditions, among which the bell metal artisans (*Kohars*) in Sarthebari and brass craftsmen in Hajo preserve age-old practices. Ethnographic studies reveal strong continuity with historical

techniques, with regional specialisations dating back to the Ahom period. Future research will involve sourcing local ores and conducting further compositional studies to deepen our understanding of Assam's metallurgical legacy.

History of semiconductor research in India

Prasanta Kumar Basu

NIT Delhi, Delhi

Semiconductors gained importance with the invention of the transistor, which was announced in 1947, and then the invention of integrated circuits and chips around 1958. Since then, these materials and devices have shaped the world, leading to the current Information Age. This project reports a brief history of semiconductors from 1782 to 1960, including a brief description of the Indian contribution from Acharya Jagadish Chandra Bose. Following this, a detailed investigation of the Indian contribution in the first decade after the transistor is carried out. It is concluded that established Indian groups were either unaware of the vast potential of emerging subjects or were unwilling to embark on the new area of study just after independence. The few workers engaged in research in semiconductors and transistors have been identified in the present study, and their contributions are discussed in detail. It is also found that initial research was conducted in two newly formed technology departments. The reasons for this, the then research atmosphere, and the visions of the departmental heads are also discussed. The first reported work on transistors in India, its author, and his background are discussed in the project. A detailed study of Acharya J C Bose's pioneering contribution to semiconductors and electronics has also been made. It has been felt that an authentic history of Indian research from 1960 to the present cannot be completed in one year. In spite of this, the activities in academia and R&D Labs by a large number of workers in the next decade have been reported briefly in this project.

A study on *Kaiths* and *Kaitheli* mathematics in medieval Assam

Rasna Rajkhowa

THB College, Sonitpur

The Brahmaputra Valley bears at least 2000 years of History of the formation of stratified states. Applied mathematics always plays a prominent role in running such stratified states. Medieval chronicles and literature reveal the existence of a group of individuals, known as '*Kaiths*', who specialized in mathematical calculations related to state administration. These *Kaiths* developed a unique mathematical system, called '*Kaitheli Añka*', to calculate and manage land revenue and other royal taxes. This specialized mathematical practice was referred to as '*Kaitheli Vidya*'. In pre-colonial times, schools of ancient *Kaitheli* education flourished in various parts of Assam. Until the early days of the British Empire, *Kaitheli* mathematics was taught in the indigenous language in village schools. Evidence suggests that various mathematical concepts, such as *athakatha*, *daśāṅsh*, *vidyāuthi*, *piyal*, *pañcak*, deposit-cost, *jamābandī*, summons, accounts, and survey, were part of the curriculum. In the *Kaitheli Angka* method, numbers are not written directly; instead, a specific word is used to represent each number. Each word in *Kaitheli* mathematics corresponds to a unique numerical value. By utilizing these word numbers and performing operations such as addition, subtraction, multiplication, and more, numerical problems can be effectively solved. In this project, we consider the seven *Kaitheli* manuscripts preserved presently in the Department of Historical and Antiquarian Studies of the Government of Assam. The manuscripts are – *Kitabat Manjari* (manuscript no. 269), *Jyotish* (manuscript no. 148), *Angkor puthi* (manuscript no. 594), *Kaitheli Angkaputhi* (manuscript no. 849), *Angkor puthi* (manuscript no. 140), *Lilawatirpatigonit* (manuscript no. 986), and *Lilawatir Angkoputhi* (manuscript no. 664). The similarities and differences between the *Lilāvati* of Bhāskara-cārya and *Kaitheli* mathematics

and the various units and measurements used in medieval Assam mentioned in the Kaitheli mathematical manuscripts are discussed.

Pandemic Spanish influenza of 1918-19 in India with special reference to colonial Bengal: A historical perspective

Saumitra Basu

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The project report titled “Pandemic Spanish Influenza of 1918-19 in India with Special Reference to Colonial Bengal: A Historical Perspective” provides a comprehensive analysis of the impact of the Spanish Flu in colonial Bengal. The study explores the introduction of the pandemic into India, its outbreak in colonial Bengal, and the government’s response. Through six detailed chapters, the study explores the death toll in Calcutta, its impact on other districts of colonial Bengal, and the famine that led to further violence. It demonstrates the inadequacy of the British government’s response to the pandemic and the failure of disaster relief by demonstrating the intersection of disease, medicine and imperial politics, revealing the British government’s inadequacy in responding to the pandemic and its failure of disaster response. The research further explores the reaction of nationalists to the colonial administration’s management of the crisis, highlighting how Indian leaders condemned British government’s actions as insufficient and utilized the pandemic to express their dissent against calls for greater freedom. The report also discusses the long-term epidemiological consequences of this devastating pandemic, including vaccine development, and its future public health implications. This study highlights the importance of understanding the History of a historical pandemic to inform current and future interventions and to address the need for robust clinical, health-based measures, and community engagement. Drawing on primary and secondary sources, the present research

provides valuable insights into colonial Bengal’s socio-economic and politico-historical landscape during the pandemic, contributing to the broader field of the History of science.

Exploration and documentation of Sun-dials and other time-keeping instruments of Islamic tradition and colonial period

Aalok Pandya and Tej Bahadur

Indira Gandhi National Tribal University (IGNTU), Amarkantak

Research Project INSA/HS/RC/296 (Dated 26 June 2022) was completed in September 2024. We undertook several field visits in these two years *viz.*, (i) Bhubneshwar, Konark, Katak, Kendrapara, Mahuppurgarh, Barambagarh, Khandaparagarh (16th December to 20th December, 2022); (ii) ; (iii) Varanasi, Chunar, Ghazipur, Nauli, Nalanda, Patna and Agra (11th February, 2024-16th February, 2024); and (iv) Shimla and Kasauli (27th and 28th March, 2024); and (v) Kochin, Kottayam, Kollam, Trivendrum (15th August-19th August, 2024). We observed and recorded the number of Sun-dials. We found as many as 34 Sun-dials and related instruments of colonial period and Islamic tradition at different locations across the country. All the field visits are documented, and the respective annual reports and project completion reports have been submitted to INSA. Constructed under different circumstances, all of them are made in many different styles and traditions. Of course, many of these instruments are made in modern scales of time. The oldest was found in *Tazthangadi*, Kottayan (Kerala), made in the 10th century. The deterioration in most of these instruments is visible, and in many of these instruments, the gnomon is missing or the engraving is eroded. At some places, efforts of restoration are underway. We could gather all information regarding their History and catalogued them all. We have catalogued them all and will keep updating all possible information about their niceties and relevance.

It is suggested that the Project Report may be shared with the custodians of these Sun-dials and instruments to observe better maintenance and upkeep of these instruments and sites.

Women health care and role of vernacular press in colonial Bengal

Mahua Sarkar

Jadhapur University, Kolkata

The arrival of colonial modernity and Western education in the nineteenth century significantly affected the urban elite of Bengal. One of the most notable results was the rise and publication of vernacular journals. This research project explores health care for Bengali women during the nineteenth and twentieth centuries by examining primary records from journals like *Bamabodhini*, *Antahpur*, *Probasi*, *Swasthyo*, *Swasthyo Samachar*, *Suswasthyo*, *Chikitshok*, *Bongolokhsmi*, and others. These journals showed how Western-educated bhadralok shaped ideas about health and preventive care. Importantly, they included women's voices. For instance, *Bamabodhini*, started by Umesh Chandra Dutta and later edited by Sukumar Dutta, promoted a scientific view of living conditions and health practices. It featured a regular column called *Bamarochona*, where women shared their writings.

Three main themes appeared in these journals: cleanliness, motherhood, and childcare. They stressed the importance of female education in creating hygienic living conditions. An educated mother in health and child care was seen as vital for building a modern home. This image of the "scientific and enlightened woman" drew heavily from Victorian values of domesticity and couplehood. However, for Western-educated male reformers, the focus on hygiene, cleanliness, and self-care went beyond concern for women. It aimed at a broad internationalist strategy for social reform and cultural advancement. These journals advised on many health topics, including maternal and child care and household cleanliness.

Their influence gradually raised awareness and improved maternal and child health in the medical field. Still, a careful reading of the articles shows a mixed response from women. While the journals promoted Western medical solutions, many women preferred traditional home remedies using herbs and local practices. Interestingly, women entering the medical field during this time largely accepted Western training and methods. Alongside the spread of Western medicine, Ayurveda was also revived, supported by figures like Gangaprasad Sen, Gangadhar Ray, and Haracharan Chakrabarty. This project looks at how their views on women's health and child care differed from those of Western practitioners. It also assesses the role of traditional midwives, or dais, in child birth and their place in a changing medical landscape.

The complexity of these vernacular journals—as collaborative works, cultural objects, and commercial products—shows both common features and differences. Starting in the 1920s, magazines and their audiences transformed rapidly, influenced by technology, changing gender roles, rising nationalist ideas, and the growth of consumer culture. This study aims to uncover the influences, conflicts, and interests shaping these journals' portrayals of middle-class women as readers, consumers, and emerging citizens. Through this perspective, the project seeks to trace the evolving principles of health science related to women in colonial Bengal, highlighting the complicated and contested nature of medical modernity, tradition, and gender.

Scientific validation of the factors affecting ageing as defined in "Ain al-Hayat"

Syed Ziaur Rahman

Aligarh Muslim University, Aligarh

This project, titled *Scientific Validation of the Factors Affecting Ageing as Defined in "Ain al-Hayat"* by Muhammad ibn Yusuf al-Harawi (active 1492-1518, died 1542), investigates the anti-

aging perspectives of a Unani physician as outlined in his 16th-century manuscript *Ain al-Hayat*. The work identifies 126 interventions ranging from medicinal substances and dietary recommendations to lifestyle practices and psychological strategies, designed to enhance longevity. Grounded in Unani medical principles such as temperament (*Mizaj*) and innate heat (*HararatGhariziyya*), the manuscript underscores the importance of immune resilience and overall well-being. This project critically assesses these interventions through modern evidence-based frameworks and draws comparisons with classical authorities like Galen, Ibn Sina, and Hippocrates. It emphasizes the relevance of these traditional, non-invasive approaches for contemporary anti-aging treatments and calls for further clinical research to validate their efficacy.

Search for astronomical records in stone inscriptions

Geetha Kydala Ganesha

Indian Institute of Astrophysics, Bengaluru

A detailed list of stone inscriptions for historically astronomically significant details (ASD), is prepared. These inscriptions are found in and around the states of Karnataka, Andhra Pradesh, and Telangana. ASD includes eclipses, solstices, planetary positions, and many other astronomical events that can be observed with the naked eye. More than 20,000 inscriptions, ranging from the 5th to 18th century, have been thoroughly searched, and about 2,000 have been found to have ASD in them. The majority of inscriptions are in the languages of Old Kannada, Old Telugu, and Sanskrit. The compiled list of inscriptions with ASD gives the GPS co-ordinate of the place where the stone inscription is found; the lines of text in the old language, mentioning details of time and date, along with their transliteration and translation; an explanation using modern astronomical terms; and explanatory diagrams generated from

different software, wherever required. An effort to include photographs of the inscriptions and to present this list as a searchable online database is ongoing. This study gives an evidence-based historical perspective of naked eye observations from the selected parts of Southern India. The study is presented in bilingual (Kannada and English) format to benefit both local and global researchers.

ONGOING PROJECTS 2024-25

A quest to understand the science of indigenous technologies like making cementing materials, bricks, and gunpowder of the Ahom dynasty

Jagannath Bhuyan

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Assam's ancient monuments, which still show the glorious History, withstanding several strong earthquakes and extreme environmental conditions, are from the Ahom dynasty. Our project objective was to understand the science behind making bricks and cementing materials of the Ahom dynasty and to cross-verify the scientific findings with contemporary historical documents. We have performed the chemical and mineralogical analyses of mortar and brick samples from two monuments: Jagadhatri Dou of Sibsagar and Nrisingha Devalaya of Nagaon, using instruments such as FTIR, PXRD, FESEM (EDX), TGA, and ICP-OES. Physical properties like density, porosity, water absorption properties, and compressive strength are also analyzed. PXRD and EDX analysis revealed that the mortars are composed mainly of calcite, quartz, and feldspar, whereas bricks mainly have quartz and feldspar, with a smaller amount of hematite and kaolinite. Mineralogical composition indicates that the bricks were burnt below 800°C. Surprisingly, the bricks' compressive strength was much higher (~21 to 15 N/mm²). Experiments are going on to check the presence of any decomposed organic compounds in the mortars. To cross-verify the scientific results, we are going through

contemporary historical documents, including Changrung Phukan's Buranji (a document of the construction of Ahom buildings).

Scientific contributions of the Trivandrum observatories

R Jayakrishnan

University of Kerala, Thiruvananthapuram

Literature survey and data collection have been the project's main activities during this period. A majority of relevant historical documents, including journals, proceedings, transactions, and almanacs related to the observatory, have been digitally stored and catalogued. We have managed to retrieve the second publication of The Travancore Almanac, published in 1838 from Germany, which is not available in the state archives. The copy of the first publication of 1837 remains elusive. The collection of unpublished data from the manuscripts of John Allan Broun at the National Library of Scotland was archived by digital data from Notebook-151 (1859) and Notebook-152 (1860), which were retrieved. It contains valuable information and diagrams noted by Broun during the Magnetic Survey of Travancore. The Carrington Event of 1859, observed by British astronomer Richard Carrington, marked one of the most intense geomagnetic storms in recorded History, triggered by a powerful solar flare and subsequent coronal mass ejection (CME). We have collected declination data from August 29 to September 2, 1859, covering the onset and peak of the geomagnetic storm. This data from the Trivandrum Observatory provides a unique perspective on equatorial geomagnetic responses that have not been reported previously. Our research has identified that between 1837 and 1839, Caldecott and Taylor conducted pioneering magnetic measurements near Bolgatty Island, where they observed a magnetic inclination of zero. This observation indicated that the Magnetic Equator—a line where the Earth's magnetic field is horizontal—was passing through the

region during that period. These findings stand as one of the earliest documented records of the Magnetic Equator's presence in Southern India. As the earliest recorded magnetic observation in the region, this discovery underscores its scientific and historical importance. The scientific community has overlooked the contribution of the Trivandrum observatory in the discovery of the magnetic equator in India. Analysis of the magnetic equator position by Lieutenant Ludlow (1844) confirmed a southward shift of the magnetic equator. This finding has never been celebrated. The magnetic survey conducted by John Allan Broun, as documented in his 1874 book, identified continuation in southern migration of the Magnetic Equator's position with some accuracy across Travancore.

Ketakīgrahaṇitam—English exposition and mathematical analysis of astronomical phenomena with examples

SK Uma

Dr H N National College of Engineering, Bengaluru

In the current project, I propose to work on *Ketakīgraha ṇitam* by translating it to English with sufficient mathematical explanatory notes and worked examples on planetary positions, eclipses, and other phenomena. The project's main objective is to analyse mathematically the procedure given in the text, formulate their algorithms so that the present-day users and researchers can easily understand and pursue the *siddhāntic* astronomy on modern lines. During the period of 8 months, examples are worked out for finding *Ahargana*, mean positions, and also true positions of planets for older dates as well as for present dates. Results are compared with modern and *Grahalāghava* methods.

History of Kalaripayattu and its links with indigenous medical practices

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Indian Institute of Technology Ropar

Kalaripayattu is a notable traditional aesthetic martial art form predominantly practiced in Kerala, a state located at the southern tip of India. The origins of this martial art form are shrouded in mythical tales. In several ancient Indian texts, there are references to this martial art form hence proving the antiquity of this art. Several studies have been done on the topic of better health and respiratory function associated with the practice of this martial art form. This martial art form, banned during British Colonial rule, saw a boom in the late 20th century and early 21st century. This study is an initiative to revive and create global awareness on this martial art form. This study has two objectives: (i) to revive the scholarship on Indian martial practice and its health benefits from a pan-Indian perspective by mapping its History, and (ii) to trace the links between the practice of *Kalari* and the ancient indigenous medical systems of knowledge, coupled with the practice of this art. A Junior research fellow was recruited as part of the project, and the study was divided into phases. Firstly, the study was divided into two segments that were concurrent with the objectives. Data was collected for both objectives. For the first objective, books, articles, and archives were accessed. A list of Kalaripayattu centers in Kerala was initially prepared to collect relevant data for the project's second objective. Meanwhile, the data collection plan was discussed and finalized. The questionnaires prepared were for five groups: *kalaripayattu* instructors, *kalaripayattu* students, healthcare providers of *kalarimarmachikitsa*, *marmachikitsa* patients, and the general public. The data was analysed, and publication initiatives were taken. The results and findings of the study are translated into visible output: (i) Published Interview: Nandha, A., & Suresh, A. V. (2024). Interview with Padma Shri SRD Prasad: On

the Martial Art Form of Kalaripayattu. *Theatre, Dance and Performance Training*, 15(1), 54-60. <https://doi.org/10.1080/19443927.2024.2305569> (ii) Published article: Nandha, A., Suresh, A.V. Philosophy of health in ancient Indian martial art: Traditional knowledge of marma embedded in kalaripayattu and the health benefits of its practice (Indian J Hist. Sci. (2025). <https://doi.org/10.1007/s43539-025-00154-7>).

A study of the evolution of Tibetan medicine and institutionalization of traditional knowledge with special reference to Indian Himalayas

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The History of Tibetan medical institutions dates back to ancient times. The interaction among ancient civilizations-India, China, Tibet, Greece, Mongolia, Nepal, and Bhutan-played a significant role in developing traditional medical practices. The first International Medical Conference was held at Samye Monastery during the reign of King Trisong Deutsen. The Fifth Dalai Lama (1617-1682 CE) established a medical school at Dga' ldan (Ganden) Pho Brang in the Bras-spungs Monastery. This institution continues to offer medical training programs to this day. In 1916, during the reign of the Thirteenth Dalai Lama (1876-1933 CE), under the leadership of physician Mkhyyen-rab Norbu (1882-1962 CE), a College of Medicine and Astrology, known as Sman-rtsis-khang (Men-Tsee-Khang), was established in Lhasa and remains active to this day. We have conducted interviews at the Men-Tsee Khang, Salugara, and Siliguri.

The doctors, patients, and Staff members participated in the interview. The first, second, and third chapters of the work are completed. The Tibetan medical system is one of the world's oldest known medical traditions. It is an integral part of Tibetan culture and has been developed through many centuries. We believe that the origin of the Tibetan medical tradition is as old as civilization itself. The era from the

beginning of human civilization to the advent of Buddhism in Tibet can be termed the pre-Buddhist era. During that time, Bon tradition flourished in Tibet, and Bon's medical practice influenced and enriched the existing Tibetan Medical knowledge and practice. Scholars of the Bon tradition, including medical scholars, treat diseases through medication and therapy. This indicates that Tibetans practiced medicine, and there were Tibetan physicians even prior to the advent of Buddhism in Tibet. In order to preserve and promote the richness of Tibetan culture, many institutions, monasteries, and schools were re-established in India under the auspices of His Holiness the 14th Dalai Lama. Men-Tsee-Khang (Tibetan Medical and Astro. Institute of H.H. the Dalai Lama) was re-established under the visionary guidance of His Holiness the 14th Dalai Lama on March 23, 1961, with Dr Yeshe Dhonden and Ven. Dukhorwa Lodoe Gyatso as the heads of the Medical and Astrological centers, respectively, and Dr. Jamyang Tashi as the Director of Pharmacy & Physician to His Holiness the Dalai Lama. With the arrival of other senior doctors from Tibet like Dr Tenzin Choedak, Dr Lobsang Wangyal, and Dr Nyarongshar Kunga Gyurmey in 1980s, the institution was further developed.

A comprehensive study on indigenous zootherapeutic practices and their contemporary status in Raji tribe of Uttarakhand

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Zootherapeutics or Zootherapy, the therapeutic use of animals or their derivatives, is a well-documented worldwide ethnomedicinal healthcare practice among various indigenous and tribal populations. The Raji tribe is a primitive tribal group located in the Central Himalayan region of India, specifically in the districts of Pithoragarh, Champawat, and Udham Singh Nagar in the state of Uttarakhand, declared as a Primitive Vulnerable Tribal Group (PVTG)

by the Government of India in 1975. However, in the case of the fast-declining Raji tribe, no documentation of ethno-zootherapeutic practices exists, and the study aims to fill this gap. To date, the whole Dharchula block (Kimkhola, Bhaktirwa, Ganagaon, and Chifaltara villages) and Kantoli village of Kanalichina block of Pithoragarh district, where the major Raji population resides, have been surveyed. For the first time, 19 animal species that the Raji tribe traditionally uses for zootherapeutic purposes for the treatment of various ailments have been recorded by interviewing 59 Raji individuals. The data was compiled on a taxonomical basis, and biostatistical analysis was performed. Arthropods (11%), Pisces (5%), Aves (21%) and Mammals (63%) are the major categories of animals that the Rajis have traditionally used for zootherapeutic purposes. Several biostatistical analyses have been performed, including fidelity level, use value index, informant consensus factor, relative frequency of citation, and popularity level. So far, Project work has been presented on various national and international platforms in the form of paper presentations. Six Raji villages have yet to be visited for comprehensive data collection and compilation. Further potential candidates for bioprospecting studies, developing novel and potential drugs, and promoting socio-economic and environmental reforms to policymakers will also be suggested.

Indigenous ethnobotanical practices of local communities concerning health and environment in the Kumaun Himalayas during the colonial period: A historical perspective

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This study examines the indigenous ethnobotanical practices of local communities in the Kumaun Himalayas during the colonial period from a historical perspective. The research highlights how traditional healthcare systems, rooted in ethnobotanical knowledge and practiced by folk healers or Vaidyas, were crucial in addressing

health and environmental concerns before and during British rule. These practices involved the use of native plant species for medicinal, nutritional, and ritualistic purposes, reflecting a deep ecological understanding and cultural significance. However, the advent of colonial policies and the institutionalization of Western medicine significantly altered the region's socio-cultural fabric. This study traces the transformation and gradual decline of indigenous knowledge systems during colonial rule through a comprehensive review of literature, archival research, and fieldwork involving oral histories and interviews. The imposition of Western medical ideologies, combined with the establishment of dispensaries and vaccination programs, marginalized traditional practices while reshaping public health infrastructure. The project further explores how traditional healers responded to this paradigm shift and the impact it had on cultural identity and livelihoods. By adopting an interdisciplinary methodology that integrates historical, botanical, anthropological, and environmental perspectives, this research sheds light on the resilience of local knowledge systems amid colonial intervention. The findings underscore the importance of documenting and preserving these practices for cultural heritage and promoting sustainable healthcare models. Recognizing the role of ethnomedicine and folk psychiatry can enhance holistic healthcare strategies and contribute meaningfully to contemporary discussions on environmental sustainability, cultural preservation, and indigenous rights. The study calls for renewed collaboration between traditional knowledge holders and modern scientific communities to ensure the continuity and relevance of indigenous ethnobotanical traditions in the present day.

Investigations on ethnobiological practices of insect and worm eating by the tribal communities of Surguja district of Chhattisgarh, India

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Sant Gahira Guru Vishwavidyalaya, Chhattisgarh

The consumption of insects, or entomophagy, is practiced in various regions worldwide, including Southeast Asia, Australia, Latin America, and sub-Saharan Africa. This practice is gaining broader attention due to the nutritional benefits and sustainable food security options. Animal proteins are high-quality sources of vitamins and minerals and have the potential to emerge as a substantial global food supply in the future. Possible food shortages, health challenges, and environmental issues, interconnected with the increasing global population, propel the quest for alternative and sustainable food supplies. Incorporating edible insects in global food security projects is a viable option. Various ethnic communities of Surguja, Chhattisgarh (*Oraon, Nagesia, Gond, and Kamar*) consume various insects and animal species as rich sources of nutrients as well as to treat various ailments. The project's objectives are to: (i) document traditional knowledge and ethnozoological use of insects and worms across different tribal communities of Surguja (ii) investigate the importance of each insect and worm species by quantitative ethnozoology analysis, and (iii) analyze the cross-cultural use of reported animal species among different tribal societies.

In the 2nd year of the project, field visits were conducted to seven villages of Lakhanpur and Batauli Tehsils of Surguja district of Chhattisgarh. A cross-sectional study was conducted to gather ethnozoological data concerning therapeutic animals and their products employed in traditional medicine. The snowball technique was used to collect data using multiple approaches like personal interviews, meetings, and group discussions. The live species (if available) or naturally dead animal species were excavated alongside images during the survey.

The corresponding photographs for each species (N=10) were then identified using field guides, with the help of a local taxonomist and the Regional Centre, Zoological Survey of India, Jabalpur, Madhya Pradesh, India. Before data collection, we ensured that every informant gave written prior informed consent. Thirty-four animal species belonging to 11 taxonomic groups were documented to be used by *Oraon*, *Nagesia*, *Gond*, and *Kamar* tribes in Surguja, Chhattisgarh. The highest IFC value (1.0) was documented for diseases of the circulatory, genitourinary, and musculoskeletal systems, followed by Tissue damage (0.99), Skin-related disease (0.98), Diseases during the postpartum period (0.98) and Diseases of the respiratory system (0.97). *Aporrectodea Caliginosa* and *Lumbricustrrestirs* scored the highest FL (100%) for the postpartum period-associated diseases; Python also had the highest FL for diseases of the musculoskeletal system and connective tissue.

In the 3rd year, cross-cultural use analysis of reported animal species among different tribal societies and an attempt to increase the sample size to achieve statistically significant data will be carried out. A cross-cultural assessment of the recorded fauna revealed that few animal species were used only by the *Nagesia* community, whereas the *Oraon* (Ekka) does not kill or harm those animals. This can be elucidated by the fact that the *Oraon* clan maintains a special affinity with animals on which their clan name is based. To compare cross-cultural differences and similarities of documented species between other ethnic groups, a Dissertation work has been conceptualized to document the ethnozoological practices of *Pahari Korwa*, a particularly vulnerable tribal group (PVTG) of Chhattisgarh.

Environmental degradation and incidence of high endemicity of Leprosy in South-West Bengal, 1870s–1940s

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Indian Leprosy Commission, in its report, mentioned that the Burdwan division of Bengal contained a high rate of leprosy. It was almost higher than the Bombay and Madras Presidencies. Due to high rainfall, as the Meteorological Map shows, this area is very hot and humid. The Report of the Leprosy Commission of India (1890–91) mentioned the connection of rainfall and humidity with leprosy incidence. The reports of West Bengal State Archives (WBSA hereafter), the annual report of the Public Health and Sanitary Commissioner for Bengal, Local Self Govt. (Public health) during the period of 1899–1937 explained the disease phenomenon of South-West Bengal in connection with irregular meteorological conditions and the spreading of various diseases like leprosy, smallpox, kala-zar, and malaria. From the Leprosy Research Dept., of the Calcutta School of Tropical Medicine, Dr Muir investigated the high prevalence in such places where people sustained their lives in starvation as a result of bad harvests that occurred because of soil infertility and erratic monsoons. The British Empire Leprosy Relief Association mentioned in its report that Leprosy and endemic diseases are prevalent in famine districts. In their finding, the researchers of Calcutta School of Tropical Medicine mentioned that the Bankura Sadar subdivision was more endemic than Bishnupur because the former was infertile and famine-prone, and later was fertile. Apart from unsanitary conditions, the overcrowded living conditions of the labourers made the coal mining area prone to disease. The Indian Council of the British Empire Leprosy Relief Association (the Indian Leprosy Association) conducted a leprosy survey in the 1920s and 1930s. It multiplied the number of cases by about one million (Dharmendra, 1978). The Committee appointed by the Central Advisory

Board of Health in 1941 reported that a high incidence of leprosy occurred in West Bengal, South Bihar, and Orissa, and the whole of the east coast and parts of Madras, Travancore, and Cochin of the southern peninsulas. West Bengal, Orissa, and parts of Madras were identified as highly endemic areas of the country.

Ethno-Botanical study of the medicinal plants written in the *Puya* of ancient Manipur

Asem Ibemhal Devi

Shree Shree Gourgobind Girls, Manipur

The History of Manipur *Meities* is chronicled in *Puyasor Puwaris* (stories about our forefathers). The *Puyas* are literary pieces that deal with varied subjects like medicine, the code of warriors, religion, rites and rituals, migration, astronomy, History, politics, administration manuals, natural phenomena, etc. The *Puyas* are a written record handed down to posterity by the ancestors of the *Meiteis*. The survey study recorded more than five hundred *Puyas* collections from the custodians and Manipur State Archives, Directorate of Art and Culture, Government of Manipur. The *Puyas* were found to be written in indigenous script, known as *Meitei Mayek*, using indigenous materials. *Puyas'* writing is in two forms, Latam and Lathup. In Latam form, the writing plates are square and of the same size and are written on leaf by leaf; the leaves are then folded together into a book form, and all large books were written in Latam. In Lathup form, a long sheet is continuously turned over into equal square folds, and the writing is done leaf by leaf; in smaller manuscripts, short ritual prayers and chants were found to be written. The *Puyas* were recorded to be written on various subjects such as History of Manipur-*Cheitharol Kumbaba* (Royal Chronicle of Manipur), Literatures-*Pakhangba*, Geographical features/ landscapes - *Kouburu Chingoirol*, War and battle fight-*Theng-gourol*, Genealogy-*Sanamahi Laikak*, Administration-*Loiyumba Shilyen* (Distribution of employments/ professions by King Loiyumba), Astrology-*Subika*, Medicine and treatment - *Maibaron*

and *Hidaklon*, Way of constructing homes-*Khagemba Yumbi*, Creation-*Laithak Leikharol*, Rites and rituals-*Thounirol*, Dance and music-*Ougri*, Predictions-*Mai-chou Laang-on*, Pilgrimage places- *Kaang-lei Laa-yaat*, Idioms -*Laang-lon*, etc. The medicinal plants written in the *Puyas* were identified using different literature and consulting with experts. The botanical name, family, common name in English, Hindi, and local name in Manipuri (*Meiteilon*), different parts of the plant utilized in preparing the traditional medicines, and for which problem/ illness/ diseases were studied. From studying the *Hidaklon Puyas*, 152 medicinal plants in Manipur have been recorded. Therefore, the study helps identify Manipur's rich heritage. It is concluded that the *Puyas* should be preserved with care. Studying the *Hidaklon Puyas*, a unique set of principles and guidelines for using traditional folk medicine by the *Meities* of Manipur, may be useful for adopting natural medicines and many modern drug discoveries.

Technology of hunting: Methods and techniques of wildlife hunting in colonial Assam

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The project's first chapter discusses the implications of the term technology in hunting and extensive literature reviews related to the topic. The 2nd chapter, entitled Tools of Hunting, discusses the tools, both indigenous and modern weapons, used for wildlife hunting. The Indigenous tools included bows and arrows, spears, swords, dao, bells, vegetable poison, crossbows, large heavy knives, shields, china-made matchlocks, battle axes, javelins etc. The advancements in firearms during the mid-nineteenth century marked a pivotal moment in the History of firearm evolution, particularly shaping the trajectory of innovation in the realm of big-game hunting in colonial India. The colonial authorities used the following types of rifles and guns: 450/.400 Cordite Double-Barrelled Rifle, 465/.500 Cordite

Double-Barrelled Rifle, .577 Westley Richards Cordite Rifle, .475/600 Nitro Express Rifle, .375 Cordite Rifle, Greener Single Barrel Shotgun, 12 Bore Cordite Paradox Rifle, 12 Gauge Shotgun, Muzzleloader Rifles. The use of cameras, boats, motorbikes, torchlights and lamps, watches, telegraphs and radio can also be observed in such hunting. The third chapter explores hunting methods such as noose, traps, snares, pits, decoys, baits, and poisons. The fourth chapter focuses on the use of animals such as elephants, dogs, and horses in hunting, as well as types of hunting such as individual and group hunting, and seasonal hunting. The project tries to study (i) both indigenous and modern tools of wildlife hunting in colonial Assam, (ii) the methods and techniques of wildlife hunting, (iii) the use of animals and types of wildlife hunting, (iv) the rules and manuals of hunting made by the British official in Colonial Assam and (v) the conservation through hunting.

Conservation of handmade paper manuscripts of Assam

Robin Kumar Dutta

Tezpur University, Assam

Assam had a rich medieval tradition of manuscript writing. The Sancipat, prepared from the bark of the Sanci tree, was the most popular writing base. There are still tens of thousands of handmade paper (Tulapat) manuscripts. These handmade papers were made from different raw materials with slightly differing recipes. Most of these papers, especially those preserved in ordinary rural conditions, are wearing off and becoming brittle due to weathering. They need urgent conservation to save them from further damage and increase their strength and life. Existing methods of conservation of paper manuscripts or books, including passive environment, are neither suitable nor feasible for conserving such a huge number of manuscripts preserved in ordinary conditions in villages and Satras (Vaishnavite monasteries). We proposed

carrying out a detailed scientific study of different types of Tulapat of Assam and developing a suitable method of conservation of these manuscripts, which can be used to conserve the huge number of Tulapat manuscripts for preservation in ordinary rural setups. Special emphasis will be placed on strengthening and deacidifying the brittle manuscripts without doing any harm to them. The works done so far are: (i) Studies of literature on the traditional knowledge related to the recipes, characteristics, conservation and repair methods for conserving old manuscripts and cellulosic paper materials have been completed. (ii) Preparation of handmade paper using traditional methods from different raw materials, viz, cotton, inner bark of mulberry tree, silk cotton and bamboo is done (iii) The physiochemical characterization of the old and freshly made Tulapat samples have been almost completed (iv) Development and customization of a method through detailed physiochemical characterization for conservation of handmade paper manuscripts and machine-made paper books, and (v) Indian patent has been filed, Application No. 202431039000(KOL), dated 2024/05/17. The work that remains to be done is: (i) Continuation of the small remaining characterization of newly made and old handmade papers from different raw materials. (ii) Further study to make value addition in the developed conservation method of paper manuscripts (iii) Works on scaling up of the traditional method of preparation of Tulapat and to improve the properties of Tulapat are in progress (iv) Piloting on conservation of handmade paper manuscripts made from different raw materials, especially at Nam Phake Monastery at Naharkatiya, Dibrugarh, Assam. (v) Writing of three research papers for submission to journals for publication.

Tracking technologies: Reckoning with histories of Tramways in Calcutta 1870s-1970s

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This project investigates the technological History of Kolkata's tramways (1870s-present), analyzing their technological development, colonial governance, and postcolonial cultural legacy. As intra-city networks distinct from railways, tramways transformed urban mobility, labor dynamics, and public spaces, offering unique insights into hybrid modernity and sustainable urban development. Using an interdisciplinary HISTEM framework (History of Science, Technology, Environment, and Medicine), the research synthesizes archival materials (colonial records, municipal files) with cultural sources (newspapers, periodicals) to examine how tramways mediated between colonial power structures and local adaptation, particularly with regard to the maintenance process and training of the technical staff. Initial findings position tramways as contested sites of technological transfer - initially instruments of imperial control that were progressively appropriated by Indian workers and engineers, surviving as heritage artifacts despite functional obsolescence. During the current phase (Since December 16, 2024), research has focused on the West Bengal State Archives, though digitization efforts have temporarily restricted access to post-1910 materials (expected to reopen mid-2025). Critical work remains in several key repositories: the Calcutta Municipal Corporation Library (for operational records), the National Library (for newspaper archives and public discourse), the National Archives of India (for inter-governmental correspondence), and technical libraries (including Shibpur Engineering College and the Rail Museum), and other repositories (full list in derailed report). Given these archival challenges and the scope of remaining research, the project requires an additional 12-18 months to complete: 6-8 months for comprehensive archival work across Kolkata

and Delhi, 3 months for chapter development, and 6 months for monograph drafting. Work is currently underway for a paper to be submitted by the first half of July. Several popular media pieces and podcasts are in the pipeline. The study addresses a significant gap in South Asian urban and technological History while contributing to contemporary debates about sustainable mobility and colonial infrastructure legacies. The renewal (with some extension in time and funding; details in the larger report) will ensure the completion of the project in all respects, culminating in both scholarly publications and policy-relevant outputs that bridge historical analysis with current urban challenges.

Promotion of scientific ideas, concepts and observations by the Mughal Emperor Jahangir: A critical study

Enayatullah Khan

Aliah Universtiy, West Bengal

The contribution of Emperor Jahangir to the promotion of scientific observations, ideas, and concepts remains an untouched area of study. The interest, enthusiasm, curiosity, and support of Jahangir and his observations and experiments accelerated the scientific and technological growth of the medieval period. The scientific experiments, observations, and ideas by Emperor Jahangir are strongly echoed in his memoirs, *Tuzuk-i- Jahangiri*, as well as other contemporary works such as *Majalis-i- Jahangiri*, *Iqbal Nama-i- Jahangiri* and *Maasir-i- Jahangiri* etc. His descriptions of the flora and fauna are precise enough to allow proper scientific identification of the objects. Numerous experiments on birds and animals involving their anatomical structures, behavior, measurement, weight, and other aspects have been done under Jahangir's guidance. In Botanical studies, the purpose of experiments was mainly medicinal and horticultural in nature. He laid out some beautiful botanical gardens such as *Baghi-i-*

Gulshan-i-Ibrahimi, *Baghi-i-Nur Manzil* (Agra), *Baghi-i-Shahr Ara* (Kabul), *Baghi-i-DilAmez* (Lahore), and *Chahar Bagh*, etc. Under his guidance, it was also made possible to cultivate high-altitude trees such as cypress, juniper, pine, and the Javanese sandalwood tree in the plains of India. Jahangir also has a keen interest in medicine and the health care system, with a mix of indigenous knowledge and influences from Persian and Central Asian medicine. He often recorded the discourses related to diseases, their treatment, and medications in his memoirs *Tuzuk-iJahangiri*. Under his patronage, numerous

works on different diseases and their treatment have been composed, such as *Dastur-ul-Atibba*, *Alfaz-ul-Adwiyah*, *Umm-ul-Ilaj*, *Mufridat-i-Nami*, *Yogasangraha*, and *Jvatimirabhaskara* etc. He also ordained the establishment of the *Shifakhana* i.e. hospitals in all the major cities of the empire, to heal the sick, poor and needy people. Jahangir, in his Astronomical studies, recorded in detail the account of the celestial events such as lunar eclipse, solar eclipse, comets, and meteorites etc. in his memoirs *Tuzuk-iJahangiri*, which occurred during his life.

Annexure-XIX

Lectures delivered by INSA Fellows / Young Scientists / Teacher Awardees / INYAS Members / INSA Associate Fellows in Remote / Rural areas

(April 01, 2024 - March 31, 2025)

S.No	Name	Place & Date of lecture	Title of lecture
1	Prof. P N Gajjar	Dr APJ Abdul Kalam Govt. College, College of Arts, Commerce & Science, Silvassa, Dadra & Nagar Haveli On 23 Sep. 2024	Untold stories of Indian Scientists
		Gajwani Institute of Science & Technology, Gujarat On 07 December 2024	Let's Talk Science and Demonstration of Models / Projects by School Students
		Sheth H H Shirolawala High School, Bodeli, Gujarat On 20 December 2024	Role of Science / Physics Teachers in NEP 2020
		Tolani College of Arts & Science, Adipur, Gujarat On 23 December 2024	Untold Stories of Defence Research & Development in India
		Department of chemistry, KSKV Kachchh University Bhuj, Kachchh, Gujarat On 23 December 2024	Untold Stories of Defence Research & Development in India
		Shri R.R Lalan College, Bhuj, Gujarat On 24 December 2024	Untold Stories of Defence Research & Development in India
		Shri R.K Parikh Arts & Science College, Petlad, Gujarat On 14 Feb. 2025	Untold Stories of Defence Research & Development in India
		Dr Ashaben Patel Govt. Science College, Unjha Sheth M.R.S High School Campus Unjha On 18 Feb. 2025	Untold stories of Indian Scientists
		Matushri Rumba Tejani & Matushri Shantaba Vidia Science College, Sardar Patel Educational Institute, Kalvibid, Bhavnagar On 22 Feb. 2025	Untold Stories of Defence Research & Development in India
		Department of Life Sciences Hemachandrachary North Gujarat University Patan On 05 March 2025	Let's Talk about Science

2	Prof. N.M Bujurke	Gulbarga University, Kalburgi, Karnataka on 28 March 2025	Glimpse of Srinivasa Ramanujan : His Life and His Work Linear Algebra & its Applications
3	Dr Mohd Asgher	Government Higher Secondary School, Rajouri on 13 Feb. 2025	Impact of climate change on the flora & fauna of Jammu & Kashmir
4	Dr Sukhendu Mandal	Naikuri Thakur Das Institution' Purba Medinipur, West Bengal on 29 November 2024	Nanomaterials for Environment and Energy Applications
5	Dr Pratulananda Das	Pachhunga University College, Aizawl, Mizoram On 10/02/2025 Department of Mathematics & Computer science, Mizoram University, Aizawl, Mizoram On 11/02/2025	The First Step To Infinite Sets: Some History And Observations Nice ideals: An overview and some observations
6	Dr Rup Lal	Govt. Model Senior Secondary School (GMSSS), Bani, Hamirpur, Himachal Pradesh on 24.01. 2025	Transforming India through Science and Technology : Past Milestones (Before 1990 and Now), Future Goals for Viksit Bharat 2047
7	Dr Charu Dogra Rawat	PM Shri Kendriya Vidyalaya EAC Upper Shillong, Meghalaya on 29.11.2024 PM Shri Kendriya Vidyalaya EAC Upper Shillong, Meghalaya On 29.11.2024 Army Public School , Shillong On 03.12.2024	The Invisible world around us – Power of Microbes Career Prospects in science Mighty Power of the Unseen – Microbes & Us
8	Dr Kunal Chakraborty	Rabindra Mahavidyalaya Champadanga, Hooghly, West Bengal On 02.12.2024 Hiralal Mazumdar Memorial College for Women Dakshineswar, North 24 Paraganas, West Bengal On 03.12.2024	Ocean Information & forecast services for the well being of seafarers Ocean Science: An interdisciplinary research area for a sustainable future
9	Dr Amit Roy	Rabindranath Thakur Mahavidyalaya, Bishalgar, Agartala on 15.11.2024	Recent Development in Research and Scientific Research as a Career
10	Dr Raja Ram Yadav	Veer Bhumi Postgraduate College Mahoba, U.P on 15.10.2024	Ultrasounds and its applications

11	Dr Sudipta De	Bijoyanagar Adarsha Vidyamandir (H.S), Sunderban, West Bengal on 12.11.2024	Sustainable Development
12	Dr Gaurav Verma	Kendriya Vidyalaya No.1, Gaya, Bihar on 26.10.2024	Powerhouses and Superhighways: Exploring Mitochondria and Neurons
13	Dr Mewa Singh	Shaheed Mati Das School of Eminence, Longowal, District Sangrur, Punjab on 30.09.2024 Shaheed Mati Das School of Eminence, Longowal, District Sangrur, Punjab On 01.10. 2024	Science motivation I: Becoming a conservation biologist Science motivation II : Becoming an experimental animal scientist
14	Dr Vinod Kumar	Shaheed Mati Das School of Eminence, Longowal, District Sangrur, Punjab on 30.09.2024 Shaheed Mati Das School of Eminence, Longowal, District Sangrur, Punjab on 01.10.2024	Life on Time : Importance of time for animal and human health Consequences of an urbanized environment on physical and mental health (Importance of the Darkness of Night on Physical and Mental Health)
15	Dr. Upendranath Nandi	Swami Akhandananda Balika Vidyamandir High School, Murshidabad, West Bengal On 19.08.2024 Suren Chandra Modern School, Paschim Bardhaman, West Bengal On 23.08.2024	Electromagnetic Wave – The Backbone of Scientific Development Electromagnetic Wave – The Backbone of Scientific Development
16	Prof Srubabati Goswami	Debkunda SK Abdur Razzak Memorial Girls High Madrasah Beldanga, Murshidabad, West Bengal on 28.10.2024	Thy Mystery of the Missing Neutrinos
17	Prof. Sharmistha Banerjee	Palampur Science Centre, Banuri, Himachal Pradesh on 12.09.2024 Palampur Science Centre, Banuri, Himachal Pradesh on 14.09.2024	Antibiotic Resistance : A global health crisis Antibiotic Resistance : A global health crisis
18	Prof. Shekhar Mande	Palampur Science Centre, Banuri, Himachal Pradesh on 12.09.2024 Palampur Science Centre, Banuri, Himachal Pradesh on 14.09.2024	Viksit Bharat @ 2047 Viksit Bharat @ 2047
19	Prof. Satyen Saha	Kargil campus, University of Ladakh, Ladakh on 12-13 Aug 2024	Molecular Spectroscopy: Fundamentals to Practical Demonstrations

20	Prof. Debnarayan Jana	Chalksimuliya Kamakhya Vidyapith, Purba Medinipur on 23.07.2024	Dimensional Analysis in Science
		Jhapordah Duke Institution, Howrah, West Bengal on 23.07.2024	Dimensional Analysis and Nano Science
		Garfa Dhirendra Nath Memorial High School, Kolkata on 02.08.2024	Dimensional Analysis in Science
		Dinabandhu Mahavidyalaya, Bangaon, North 24 Parganas on 24.08.2024	100 years of Bose Einstein Statistics
21	Prof. Dilip Kumar Pratihar	Hijli College, Kharagpur on 05.07.2024	Artificial Intelligence in Robotics

Annexure-XX

SUMMER RESEARCH FELLOWSHIP PROGRAM 2024

Subjects	Applications received		Offered		Availed	
	S	T	S	T	S	T
Life Sciences (including Agricultural Sci.)	5593	206	436	1	333	1
Engineering & Technology	4129	104	324	4	191	1
Chemistry	2360	101	274	21	189	10
Physics	2316	102	265	18	178	10
Earth & Planetary Sci.	797	9	108	0	82	0
Mathematics	866	45	89	0	64	0
Total	16061	567	1496	44	1037	22
Grand Total	16628		1540		1059	

Annexure-XXI

FOCUS AREA SCIENCE TECHNOLOGY - SUMMER FELLOWSHIP 2024

Subjects	Applications received		Offered		Availed	
	S	T	S	T	S	T
Life Sciences (including Agricultural Sci.)	216	19	23	0	15	0
Engineering & Technology	157	4	24	1	17	0
Chemistry	110	9	15	4	14	3
Physics	147	6	23	4	18	1
Earth & Planetary Sci.	72	4	10	1	8	0
Mathematics	47	2	5	0	3	0
Total	749	44	100	10	75	4
Grand Total	793		1100		79	

Annexure-XXII

REFRESHER COURSES HELD FROM APRIL 2024 – MARCH 2025

S. No.	Topic	Venue	Date
1	Modern Trends in Evolution and Biodiversity	Periyar University, Salem	April 02-17 2024
2	Experimental Physics	Maharani Lakshmi Ammanni College For Women Autonomous (m LAC), Bengaluru	August 19-3 September 2024
3	Theoretical Physics	Sri S. Ramasamy Naidu Memorial College, Sattur	March 17-30, 2025
4	Evolutionary Ecology of Plant and Animal Adaptation	Vivekananda College of Arts & Science for Women, Tiruchengode	March 10-23, 2025

SUMMER SCHOOL HELD FROM APRIL 2024 – MARCH 2025

S. No.	Topic	Venue	Date
1	Summer School in Life Sciences	University of Hyderabad, Hyderabad	May 15-11 June, 2024
2	Summer School in Physics	Banaras Hindu University, Varanasi	June 10-29, 2024

ASSURE WORKSHOP HELD FROM APRIL 2024 – MARCH 2025

S. No.	Topic	Venue	Date
1	ASSURE Workshop in Physics	TIFR, Hyderabad	December 11-21, 2024

Annexure-XXIII

LECTURE WORKSHOPS HELD FROM APRIL 2024 – MARCH 2025

S No.	Topic	Venue	Date
1	Recent Advances in Plant Genomics	Cauvery College for Women (Autonomous), Tiruchirapalli	April 1-2, 2024
2	Number Analytics and Data Science	Madanapalle Institute of Technology & Science, Madanpalle	April 1-2, 2024
3	Recent Trends in Functional Materials	Shri Gnanambica Degree College, Madanapalle	April 1-3, 2024
4	Molecular spectroscopy : fundamentals and recent developments	The University of Burdwan, Burdwan	April 2-3, 2024
5	Recent Developments on Biodiversity and Ecoservices, and their impact on Human Welfare	V. O. Chidambaram College, Thoothukudi	April 3-4, 2024
6	21st Century: An Era of Multidisciplinary Research	Punjabi University, Patiala (Punjab)	April 3-5, 2024
7	Current Trends in Chemistry	Kongu Engineering College, Erode	April 12-13, 2024
8	Contemporary Topics in Chemical Sciences	Rajiv Gandhi University, Doimukh	April 17-19, 2024
9	Novel Insights from Structural and Functional Genomics	Hindusthan College of Arts and Science, Coimbatore	April 18-19, 2024
10	Holistic Approach to Explore the Beauty of Chemistry	Birla Institute of Technology-Mesra, Ranchi	May 2-4, 2024
11	Recent Advances In Agricultural Microbiology and Biotechnology	St. Joseph's University, Bengaluru	May 7-8, 2024
12	Himalayan Mountains and their life	University of Kashmir, Srinagar	May 8-10, 2024
13	The Extended Genotype: The role of microbial genome in plant growth and development	Kerala Agricultural University, Kasaragod	May 13-15, 2024
14	Recent Advances in Life Science	St. Joseph's College (Autonomous), Irinjalakuda	July 4-5, 2024
15	Physics for Engineering	Kongu Engineering College, Erode	September 1-2, 2024
16	Trends in Mathematics	Maharajah's College (Autonomous) , Vizianagaram	January 31-1February, 2025
17	Recent Advances in Life Science	Garden City University, Bangalore	February 5-6, 2025
18	Nonlinear Optical Properties of Molecules and Materials	Thanthai Periyar Government Arts and Science College (Autonomous), Tiruchirappalli	February 7-8, 2025

19	Mathematical Analysis	Sri Vasavi College, Erode	February 8-10, 2025
20	Ever young topics in Physical Sciences	St Aloysius (Deemed to be University), Mangalore	February 17-18, 2025
21	Taxonomy of Higher Plants and their Conservation	VHNSN College, Virudhunagar	February 18-19, 2025
22	Application of Datamining Statistics, AI & ML tools in Bio-Medicine	Swami Rama Himalayan University, Dehradun	February 18-20, 2025
23	New Frontiers in Microbial Pathogenesis	Visakha Govt Degree & PG college for Women, Visakhapatnam	February 19-20, 2025
24	Fundamentals and Advances in Quantum Dynamical Systems	The Gandhigram Rural Institute (Deemed to be university), Dindigul	February 20-22, 2025
25	Omics to Biomarker and Therapeutics	Bharathiar University, Coimbatore	February 24-25, 2025
26	Exploring Frontiers in Biomedical Research	Dhanalakshmi Srinivasan University, Trichy	February 24-25, 2025
27	Recent Advances In Biodiversity of Andaman and Nicobar Islands	Zoological Survey of India, Port Blair	February 27-28, 2025
28	Recent trends in molecular biology and biotechnology	Vignan foundation for Science Technology and Research (VFSTR), Guntur	March 3-4, 2025
29	Biotechnology: Impact on Biodiversity for Sustainable Development	Maharaja Sriram Chandra Bhanja Deo University, Baripada	March 5-6, 2025
30	Applications of rDNA Technology in Health Care	Kakatiya University, Warangal	March 5-6, 2025
31	Horizons of Quantum Science and Technology" (Celebrating the Centenary of Bose-Einstein Statistics)	P.K. College, Contai	March 5-6, 2025
32	Introduction to Theoretical Physics	Govt. Arts College, Melur	March 6-7, 2025
33	Recent Advancements in the Development of Applications for Specific Materials	Indira Gandhi National Tribal University, Amarkantak, M. P	March 6-7, 2025
34	Astronomy and Astrophysics	St. Anthony's College, Shillong	March 6 - 8, 2025
35	Genomics in Biology & Medicine	Poompuhar College (Autonomous), Mayiladuthurai	March 7-8, 2025
36	Recent Advances in Chemistry-2025 (RAC-25)	Karunya Institute of Technology and Sciences, Coimbatore	March 10-11, 2025
37	Medical Biotechnology	PGIMER, Chandigarh	March 10-11, 2025

38	Recent Advances in Organic Synthesis, Medicinal Chemistry and Spectral Analysis	Vaagdevi Degree & PG College (Autonomous), Hanamkonda	March 12-13, 2025
39	Algebra, Algebraic Number Theory, Topology and their Applications-2024	S.V.University, Tirupati	March 12-14, 2025
40	Recent Advances in Chemistry	KSR College of Arts & Science for Women, Tiruchengode	March 13-14, 2025
41	Groundwater Prospecting and Management: A Future Scenario	V.O. Chidambaram College, Tuticorin	March 14-15, 2025
42	Frontiers of Modern Biology: Discovering the Recent Scientific Advances	Bishop Heber College, Trichy	March 14-15, 2025
43	Modern Trends in Chemical Sciences	B.S. Abdur Rahman Crescent Institute of Science and Technology, Chennai	March 17-19, 2025
44	Mathematics	Bharathiar University, Coimbatore	March 19-21, 2025
45	Communication Systems in Biology	Yogi Vemana University, Kadapa	March 20-21, 2025
46	Frontiers in Chemical Sciences	Visakha Govt. Degree & PG College for Women (A), Visakhapatnam	March 21-22, 2025

