

INDIAN NATIONAL SCIENCE ACADEMY
Bahadur Shah Zafar Marg, New Delhi - 110002

Minutes of the 90th Anniversary General Meeting of the Indian National Science Academy held during 9-10 December 2024 at SRM Institute of Science and Technology, Chengalpattu, Tamil Nadu.

The following INSA Fellows/IDL-1/INSA Young Associates/INSA Associate Fellows/INSA History of Science Young Associates were present:

Professor Ashutosh Sharma, President
Professor Narinder K Mehra, Vice-President (International Affairs)
Professor Spenta R Wadia, Vice-President (Science Promotion)
Dr Gaurav Ahuja
Professor A Ajayaghosh
Dr Asadulla Asraf Ali
Dr Sandeep Anand
Professor Amit Awasthi
Professor Santokh Singh Badesha
Professor Vineeth N Balasubramanian
Professor Anjan K Banerjee
Professor Rahul Banerjee
Professor SS Banga
Professor Saroj K Barik
Dr Anirban Basu
Professor Gautam Basu
Dr Mrinmoyee Basu
Professor Sanjay Behari
Professor Neerja Bhatla
Professor Dipankar Bhattacharya
Professor Jayanta Bhattacharya
Dr Tanushree Bhattacharya
Professor Arup Bose
Professor Sivaji Chakravorti
Professor Dipshikha Chakravorty
Dr Pankaj Chauhan
Dr Santosh Chauhan
Dr Parveen Chhuneja
Professor Swagata Dasgupta
Professor Sushanta Dattagupta
Professor BS Daya Sagar
Professor Sirshendu De
Professor Abhishek Dey
Dr Ramendra Sundar Dey
Dr Sourav Dutta
Professor SR Gadre
Professor Animangsu Ghatak
Professor Parag R Gogate
Dr Aditya Gopalan
Shri Arvind Gupta
Professor Harsh Kumar Gupta

Professor Kailash Chand Gupta
Professor Jayanta Haldar
Dr Kalikrishna Hazra
Dr Neha Jain
Dr Bhavanath Jha
Professor M Lakshmi Kantam
Professor Santosh Kapuria
Dr Mohd Iqbal Raja Khan
Dr Anzar A Khuroo
Professor Gopal Krishna
Dr Raghavan Krishnan
Dr Veda Krishnan
Professor Sanjay Kumar
Professor Rup Lal
Dr Girdhari Lal
Professor R Mahalakshmi
Dr Biswanath Maity
Dr Manoj Majee
Dr Gaurav Majumdar
Professor Gobinda Majumder
Professor Govind K Makharia
Professor Nirupama Mallick
Professor Sukhendu Mandal
Dr Swathy Manohar
Professor G Marimuthu
Professor Hari S Misra
Dr Debashis Mitra
Professor Supriyo Mitra
Professor Sanjay Mittal
Professor JN Moorthy
Professor Debdeep Mukhopadhyay
Professor Dinesh A Nagegowda
Dr Awadhesh Narayan
Professor Rishikesh Narayanan
Professor Neela Nataraj
Professor Sankar Kumar Pal
Dr Jiban Jyoti Panda
Professor G Parthasarathy
Professor Vandana B Patravale
Dr Amit Kumar Rai
Dr T Ramamurthy
Professor R Ramaraj
Professor Sankar P Rath
Dr Bahni Ray
Professor Siddhartha Roy
Dr Kasturi Saha
Dr Sriparna Saha
Dr Manas Ranjan Sahoo
Professor Raghunath Sahoo
Dr Kalachand Sain
Dr VVSS Sarma
Professor Neelima Satyam

Dr Ellora Sen
Dr Eklabya Sharma
Dr Mahak Sharma
Dr Tarun Kumar Sharma
Dr Veerendra Kumar Sharma
Professor Ajit Kumar Shasany
Dr Jogender Singh
Professor Kamal Priya Singh
Professor Kashmir Singh
Dr Kulinder Pal Singh
Professor Neetu Singh
Dr Rajendra Singh
Dr Rishitosh Kumar Singh
Dr Sudhir Pratap Singh
Dr Surya Prakash Singh
Dr Swatantra Pratap Singh
Dr Surendra Nadh Somala
Professor K Somasundaram
Dr Arjun Srivathsa
Professor Balasubramanian Sundaram
Professor KM Sureshan
Professor Ashish Suri
Professor Satyam Suwas
Professor Qudsia Tahseen
Professor Pinaki Talukdar
Professor M Tanveer
Professor Anil K Tripathi
Professor Timir Tripathi
Professor JB Udgaonkar
Professor Siva Umapathy
Professor KC Upadhyaya
Professor TNC Vidya
Professor Vikram Vishal

In the 90th Anniversary General Meeting (9-10 December 2024), the following activities were organized: Presidential address, lectures from new INSA Fellows, INSA Young Associates, INSA Associate Fellows, INSA Distinguished Lecture Fellows-I, INSA Distinguished Lecture Fellows-II, INSA History of Science Young Associate and INYAS Chair.

A. The inaugural session: (9th December, 2024)

Professor Ashutosh Sharma, President INSA, Professor Indranil Manna, Vice-President (Science & Society), Professor C. Muthamizhchelvan, Vice Chancellor, SRMIST and Dr. P. Sathyanarayanan, Pro-Chancellor (Academics), SRMIST welcomed the participants. President, INSA expressed his gratitude to the VC of SRMIST, Chennai, for their efforts in organizing INSA AGM.

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-I***.

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

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-II*.

C. Sessions- The following sessions were conducted during the meeting:

Session 1

Sectional Committee I- Chair: Professor Kapil Paranjape

Lecture New Fellow

1. Professor Mahesh Kakde
2. Professor Neela Nataraj

Lecture INSA Young Associate

1. Dr Ratna Pal

Lecture INSA Associate Fellow

1. Dr Manas Ranjan Sahoo

Lecture PREVIOUS INSA Associate Fellow

1. Dr Haripada Sau

Sectional Committee II- Chair: Professor Kalobaran Maiti

Lecture of INSA Distinguished Lecture-2 Fellow

1. Professor Rajesh Gopakumar

Lecture New Fellow

1. Professor Dipankar Bhattacharya
2. Professor Sanjay Kumar

Lecture of INSA Distinguished Lecture-1 Fellow

1. Dr Veerendra Kumar Sharma

Lecture INSA Young Associate

1. Dr Sourav Dutta

Lecture INSA Associate Fellow

1. Professor Kamal Priya Singh
2. Professor Raghunath Sahoo

Lecture PREVIOUS INSA Associate Fellow

1. Dr Kasturi Saha

Session 2

Sectional Committee III- Chair: Professor M Lakshmi Kantam

Lecture of INSA Distinguished Lecture-2 Fellow

1. Professor Srinivasan Natarajan

Lecture New Fellow

1. Professor Rahul Banerjee
2. Professor Swagata Dasgupta
3. Professor Abhishek Dey
4. Professor Jayanta Halder
5. Professor Sankar P Rath
6. Professor AK Sahoo
7. Professor Balasubramanian Sundaram
8. Professor KM Sureshan
9. Professor Siva Umapathy

Lecture of INSA Distinguished Lecture-1 Fellow

1. Dr Ramendra Sundar Dey

Lecture INSA Young Associate

1. Dr Awadhesh Narayan
2. Dr Pankaj Chauhan
3. Dr Mrinmoyee Basu

Lecture INSA Associate Fellow

1. Professor Chidambaram Gunanathan
2. Professor Sukhendu Mandal
3. Dr Surya Prakash Singh

Lecture INSA History of Science Young Associates

1. Dr Asadulla Asraf Ali

Session 3

Sectional Committee IV- Chair: Dr Kalachand Sain

Lecture of INSA Distinguished Lecture-2 Fellow

1. Professor Harsh Kumar Gupta

Lecture New Fellow

1. Dr VVSS Sarma

Lecture of INSA Distinguished Lecture-1 Fellow

1. Professor Vikram Vishal

Lecture INSA Young Associate

1. Dr Rishitosh Kumar Sinha

Lecture INSA Associate Fellow

1. Professor Supriyo Mitra
2. Dr Tanushree Bhattacharya

Sectional Committee X- Chair: Dr MS Chauhan

Lecture of INSA Distinguished Lecture-2 Fellow

1. Professor Rup Lal

Lecture New Fellow

1. Dr Parveen Chhuneja
2. Professor DA Nagegowda
3. Dr AK Shasany

Lecture of INSA Distinguished Lecture-1 Fellow

1. Dr Amit Kumar Rai

Lecture INSA Young Associate

1. Dr Md Iqbal Raja Khan
2. Dr Veda Krishnan
3. Dr Kalikrishna Hazra

Lecture INSA Associate Fellow

1. Dr Sudhir Pratap Singh
2. Professor Kashmir Singh

Lecture New Foreign Fellow

(Video Lecture)

1. Professor Prabhu Pingali

Session 4

Sectional Committee V- Chair: Professor Santosh Kapuria

Lecture of INSA Distinguished Lecture-2 Fellow

1. Professor Sankar Kumar Pal

Lecture New Fellow

1. Professor Sivaji Chakravorti
2. Professor Sirshendu De

3. Professor Animangsu Ghatak
4. Professor Debdeep Mukhopadhyay
5. Professor Satyam Suwas

Lecture of INSA Distinguished Lecture-1 Fellow

1. Professor M Tanveer

Lecture INSA Young Associate

1. Dr Surendra Nadh Somala
2. Dr Sriparna Saha

Lecture INSA Young Associate

1. Dr Bahni Ray
2. Dr Swatantra Pratap Singh

Lecture INSA Associate Fellow

1. Professor Parag Ratnakar Gogate
2. Professor Vineeth N Balasubramanian
3. Professor Neetu Singh
4. Professor Neelima Satyam

Lecture PREVIOUS INSA Associate Fellow

1. Dr Sandeep Anand

Lecture New Foreign Fellow

1. Professor Santokh Singh Badesha

Lecture INSA History of Science Young Associates

1. Dr Swathy Manohar

Session 5

Sectional Committee VI- Chair: Professor Nirupama Mallick

Lecture of INSA Distinguished Lecture-2 Fellow

1. Dr Eklabya Sharma

Lecture New Fellow

1. Professor SP Sane
2. Professor TNC Vidya

Lecture INSA Young Associate

1. Dr Gaurav Majumdar

Lecture INSA Associate Fellow

1. Dr Anzar Ahmad Khuroo

Lecture PREVIOUS INSA Fellow

1. Professor SK Barik

Lecture PREVIOUS INSA Associate Fellow

1. Dr Arjun Srivathsa

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

Lecture of INSA Distinguished Lecture-2 Fellow

1. Professor Kumaravel Somasundaram

Lecture New Fellow

1. Professor Sanjay Behari
2. Professor Neerja Bhatla
3. Professor Jayanta Bhattacharya

Lecture New Fellow

1. Professor GK Makharia
2. Professor VB Patravale
3. Professor Ashish Suri

Lecture of INSA Distinguished Lecture-1 Fellow

1. Dr Tarun Kumar Sharma

Lecture INSA Young Associate

1. Dr Neha Jain

Lecture INSA Associate Fellow

1. Dr Girdhari Lal
2. Dr Biswanath Maity

Session 6

Sectional Committee VII- Chair: Dr Sagar Sengupta

Lecture of INSA Distinguished Lecture-2 Fellow

1. Professor Vidita Ashok Vaidya

Lecture New Fellow

1. Professor Amit Awasthi
2. Professor AK Banerjee
3. Dr Santosh Chauhan
4. Dr Manoj Majee
5. Dr Ellora Sen
6. Professor Amit Singh

Lecture INSA Young Associate

1. Dr Jogender Singh

Lecture PREVIOUS INSA Associate Fellow

1. Dr Mahak Sharma

Sectional Committee VIII- Chair: Dr Rajan Sankaranarayanan

Lecture of INSA Distinguished Lecture-2 Fellow

1. Professor JB Udgaonkar

Lecture New Fellow

1. Professor Gautam Basu
2. Professor Radhakrishnan Mahalakshmi
3. Professor Rishikesh Narayanan
4. Professor Pinaki Talukdar

Lecture of INSA Distinguished Lecture-1 Fellow

1. Dr Jiban Jyoti Panda

Lecture INSA Young Associate

1. Dr Gaurav Ahuja

Lecture INSA Associate Fellow

1. Professor Timir Tripathi

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

INYAS 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-IV***.

Admission of Fellows under Rule 11

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 list is given in ***Annexure-V***.

Presentation of awards:

- a) INSA Young Associate Fellows
- b) INSA Associate Fellows
- c) INSA Distinguished Lecture Fellows I and II
- d) INSA History of Science Young Associate

17 INSA Young Associate Fellows, 25 INSA Associate Fellows (including 7 previous IAFs), 2 INSA History of Science Young Associates received the Certificate and Angavastram from President of INSA. They also took oaths, signed the Register, and were inducted. In addition, 16 INSA Distinguished Lecture Fellows I and II received the Citation and Angavastram from President of INSA. The list is given in ***Annexure-VI***.

Following the presentations mentioned above, regular agenda items were taken up:

1. Condolence at the passing away of the distinguished Fellows:

The sad demise of Dr Sukh Dev, Professor Rohini Madhusudan Godbole, Professor Anil Kumar, Professor Satya Priya Moulik, Dr Satinder Kumar Sikka and Professor Mahendra Singh Sodha were reported. The President, INSA, read the obituary notes, and all those present stood in silence for two minutes as a mark of respect to the deceased.

2. Confirmation of minutes of the Annual General Meeting held on 20 September, 2024.

The minutes of the AGM held on 20 September 2024 were presented by Professor Narinder K Mehra, Vice-President (International Affairs) INSA. These minutes were uploaded on the INSA website, and no comments were received. Thereafter, the minutes were confirmed.

3. To read as required under Rule 40(c) the name of nominees for election as INSA Fellow from 1 September 2024 to 14 November 2024.

Professor Narinder K Mehra, Vice-President (International Affairs) INSA, read the names of nominees for election as INSA Fellow.

4. Following the Redeployment of surplus staff from Vigyan Prasar / Retirement during the year 2024.

Prof. Narinder K Mehra, Vice-President (International Affairs), announced the redeployment of surplus staff from Vigyan Prasar / Retirement during the year 2024

Redeployment of surplus staff from Vigyan Prasar:

Sno.	Name & Designation	Level in Pay Matrix	Date of Joining	Redeployment
1.	Smt. Sonu Bhatia Assistant -I	7	03-06-2024	Redeployment
2	Smt. Usha Kumari Assistant -I	6	03-06-2024	Redeployment

Supernumerary post in r/o Dr. Kinkini Dasgupta Misra, Scientist F surplus employee of Vigyan Prasar during the year 2024:

Supernumerary post from Vigyan Prasar:

S No.	Name & Designation	Level in Pay Matrix	Date of Joining	Supernumerary post
1.	Dr. Kinkini Dasgupta Misra Scientist –F	13A	22.10.2024	Supernumerary post

RETIREMENT:

Sno.	Name & Designation	Level in Pay Matrix	Date of Retirement	Retirements
1.	Sh. Anil Kumar MTS	4	31.01.2024	Retirement
2.	Sh.Adarsh Kumar Arora AED-II	10	31.07.2024	Retirement
3.	Sh.Mangal Singh MTS	4	31.07.2024	Retirement

5. Any other item.

a. To report the dropping of names of Shri Shiv Nadar and Shri Azim Hashim Premji from INSA Fellowship.

The President INSA, announced the decision to drop the names of Shri Shiv Nadar and Shri Azim Premji from INSA Fellowship.

b. To enhance the Admission Fee and one-time Fellowship subscription from Newly Elected Fellows & introduce Fellowship Fee for INSA Young Associates/INSA Associate Fellows.

The President INSA, has announced that admission fees for Fellows will be increased from Rs. 500/- to Rs. 2000/- and Fellowship subscriptions to be increased from Rs. 2000/- to Rs. 8000/-.

The Fellowship fees have been introduced to IYA/IAF to Rs. 5000/-. However, this proposal will be put up to Resource Generation and Management Committee to be deposited to INSA corpus fund.

c. Regarding Honorarium of INSA Distinguished Professorship.

The President INSA, has briefed the members about the following:

The total outlay for each INSA Distinguished Professor will be fixed i.e. Rs 14 Lakhs per annum, and cannot be increased.

In view of the current allocation from DST, a portion of the honorarium may be reallocated to the contingency fund if necessary.

Accordingly, INSA Distinguished Professors may choose one from the following three options for the same:

Honorarium Rs. 12 lakh per annum (@ Rs. 1 lakh per month) and Rs. 2 lakh contingency grant per annum (same as the existing INSA scheme)

OR

Honorarium of Rs. 9 lakh per annum (@ Rs. 75000/- per month) and Rs 5 lakh contingency per annum

OR

Honorarium of Rs. 6 lakh per annum (@ Rs 50000/- per month) and Rs 8 lakh contingency per annum).

d. Regarding the change in tenure of the Council

The President INSA, briefed the Fellows about the discussion held in the Council Meeting regarding the extension of tenure of President, Vice President and Council of INSA. The Council debated this issue in the meeting, and after due deliberation, the Council recommended extending the tenure of the President and Council. The Council proposed that this issue be discussed and reported in the Anniversary General Meeting to be held on 10th Dec. 2024 and a referendum to be sent to all Fellows for voting on the following options along with a Preamble:

- a. Increase the tenure of the Council from 3 to 5 years
- b. Allow Re-election of the Council for a second and final 3-year term.

- c. Maintain the Status quo of the current 3-year tenure

It was further decided that there will be an exit option after 3 years for Council Members.

e. A few Fellows suggested extending the meeting for three days and including sight-seeing in the programme. Also, the title of the lecture was suggested to be included in the Anniversary General Meeting programme. Professor Narinder K Mehra urged that INSA should be represented in various International Bodies which would increase its visibility. ED informed that Professor Mehra has been elected as Treasurer of the Association of Academies and Societies of Sciences in Asia (AASSA) for 2024-27. President INSA, emphasized the INSA Young Associates/INSA Associate Fellows should be more involved in various INSA activities. Hence, the Academy has created a new platform INSA-Centre for Science & Technology Policy (CSTP) to provide the opportunity. All Fellows/IYA/IAF are requested to contribute to INSA-CSTP.

During the discussion of INSA Foundation Day, President INSA, informed that INSA Achieves may be restored. A special section of PINSA will be created for Achieves. Fellows were requested to include INSA slides during their presentation in various National & International forums.

f. New Initiatives

The President INSA, briefed the Fellows about the new initiatives (**Annexure-VII**) taken up by the Academy.



Professor Ashutosh Sharma

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

ABSTRACT

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

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 land 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 Prof. 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.





DR ANIL KAKODKAR

Chancellor, Homi Bhabha National Institute

Chairman, Rajiv Gandhi Science & Technology Commission

ABSTRACT

Inevitability of Thorium for energy security of developed India

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 utilisation 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 centered 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.





DR VIJAY KUMAR SARASWAT

Member, NITI Aayog,
Government of India

ABSTRACT

India's Technological Revolution: Driving Sustainable Economic Growth

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/EO-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, blockchain, 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.





DR S. SOMANATH

Secretary, Department of Space (DoS)

Chairman, Space Commission and Chairman, ISRO

ABSTRACT

Space Exploration in Amrut Kaal

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 interplanetary 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 formation 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 spacecraft operations. Chandrayaan-3 landing near the south pole of Moon was a great success under his leadership. The Aditya-L1, XpoSat, INSAT-3DS, NVS-01, Oceansat, 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 spearheaded 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.





DR SAMIR V KAMAT

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

ABSTRACT

Defence R&D the Road Ahead'

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.





DR KRISHNA M ELLA
Executive Chairman
Bharat Biotech

ABSTRACT

Innovation & Entrepreneurship

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 lifesaving vaccines while delivering over 9 billion vaccines in more than 125 developing countries.

Dr. Ella spearheaded 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.





MS VARTIKA SHUKLA
Chairman & Managing Director
Engineers India Limited
New Delhi

ABSTRACT

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

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 assets 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 spearheading 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.





DR KUMAR SIVARAJAN

Chief Technology Officer
Tejas Networks

ABSTRACT

Challenges in Next-Gen Telecommunication Networks

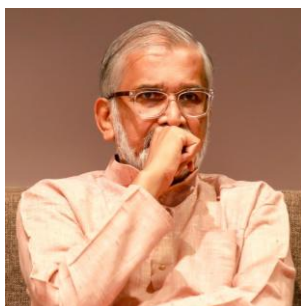
Broadband access together with the smart phone has revolutionized our lives. We will provide an overview of further advances being explored in 6G mobile and related networks and the technical challenges.

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.





DR ABHAY BANG

Founder Director

Society for Education, Action and Research in Community Health (SEARCH)

Gadchiroli, Maharashtra

ABSTRACT

Research with the People

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 Newborn 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 MacArthur 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 Macroeconomics 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.





MR SENAPATHY "KRIS" GOPALAKRISHNAN

Chairman
Axilor Ventures

ABSTRACT

Role of R&D and Innovation in economic development

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 "**itihaasa**" (<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.





MR ARVIND GUPTA

Science writer & Toy maker

ABSTRACT

Demonstration-LITTLE TOYS, BIG SCIENCE

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).





DR RAJENDRA SINGH
Founder
Tarun Bharat Sangh (TBS)

ABSTRACT

Solving the Climate Crisis through Indigenous Knowledge: Insights from Tarun Bharat Sangh

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.



SESSION-1

- **SECTIONAL COMMITTEE-I**
- **SECTIONAL COMMITTEE-II**

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.





PROFESSOR MAHESH KAKDE

Professor of mathematics
Indian Institute of Science
Bengaluru

ABSTRACT

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

ABSTRACT

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

Prof. 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.





PROFESSOR RATNA PAL

Department of Mathematics
Indian Institutes of Science Education and Research
Mohali

ABSTRACT

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 Prof. Kaushal Verma.





DR MANAS RANJAN SAHOO

School of Mathematical Sciences

National Institute of Science Education and Research

Bhubaneswar

ABSTRACT

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.





DR HARIPADA SAU

Department of Mathematics

Indian Institutes of Science Education and Research
Pune

ABSTRACT

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



Prof. Kalobaran Maiti

Senior Professor

Tata Institute of Fundamental Research
Mumbai

Prof. 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.



Sectional Committee II

Lecture of INSA Distinguished Lecture-2 Fellow



PROFESSOR RAJESH GOPAKUMAR

Distinguished Professor, TIFR and

Centre Director

International Centre of Theoretical Sciences (ICTS-TIFR)

ABSTRACT

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





PROFESSOR DIPANKAR BHATTACHARYA

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

ABSTRACT

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 astrophysics. 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

ABSTRACT

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, $A_{loop} \sim \nu^{-1/2}$, in the true thermodynamic limit.

SPEAKER PROFILE

Prof. 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. Prof. 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



Sectional Committee II

Lecture of INSA Distinguished Lecture-1 Fellow



DR VEERENDRA K. SHARMA

Scientific Officer (G)

Solid State Physics Division

Bhabha Atomic Research Centre, Mumbai

ABSTRACT

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 (BμE) [1-3], illustrating how peptides can distinctly influence BμE 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].

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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.





DR SOURAV DUTTA

Associate Professor

Tata Institute of Fundamental Research

Mumbai

ABSTRACT

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.



Sectional Committee II

Lecture INSA Associate Fellow



PROFESSOR KAMAL P. SINGH

Indian Institute of Science Education and Research (IISER) Mohali

ABSTRACT

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

Prof. 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

ABSTRACT

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. Prof. Sahoo was a

CERN Scientific Associate during 2021-22 and received the Excellence in Research award-2024 of IIT Indore.





DR KASTURI SAHA

Associate Professor
Department of Electrical Engineering
Indian Institute of Technology
Bombay

ABSTRACT

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 Prof. Paola Cappellaro's group in the Research Laboratory of Electronics at Massachusetts Institute of Technology. She obtained her Ph.D.

from Prof. Alexander Gaeta's group in the School of Applied and Engineering Physics in Cornell University. Prior to that she did her M.Sc. from IIT-Delhi and B.Sc.(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.



SESSION -2

SECTIONAL COMMITTEE-III

Sectional Committee III

Chair



PROFESSOR M LAKSHMI KANTAM

DR B.P. Godrej Distinguished Professor
Department of Chemical Engineering
Institute of Chemical Technology
Mumbai

Prof. 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.



**DR SRINIVASAN NATARAJAN**

Solid State and Structural Chemistry Unit
Indian Institute of Science
Bangalore

ABSTRACT

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]

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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.





PROFESSOR RAHUL BANERJEE

Department of Chemical Sciences

Indian Institute of Science Education and Research (IISER)

Kolkata, Mohanpur

ABSTRACT

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

Prof. Rahul Banerjee received his PhD from the University of Hyderabad, in 2006. Prof. 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. Prof. 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

ABSTRACT

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 α -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

ABSTRACT

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**ABSTRACT***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

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SPEAKER PROFILE

Dr. Jayanta Haldar 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.

Prof. Haldar'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 S. P. RATH**

Lalit Mohan Kapoor Chair
Department of Chemistry
Indian Institute of Technology
Kanpur

ABSTRACT

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

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SPEAKER PROFILE

S. P. 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

ABSTRACT*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 tricyclic ethylene moiety, 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.

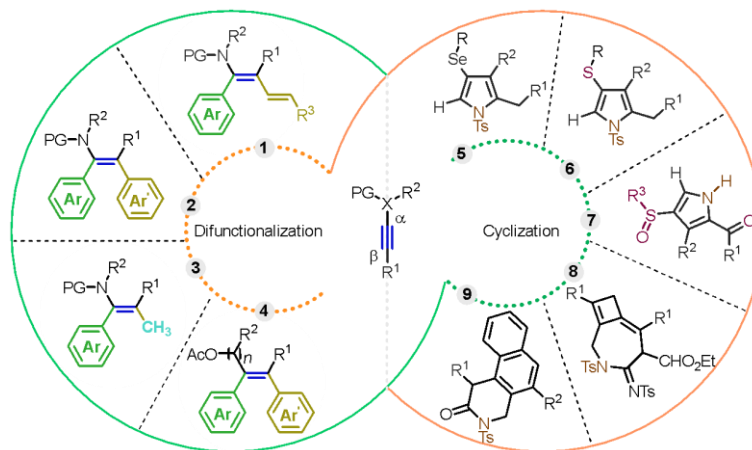


Figure 1. Regioselective difunctionalization and cyclization of internal alkynes

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SPEAKER PROFILE

Akhila was born in Bhubaneswar (Odisha), India. He completed doctoral study at the CSIR-National Chemical Laboratory, Pune under the supervision of Prof. Ganesh Pandey in 2001. He worked as a postdoc researcher with Prof. Hans-Joachim Gais (RWTHAachen- Germany, 2002), Prof. Tamejiro Hiyama (Kyoto-University-Japan; JSPS; 2002–2005), and finally with Prof. 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 Prof. 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

ABSTRACT

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

ABSTRACT*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

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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

ABSTRACT

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 Umamathy, 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





DR RAMENDRA SUNDAR DEY

Institute of Nano Science and Technology
Mohali, Punjab

ABSTRACT

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.

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- Biswas A., Barman N., Avinasj N., Thapa R., Dey, R. S.*, *Mater. Horiz.*, 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 (INYAS). He is also serving as an Associate Editor and Guest Editor of several international journals.





DR AWADHESH NARAYAN

Associate Professor
Indian Institute of Science
Bangalore

ABSTRACT

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 Urbana-Champaign, 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**

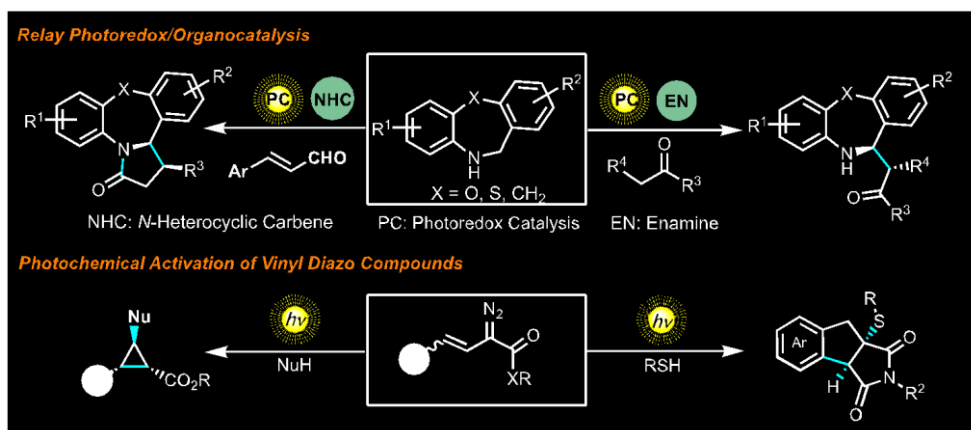
Associate Professor Department of Chemistry

Indian Institute of Technology

Jammu

ABSTRACT*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.



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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 Prof. 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

ABSTRACT

Efficient Photoelectrodes for Photoelectrochemical Water Splitting

High energy density of H_2 drives to replace all the available non-renewable energy sources in near future and can function as efficient fuel. H_2 generation via water splitting through photoelectrochemical (PEC) approach is a greener, renewable, and promising pathway. So, to attain adequate quantity of H_2 , 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, $ZnIn_{2.2}S_7$ is targeted as the model semiconductor. Vertically grown 2D nanosheets of $ZnIn_{2.2}S_7$ is developed first thorough wet-chemical method which shows enhanced efficiency of H_2 generation. $ZnIn_{2.2}S_7$ 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- $ZnIn_{2.2}S_7$ is developed from $ZnIn_{2.2}S_7$ which shows higher charge transportation ability. The Cd- $ZnIn_{2.2}S_7$ 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).



Sectional Committee III

Lecture INSA Associate Fellow



PROFESSOR CHIDAMBARAM GUNANATHAN

Professor

School of Chemical Sciences

National Institute of Science Education and Research

Bhubaneswar

ABSTRACT

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 6-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.

Sectional Committee III

Lecture INSA Associate Fellow



PROFESSOR SUKHENDU MANDAL

School of Chemistry

Indian Institute of Science Education and Research

Thiruvananthapuram

ABSTRACT

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 oxidation.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

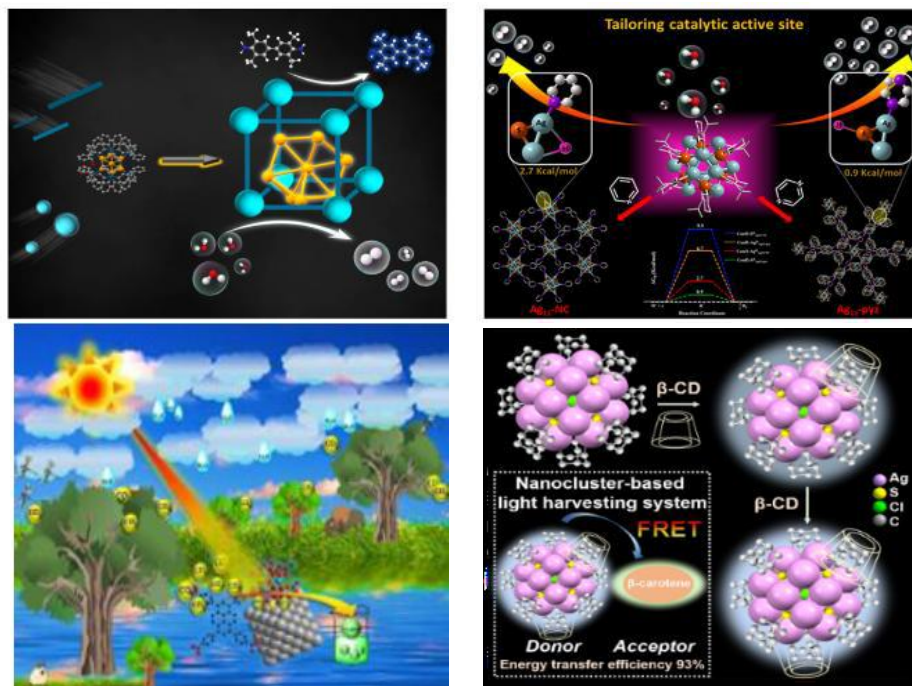


Figure 1. Structural illustration of the newly synthesized cluster and cluster assembly and their catalytic properties.

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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

ABSTRACT

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).



Sectional Committee III

Lecture INSA History of Science Young Associates



DR ASADULLA ASRAF ALI

Department of Chemistry
Assam Kaziranga University
Jorhat

ABSTRACT

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.



SESSION-3

- **SECTIONAL COMMITTEE-IV**
- **SECTIONAL COMMITTEE-X**

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.



Sectional Committee IV

Lecture of INSA Distinguished Lecture-2 Fellow



PROFESSOR HARSH K. GUPTA

INSA Senior Scientist,
CSIR-National Geophysical Research Institute (NGRI)
Hyderabad

ABSTRACT

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 Makran 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.





PROFESSOR VVSS SARMA

CSIR-National Institute of Oceanography
Regional Centre, Visakhapatnam

ABSTRACT

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

Prof. 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. Prof. Sarma's work is pivotal in advancing knowledge in marine science and addressing critical issues related to ocean health and sustainability.



Sectional Committee IV

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

ABSTRACT

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.

Prof. 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.





DR RISHITOSH SINHA

Scientist/Engineer SE
Physical Research Laboratory
Ahmedabad

ABSTRACT

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.



**PROFESSOR SUPRIYO MITRA**

Department of Earth Sciences

Indian Institute of Science Education and Research

Kolkata

ABSTRACT*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

ABSTRACT

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.





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.



Sectional Committee X

Lecture of INSA Distinguished Lecture-2 Fellow



PROFESSOR RUP LAL

Senior Scientist

Acharya Narendra Dev College,

University of Delhi

ABSTRACT

*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

Prof. 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, Prof. S.R. Vyas Memorial Award, Prof. 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.





DR PARVEEN CHHUNEJA

School of Agricultural Biotechnology
Punjab Agricultural University
Ludhiana

ABSTRACT

*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

ABSTRACT

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 of 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

ABSTRACT

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 platicarpus*. 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.





DR AMIT KUMAR RAI

Scientist D

National Agri-Food Biotechnological Institute (NABI)

Mohali

ABSTRACT

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/ Authored 5 books and author 35 book chapters with >4100 citations.





DR M. IQBAL R. KHAN

Assistant Professor
Department of Botany
Jamia Hamdard
New Delhi

ABSTRACT

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

ABSTRACT

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

ABSTRACT***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.





PROFESSOR SUDHIR PRATAP SINGH

Head (Industrial Biotech. Dept.) & Dean (Research)
Gujarat Biotechnology University
Gandhinagar

ABSTRACT

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, xylooligosaccharides, 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 quality.

SPEAKER PROFILE

Prof. 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. Prof. 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. Prof. 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

ABSTRACT

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

Prof. 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.





PROFESSOR PRABHU PINGALI

Professor & Director
Tata-Cornell Institute
Cornell University
New York, USA

ABSTRACT

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. Prof. Pingali has written 14 books and over 200 refereed journal articles and book chapters.



Session 4

Sectional Committee-V

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 Prof. P. C. P. Bhatt Faculty Research Award for best researcher at IIT Delhi.



Sectional Committee V

Lecture of INSA Distinguished Lecture-2 Fellow



PROFESSOR SANKAR K. PAL

Emeritus Professor
Indian Statistical Institute
Kolkata

ABSTRACT

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.

Prof. 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.





PROFESSOR SIVAJI CHAKRAVORTI

Electrical Engineering
Jadavpur University
Kolkata

ABSTRACT

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

ABSTRACT*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.

Prof. 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. Prof. 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. Prof. 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

ABSTRACT

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

ABSTRACT

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 assurance.

Key words: *Hardware Security, Side Channel Analysis, Fault Analysis, Micro-architectural attacks, Design-for-Security, Trust and Assurance.*

SPEAKER PROFILE

Prof. 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

ABSTRACT

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.





PROFESSOR M. TANVEER

OPTimization for MACHine Learning (OPTIMAL) Research Lab
Indian Institute of Technology
Indore

ABSTRACT

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.





DR SURENDRA NADH SOMALA

Associate Professor
Indian Institute of Technology
Hyderabad

ABSTRACT

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

ABSTRACT

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

ABSTRACT

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

Prof. 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

ABSTRACT

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 CO_2 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

ABSTRACT

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 H_2O_2 , Fenton's reagent and O_3 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.

Prof. 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).

ABSTRACT

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

ABSTRACT

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. Prof. 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

ABSTRACT

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.





DR SANDEEP ANAND

Professor

Department of Electrical Engineering

Indian Institute of Technology

Bombay

ABSTRACT

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.





PROFESSOR SANTOKH BADESHA

Distinguished Professor

Elmore Family School of Electrical and Computer Engineering

ABSTRACT

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.





DR SWATHY MANOHAR

Department of Civil Engineering
Indian Institute of Technology
Bombay

ABSTRACT

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).



SESSION 5

- **Sectional Committee-VI**
- **Sectional Committee-IX**

Sectional Committee VI

Chair



PROFESSOR NIRUPAMA MALICK

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.



DR EKLABYA SHARMA

Strategic Advisor and Distinguished Fellow

Ashoka Trust for Research in Ecology and the Environment (ATREE)

Bangalore

ABSTRACT

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.





PROFESSOR SANJAY P. SANE

National Centre for Biological Sciences
Bangalore

ABSTRACT

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 aerobatic 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 Prof. Michael H. Dickinson. He then transitioned to the field of sensory neurobiology, conducting postdoctoral research on flying insects with Prof. 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

ABSTRACT

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 Nagarhole 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.





DR GAURAV MAJUMDAR

Assistant Professor

University of Allahabad

ABSTRACT

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.





PROFESSOR ANZAR A. KHUROO

Centre for Biodiversity & Taxonomy
Department of Botany
University of Kashmir
Srinagar

ABSTRACT

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

Prof. 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. Prof. Khuroo has also discovered 12 new plant species, underscoring his significant role in advancing botanical research and conservation.





PROFESSOR SAROJ KANTA BARIK

Department of Botany
North-Eastern Hill University
Shillong

ABSTRACT

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, Prof. 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

ABSTRACT

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.



Sectional Committee IX

Chair



DR THANDAVARAYAN RAMAMURTHY

INSA-Senior Scientist

ICMR-National Institute for Research in Bacterial Infections, Kolkata

After completion of Ph.D in Marin 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.





PROFESSOR KUMAR SOMASUNDARAM

Department of Microbiology Cell Biology
Indian Institute of Science
Bangalore

ABSTRACT

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.





PROFESSOR SANJAY BEHARI

Director

Sree Chitra Tirunal Institute for Medical Sciences and Technology,
Thiruvananthapuram

ABSTRACT

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

Prof. 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. Prof. 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

ABSTRACT

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.

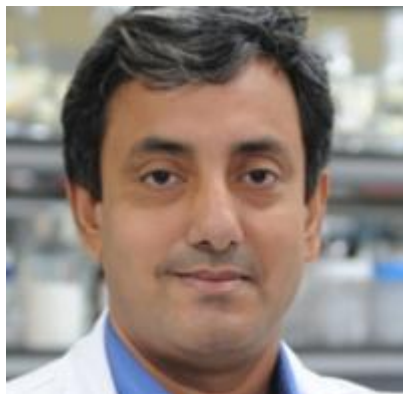
SPEAKER PROFILE

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

ABSTRACT

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

ABSTRACT

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 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

ABSTRACT

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

ABSTRACT

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

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SPEAKER PROFILE

Prof. 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). Prof. 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





DR TARUN KUMAR SHARMA

Department of Medical Biotechnology
Gujarat Biotechnology University
Gandhinagar

ABSTRACT

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.





DR NEHA JAIN

Associate professor

Department of Bioscience and Bioengineering

Indian Institute of Technology Jodhpur

ABSTRACT

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_2m) 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_2m conformers during α -syn amyloid assembly. Our results, supported by biophysical and biochemical analysis, suggest that β_2m in its monomeric form suppresses amyloid formation by α -syn. Monomeric β_2m drives α -syn to off-pathway oligomers which were found to be non-toxic to the cells. Our results indicate that β_2m could act as chaperone-like protein and prevent amyloid formation. However, the higher order species of β_2m 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.





DR GIRDHARI LAL

Senior Scientist
National Centre for Cell Science,
Pune

ABSTRACT

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

ABSTRACT

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-G65 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. Prof. Maity's broad research focus is – G-protein regulation in stress physiology



SESSION 6

- **SECTIONAL COMMITTEE VII**
- **SECTIONAL COMMITTEE VIII**

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.



Sectional Committee VII

Lecture of INSA Distinguished Lecture-2 Fellow



PROFESSOR VIDITA VAIDYA

Senior Professor and Chairperson
Department of Biological Sciences
Tata Institute of Fundamental Research
Mumbai

ABSTRACT

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.





DR AMIT AWASTHI

Senior Professor

Translational Health Science & Technology Institute

Faridabad

ABSTRACT

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

ABSTRACT

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, Stu-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, Prof. 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

ABSTRACT

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.



Sectional Committee VII

Lecture New Fellow



DR MANOJ MAJEE

Senior Scientist

National Institute of Plant Genome Research

New Delhi

ABSTRACT

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 SULFOXIDE 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

ABSTRACT

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 (PTX3) 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. Prof. 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

ABSTRACT

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 Prof. 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 ICGEB, 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.





DR JOGENDER SINGH

Department of Biological Sciences
Indian Institute of Science Education and Research
Mohali

ABSTRACT

*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 Ph.D. 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.



Sectional Committee VII

Lecture Previous INSA Associate fellow



DR MAHAK SHARMA

Associate Professor

Department of Biological Sciences

Indian Institutes of Science Education and Research

Mohali

ABSTRACT

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).





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.



Sectional Committee VIII

Lecture of INSA Distinguished Lecture-2 Fellow



PROFESSOR JAYANT B UDGAONKAR

Department of Biology
Indian Institute of Science Education and Research
Pune

ABSTRACT

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.

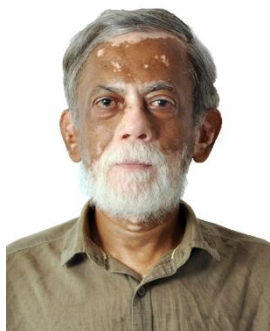
SPEAKER PROFILE

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.



Sectional Committee VIII

Lecture New Fellow



DR GAUTAM BASU

Former Professor
Department of Biophysics
Bose Institute
Kolkata

ABSTRACT

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- π 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. Prof. 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

ABSTRACT

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

Prof. Radhakrishnan Mahalakshmi is a Professor at the Indian Institute of Science Education and Research, Bhopal. Since 15+ years, Prof. 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

ABSTRACT

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

ABSTRACT

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

Prof. 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.



Sectional Committee VIII

Lecture of INSA Distinguished Lecture-1 Fellow



DR JIBAN JYOTI PANDA

Scientist E

Institute of Nano Science and Technology

Mohali

ABSTRACT

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 (IN-YAS) 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.





DR GAURAV AHUJA

Associate Professor

Department of Computational Biology

Indian Institute of Information Technology

Delhi

ABSTRACT

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, AgeXtend and scCamAge, each offering unique capabilities to decode the mechanisms underlying aging and identify potential interventions. AgeXtend 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, AgeXtend 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, AgeXtend identifies promising geroprotectors and establishes links between aging-associated microbiomes, supplemented metabolites, and host longevity. Experimental validation across yeast and human fibroblast models underscores AgeXtend's potential for uncovering novel pro-longevity therapeutic interventions. Complementing AgeXtend, 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, AgeXtend 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.





PROFESSOR TIMIR TRIPATHI

Department of Zoology
School of Life Sciences
North-Eastern Hill University
Shillong.

ABSTRACT

*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 (TGR_{sec}). To investigate the structure-function relationship of TGR_{sec}, 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 FgTGR_{sec}. Additionally, the N-terminal Grx domain positively regulates TrxR activity and contributes to the structural stability of FgTGR_{sec}. 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 FgTGR_{sec} 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

Prof. 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 Prof. 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.





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 materials engineer 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 IMPacting 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.





DR NISHANT CHAKRAVORTY

Chairperson, IN^YAS &
Associate Professor
Indian Institute of Technology
Kharagpur

ABSTRACT

IN^YAS: Celebrating a Decade of Excellence

The Indian National Young Academy of Science (IN^YAS) 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, IN^YAS has been proactive in initiating dialogue and deliberations within the scientific community, industry, and policy curators, while highlighting its core vision of 'Science for Society.'

Over the years, IN^YAS has actively organized various events under its flagship activities, including symposiums, conferences, workshops, and meetings. The year 2024-25 is a special one for IN^YAS, as it marks the completion of the first decade of its journey. IN^YAS has conducted an extensive range of notable events across India, which will be showcased during the IN^YAS 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 IN^YAS' 10th anniversary. The symposium successfully covered various sessions on climate science, agriculture, healthcare, clean energy, and materials, along with 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 IN^YAS. 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, PLOS ONE, 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.



**New Fellows elected w.e.f. 01.01.2025)
(Scrolls and Angavastram)**

1. **Professor Amit Awasthi**
Translational Health Science & Technology Institute, Faridabad
2. **Professor Anjan Kumar Banerjee**
Indian Institute of Science Education and Research, Pune
3. **Professor Rahul Banerjee**
Indian Institute of Science Education and Research-Kolkata, Mohanpur
4. **Dr Abhay Bang**
SEARCH (Society for Education, Action and Research in Community Health), Gadchiroli, Maharashtra
5. **Professor Gautam Basu**
Former Professor, Bose Institute, Kolkata
6. **Professor Sanjay Behari**
Sree Chitra Institute for Medical Sciences and Technology, Thiruvananthapuram
7. **Professor Neerja Bhatla**
Ex Professor & Head, All India Institute of Medical Sciences, New Delhi
8. **Professor Dipankar Bhattacharya**
Ashoka University, Sonapat
9. **Professor Jayanta Bhattacharya**
Translational Health Science & Technology Institute, Faridabad
10. **Professor Sivaji Chakravorti**
Jadavpur University, Kolkata
11. **Dr Santosh Chauhan**
CSIR-Centre for Cellular and Molecular Biology, Hyderabad
12. **Dr Parveen Chhuneja**
Punjab Agriculture University, Ludhiana
13. **Professor Swagata Dasgupta**
Indian Institute of Technology Kharagpur, Kharagpur
14. **Professor Sirshendu De**
Indian Institute of Technology-Kharagpur, Kharagpur
15. **Professor Abhishek Dey**
Indian Association for the Cultivation of Science, Kolkata
16. **Dr Krishna M Ella**
Bharat Biotech International Limited, Hyderabad

17. **Professor Animangsu Ghatak**
Indian Institute of Technology-Kanpur, Kanpur
18. **Mr S Kris Gopalakrishnan**
Infosys BPO Limited, Bengaluru
19. **Mr Arvind Gupta**
Toy Maker, Pune
20. **Professor Jayanta Haldar**
Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru
21. **Professor Mahesh Kakde**
Indian Institute of Science, Bengaluru
22. **Dr Anil Kakodkar**
Homi Bhabha National Institute, Mumbai
23. **Dr Samir V Kamat**
DRDO, New Delhi
24. **Professor Sanjay Kumar**
Banaras Hindu University, Varanasi
25. **Professor Radhakrishnan Mahalakshmi**
Indian Institute of Science Education and Research Bhopal
26. **Dr Manoj Majee**
National Institute of Plant Genome Research, New Delhi
27. **Professor Govind K Makharia**
All India Institute of Medical Sciences, New Delhi
28. **Professor Debdeep Mukhopadhyay**
Indian Institute of Technology-Kharagpur, Kharagpur
29. **Professor Dinesh Addihalli Nagegowda**
CSIR-Central Institute of Medicinal and Aromatic Plants Research Centre, Bengaluru
30. **Professor Rishikesh Narayanan**
Indian Institute of Science, Bengaluru
31. **Professor Neela Nataraj**
Indian Institute of Technology Bombay, Mumbai
32. **Professor Vandana Bharat Patravale**
Institute of Chemical Technology, Mumbai
33. **Professor Sankar Prasad Rath**
Indian Institute of Technology Kanpur, Kanpur
34. **Professor Akhila Kumar Sahoo**
University of Hyderabad, Hyderabad

35. **Professor Sanjay Prafullachandra Sane**
National Centre for Biological Science, TIFR, Bengaluru
36. **Dr Vijay Kumar Saraswat**
NITI Aayog, New Delhi
37. **Dr VVSS Sarma**
CSIR- National Institute of Oceanography, Visakhapatnam
38. **Dr Ellora Sen**
National Brain Research Centre, Manesar
39. **Dr Ajit Kumar Shasany**
CSIR-National Botanical Research Institute, Lucknow
40. **Ms Vartika Shukla**
Engineers India Limited (EIL), New Delhi
41. **Professor Amit Singh**
Indian Institute of Science, Bengaluru
42. **Dr Rajendra Singh**
Tarun Bharat Sangh, Mansarover
43. **Dr KN Sivarajan**
Tejas Networks Ltd., Bengaluru
44. **Dr S Somanath**
ISRO, Bengaluru
45. **Professor Balasubramanian Sundaram**
Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru
46. **Professor Kana Meethaleveetil Sureshan**
Indian Institute of Science Education and Research Thiruvananthapuram,
Thiruvananthapuram
47. **Professor Ashish Suri**
All India Institute of Medical Sciences, New Delhi
48. **Professor Satyam Suwas**
Indian Institute of Science, Bengaluru
49. **Professor Pinaki Talukdar**
Indian Institute of Science Education and Research-Pune, Pune
50. **Professor Siva Umopathy**
Indian Institute of Science, Bengaluru
51. **Professor TNC Vidya**
Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru

Fellows elected in previous years

1. **Professor Rakesh Aggarwal**
Jawaharlal Institute of Postgraduate Medical
Education & Research (JIPMER), Puducherry
2. **Dr Kalachand Sain**
Wadia Institute of Himalayan Geology, Dehradun
3. **Dr Raghavan Krishnan**
Indian Institute of Tropical Meteorology, Pune
4. **Professor Siddhartha Roy**
Bose Institute, Kolkata
5. **Professor SK Barik**
North-Eastern Hill University, Shillong
6. **Dr Harini Nagendra**
Azim Premji University, Bengaluru
7. **Professor GUR Kulkarni**
President, Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru
8. **Professor Gobinda Majumder**
Tata Institute of Fundamental Research, Mumbai
9. **Dr MS Chauhan**
Vice-Chancellor, G.B.Pant University of Agriculture and Technology, Pantnagar

New Foreign Fellow elected w.e.f. 01.01.2025)

- 1. Professor Santokh Singh Badesha**
Purdue University, USA

**INSA Young Associates
(recipient of certificate and Angavastram)**

1. **Dr Gaurav Ahuja**
Indraprastha Institute of Information Technology, New Delhi
2. **Dr Mrinmoyee Basu**
Birla Institute of Technology and Science Pilani, Pilani
3. **Dr Pankaj Chauhan**
Indian Institute of Technology Jammu, J&K
4. **Dr Sourav Dutta**
Tata Institute of Fundamental Research Mumbai, Mumbai
5. **Dr Kalikrishna Hazra**
ICAR-Indian Institute of Pulses Research, Kanpur
6. **Dr Neha Jain**
Indian Institute of Technology, Jodhpur
7. **Dr Md Iqbal Raja Khan**
Jamia Hamdard, New Delhi
8. **Dr Veda Krishnan**
ICAR- Indian Agricultural Research Institute, New Delhi
9. **Dr Gaurav Majumdar**
University of Allahabad, Prayagraj
10. **Dr Awadhesh Narayan**
Indian Institute of Science Bengaluru, Bengaluru
11. **Dr Ratna Pal**
Indian Institute of Science Education and Research Mohali, Mohali
12. **Dr Bahni Ray**
Indian Institute of Technology Delhi, New Delhi
13. **Dr Sriparna Saha**
Indian Institute of Technology Patna, Bihta
14. **Dr Jogender Singh**
Indian Institute of Science Education and Research Mohali
15. **Dr Swatantra Pratap Singh**
Indian Institute of Technology Bombay, Mumbai

16. **Dr Rishitosh Kumar Sinha**
Physical Research Laboratory, Ahmedabad
17. **Dr Surendra Nadh Somala**
Indian Institute of Technology Hyderabad, Sangareddy

**INSA Associate Fellows
(recipients of certificate and Angavastram)**

1. **Dr Tanushree Bhattacharya**
Birla Institute of Technology, Mesra, Ranchi.
2. **Professor Parag Ratnakar Gogate**
Institute of Chemical Technology, Mumbai.
3. **Professor Chidambaram Gunanathan**
National Institute of Science, Education and Research Bhubaneswar, Jatani.
4. **Dr Anzar Ahmad Khuroo**
University of Kashmir, Srinagar.
5. **Dr Girdhari Lal**
National Centre for Cell Science, Pune.
6. **Dr Biswanath Maity**
Bose Institute, Kolkata
7. **Professor Sukhendu Mandal**
Indian Institute of Science Education and Research Thiruvananthapuram, Trivandrum.
8. **Professor Supriyo Mitra**
Indian Institute of Science Education and Research Kolkata, Nadia.
9. **Professor Vineeth N Balasubramanian**
Indian Institute of Technology Hyderabad, Sangareddy.
10. **Dr Manas Ranjan Sahoo**
National Institute of Science Education and Research Bhubaneswar, Khurda
11. **Professor Raghunath Sahoo**
Indian Institute of Technology Indore, Simrol
12. **Professor Neelima Satyam**
Indian Institute of Technology Indore, Simrol.
13. **Professor Kamal Priya Singh**
Indian Institute of Science, Education and Research Mohali
14. **Professor Kashmir Singh**
Panjab University, Chandigarh.
15. **Professor Neetu Singh**
Indian Institute of Technology Delhi, New Delhi.

16. **Dr Sudhir Pratap Singh**
Gujarat Biotechnology University, Gandhinagar
17. **Dr Surya Prakash Singh**
CSIR-Indian Institute of Chemical Technology, Hyderabad.
18. **Professor Timir Tripathi**
North-Eastern Hill University, Shillong.

**Previous INSA Associate Fellows
(recipients of certificate and Angavastram)**

1. **Dr Sandeep Anand**
Indian Institute of Technology Bombay, Mumbai
2. **Dr Aditya Gopalan**
Indian Institute of Science, Bengaluru
3. **Dr Kasturi Saha**
Indian Institute of Technology Bombay, Mumbai
4. **Dr Haripada Sau**
Indian Institute of Science, Education and Research, Pune
5. **Dr Mahak Sharma**
Indian Institute of Science, Education and Research, Mohali
6. **Dr Arjun Srivathsa**
National Centre for Biological Science, TIFR, Bengaluru
7. **Dr Vikram Vishal**
Indian Institute of Technology Bombay, Mumbai

**INSA History of Science Young Associates
(recipients of certificate and Angavastram)**

1. **Dr Asadulla Asraf Ali**
Tezpur University, Assam
2. **Dr Swathy Manohar**
Indian Institute of Technology Bombay, Mumbai

**INSA Distinguished Lecture-1 Fellows
(recipients of Citations and Angavastram)**

1. **Dr Veerendra Kumar Sharma**
Bhabha Atomic Research Centre, Mumbai
2. **Dr Ramendra Sundar Dey,**
Institute of Nano Science & Technology, Mohali
3. **Professor Vikram Vishal**
Indian Institute of Technology Bombay, Mumbai
4. **Professor M Tanveer**
Indian Institute of Technology, Indore
5. **Dr Jiban Jyoti Panda**
Institute of Nano Science and Technology, Punjab
6. **Dr Tarun Kumar Sharma**
Gujarat Biotechnology University, Gandhinagar.
7. **Dr Amit Kumar Rai**
National Agri-Food Biotechnology Institute, Mohali

**INSA Distinguished Lecture-2 Fellows
(recipients of Citations and Angavastram)**

1. Professor Rajesh Gopakumar, FNA
2. Professor Srinivasan Natarajan, FNA
3. Professor Harsh Kumar Gupta, FNA
4. Professor Sankar Kumar Pal, FNA
5. Dr Eklabya Sharma, FNA
6. Professor Vidita Ashok Vaidya, FNA
7. Professor JB Udgaonkar, FNA
8. Professor Kumaravel Somasundaram, FNA
9. Professor Rup Lal, FNA

New Initiatives

INSA-CENTRE FOR SCIENCE & TECHNOLOGY POLICY (CSTP)

1. Inter-University Brainstorming Event on "Sustainable Development through Innovations & the Startup Ecosystem," held from August 23–24, 2024.
2. One-Day Workshop on "Systems Thinking for Technology and Policy" (August 30, 2024): Conducted in collaboration with DST, this workshop explored innovative methodologies to address complex technological and policy challenges. The goal was to equip participants with tools for adopting a systems-thinking approach in policy-making.
3. Newspaper article titled "A Centralised Focus to Unlock R&D Prowess" by Prof. Ashutosh Sharma and Mr. Pranav Sharma, published in Hindustan Times* on September 12, 2024.

New Initiatives (Contd.)

INSA-CENTRE FOR SCIENCE & TECHNOLOGY POLICY (CSTP)

4. Newspaper article titled "India's Scientific Potential: Breaking Barriers to Breakthroughs" by Prof. Ashutosh Sharma, published in Hindustan Times on November 12, 2024.
5. A white paper on "Strategic Innovation for Northeastern India" has been uploaded to the website for public consultation and shared with fellows for feedback.
6. The Indian National Science Academy (INSA) and the Indian Institute of Technology Delhi (IITD) signed a Memorandum of Understanding (MoU) on October 25, 2024, to collaborate on science, technology, and innovation (STI) policy research. This partnership leverages their expertise to advance STI policy frameworks, foster knowledge sharing, and engage diverse stakeholders, aiming to impact national and global policy discourse.

New Initiatives (Contd.)

INSA-CENTRE FOR SCIENCE & TECHNOLOGY POLICY (CSTP)

7. The first draft of a paper on "Building a Bioeconomy through Non-Timber Forest Produce in Jammu and Kashmir" has been prepared.
8. The INSA policy team has developed webpage content, currently in the final review stage.
9. A project titled “Ease of Doing and Sustaining Business for Women – Policies and Practices” has been conceptualized and is under development.
10. Preparations are underway for the Policy Conclave, scheduled for February at IIT Jodhpur.
11. Inviting essays from National & International speakers and International Academies who participated in the S20 meetings on selected themes.

New Initiatives (Contd.)

➤ To recognize not only the creation of scientific knowledge, but also to recognize the consumption of knowledge for socio-economic opportunities. Two additional categories of Fellows were created in 2023:

(i) Science in Translation: Recognition of extraordinary contributions to utilization of scientific knowledge.

(ii) Science for Society: To recognize some of the most compelling selected cases of utilization of science for societal gains.

New Initiatives (Contd.)

➤ INSA Young Associates/INSA Associate Fellows

To recognize the potential of young scientists in the country, and to motivate and cultivate their excellence, the Academy established INSA Young Associates/INSA Associate Fellows.

- The upper age limit is 40 years (3 years relaxation for women candidates) for INSA Young Associates and 50 years for INSA Associate Fellows.

➤ INSA History of Science Young Associate

INSA History of Science Young Associate instituted in 2023 by the Indian National Science Academy and given annually is intended to honor young researchers working in the broad area of History of Science in India.

New Initiatives (Contd.)

➤ **INSA Distinguished Lectures**

INSA Distinguished Lectures shall be given in recognition of the notable contributions made by the scientists in specific subject areas related to science and technology. The recipients shall be designated as **INSA Distinguished Lecture Fellows**.

The Academy has instituted 20 INSA Distinguished Lectures, ten in IDL-1 and ten in IDL-2.

IDL-1 (only for the current INSA Associate Fellows and INYAS)

IDL-2 (only for INSA Fellows except those covered under IDL-1)

New Initiatives (Contd.)

- The number of Fellows elected shall be limited to 100 annually. Among the total 100 Fellows, 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 annually, till such time as the total number of living Fellows reaches 1500.
- The number of Foreign Fellows elected shall be limited to 250 and not more than 15 will be elected each year.

New Initiatives (Contd.)

➤ INSA Women Associates (IWA).

It is observed that the number of women fellows remains notably low. To address this imbalance, the Academy has established a new initiative named as INSA Women Associates (IWA). The idea is to mentor, network and encourage women scientists engaged in exceptional efforts in R&D, Industry, Science management & Leadership, NGOs, Startups, Science Administration. This effort aims to diminish the gender gap in STEMM. IWA Governing Body (GB) has been approved by the Council.

New Initiatives (Contd.)

➤ LEADS (Leadership Development Program in Science & Technology)

Indian National Science Academy (INSA) and National Centre for Good Governance (NCGG) jointly organized the second and third batch of Leadership Development Program in Science & Technology (INSA-NCGG LEADS) during 1-7 April 2024 and 08 - 14 July, 2024 at INSA, New Delhi respectively. Fourth session will be organized February/March 2025.

New Initiatives (Contd.)

- **INSA-American Chemical Society (ACS) Faculty Leadership Summit and ACS Outreach Summit in INSA.**
- INSA-ACS Faculty Leadership Summit and ACS Outreach Summit were held during November 3-5 2023 and November 6-8, 2023 respectively at INSA . This year, INSA ACS Faculty Leadership forum was held during November 24-27, 2024.
- 7 days Teachers Training Program in Collaboration with ACS will be held from 27th Dec. 2024 to 2nd Jan. 2025.

New Initiatives (Contd.)

- **INSA Institute/University Distinguished Lecture Series.**
- **INSA Distinguished Public Lecture.**
- **INSA Overseas Chairs-** 4 Chairs has been selected from Sectional Committees (II to V).
- **Teachers Training Programme (TTP)** has been conceptualized by INSA.
- **INSA Foundation Day Celebration-** INSA is completing 90 Glorious Years. Several activities have been proposed to celebrate it.

New Initiatives (Contd.)

- **Renovation of three INSA Guest house rooms has already been completed. For other rooms the expression of interest was issued by the Academy.**



New Initiatives (Contd.)

- Water softener plant has been installed on INSA Roof top.

