INDIAN NATIONAL SCIENCE ACADEMY
BAHADUR SHAH ZAFAR MARG, NEW DELHI - 110002

Minutes of the 89th Anniversary General Meeting of the Indian National Science Academy held during 6-8 December, 2023 at CSIR-NGRI, CSIR-CCMB and CSIR-IICT, Hyderabad.

The following INSA Fellows and INSA Associate Fellows were present:

1. Prof. Ashutosh Sharma, President, INSA
2. Prof. Madhu Dikshit, Vice-President (Fellowship Affairs)
3. Prof. Priya Abraham
4. Dr Javed N. Agrewala
5. Prof. Tapan Kumar Adhya
6. Prof. Ruchi Anand
7. Prof. Md. Zahid Ashraf
8. Prof. Bushra Ateeq
9. Prof. Sushash Babu
10. Prof. Bijnan Bandyopadhyay
11. Prof. D.M. Banerjee
12. Prof. Chandrasekhar Bal
13. Prof. D. Basavaiah
14. Dr Anil Bhardwaj
15. Dr Sabhyata Bhatia
16. Prof. Archana Bhattacharya
17. Prof. S.K. Bhowmik
18. Prof. S.D.Biju
19. Dr Naveen C. Bisht
20. Prof. Arup Bose
21. Prof. N.M.Bujurke
22. Prof. Asit Kumar Chakraborti
23. Dr Kaustav Chatterjee
24. Prof. Amitabha Chattopadhyay
25. Prof. Arnab Rai Choudhuri
26. Dr Anindita Das
27. Prof. Justin R. David
28. Prof. Swades de
29. Dr A.P.Dimri
30. Dr Ved Prakash Dwivedi
31. Prof. B.S.Dayasagar
32. Prof. Ashok K. Ganguli
33. Prof. Debasish Ghose
34. Dr Amit Ghosh
35. Prof. Aswini Ghosh
36. Dr Diptimoy Ghosh
37. Dr P.K. Ghosh
38. Prof. Subrata Ghosh

39. Prof. Prasenjit Guchhait
40. Prof. Anil K.Gupta
41. Dr Mayanak Kumar Gupta
42. Prof. Subhasis Haldar
43. Prof. H. IIa
44. Dr Bhaskar Kanseri
45. Dr Mudrika Khandelwal
46. Prof. Sandeep Krishna
47. Prof. Veda Krishnan
48. Dr Arvind Kumar
49. Dr N. Pavan Kumar
50. Prof. Vinod Kumar
51. Dr Pramod Kumbhar
52. Dr Subrata Kundu
53. Prof. Kalpana Luthra
54. Prof. Nitish Mahapatra
55. Prof. Lolitika Mandal
56. Dr Prantik Mandal
57. Prof. Swachin K. Mandal
58. Dr Sharmila S. Mande
59. Dr Rahul Mangal
60. Prof. Sushmita Mitra
61. Prof. N.K. Mukhopadhyay
62. Prof. Samrat Mukhopadhyay
63. Prof. C.Siva Ram Murthy
64. Prof. M. Muthamilarasan
65. Prof. Sivaram V.S. Mylavarapu
66. Dr Vinay Kumar Nandicoori
67. Dr Ashutosh Pandey
68. Prof. Daya Shankar Pandey
69. Dr Sanjeev Philip
70. Prof. Appa Rao Podile
71. Dr Rakesh Kumar Pilania
72. Prof. G.Parthasarathy
73. Prof. Sathees C. Raghavan
74. Dr Amit Kumar Rai
75. Dr Brindaban C. Ranu
76. Dr Sayan Ranu
77. Prof. P.D.Prasad Rao
78. Dr T.Narayana Rao
79. Prof. Ch. Mohan Rao
80. Prof. Krishanu Ray
81. Prof. Pratap Raychaudhuri
82. Dr Manjula N Reddy
83. Dr Maddika Subha Reddy
84. Dr D. Srinivasa Reddy
85. Prof. M. Sabu
86. Dr Manmohan Sarin
87. Dr Dibyendu Sarkar

88. Prof. R. Sankarnarayanan
89. Prof. Nitin Saxena
90. Prof. Maithili Sharan
91. Dr Tarun kumar Sharma
92. Dr Yogendra Sharma
93. Prof. P.V.Shivaprasad
94. Dr Amarjeet Singh
95. Prof. Mewa Singh
96. Prof. R.N. Singh
97. Dr Prabhat Kumar Singh
98. Prof. Subrata Sinha
99. Prof. Vasudevan Srinivas
100. Prof. Pradeep Srivastava
101. Prof. K.C.Kumara Swamy
102. Dr M. Tanveer
103. Prof. V.M. Tiwari
104. Prof. Anil Kumar Tripathi
105. Dr Shashank Tripathi
106. Prof. Vijaylaxmi G.Trivedi
107. Prof. Avesh K.Tyagi
108. Dr Santosh Kumar Upadhyay
109. Prof. Akhilesh K. Verma
110. Prof. Bayya Yegnanarayana

During the 89th Anniversary General Meeting (AGM), the following lectures were organized: Presidential address, Award lectures, lectures from new INSA Fellows, Foreign Fellows, INSA Associate Fellows, INSA Distinguished Lecture Fellows and lectures from INYAS members.

A. Inaugural Session- (6th December 2023)

Prof. Ashutosh Sharma, President, INSA, Dr VM Tiwari, FNA, Dr Vinay K Nandicoori, FNA, Co-Chairs and Local Chair welcomed the participants. President INSA expressed his gratitude to the Directors of CSIR-NGRI, CSIR-CCMB and CSIR-IICT, Hyderabad, for their efforts in organizing INSA-AGM.

The inauguration was followed by the Presidential address on "***Navigating Complexity by Scientific Common Sense: Harnessing Self organization in Confined Soft Materials for Micro/Nanofabrication"*** delivered by Prof. Ashutosh Sharma, President of INSA.

A summary of the lecture and a brief Profile of the President INSA is attached in ***Annexure-I.***

B. Award Lectures-

The session for the following award lectures was chaired by Prof. Madhu Dikshit and Dr VM Tiwari:

i. Aryabhata Medal (2021) Lecture on "***Mechanisms of Electron Transfer in Mycobacterial Ribonucleotide Reductase Complex"*** delivered by Prof. SC Mande, FNA.

ii. Prof. Deepak Gaur Memorial Medal (2022) Lecture on "***Host Immunity Variation Influences Infectious Disease Expression"*** delivered by Prof. Narinder K Mehra, FNA.

iii. INSA-Vainu Bappu Memorial Award (2022) Lecture on "***The Dynamo Model of the 11-year Sunspot Cycle*** delivered by Prof. Arnab Rai Choudhuri, FNA.

The summary of the award lectures and brief Profile of the speakers are attached in ***Annexure II.***

Following the award lectures, parallel lectures were delivered by new INSA Fellows, Foreign Fellows, INSA Associate Fellows and INSA Distinguished Lecture Fellows on 6-7 December 2023 at CSIR-IICT, CSIR-CCMB and CSIR-NGRI.

The summary of the lectures and brief Profiles of speakers are provided in ***Annexure-III.***

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

Session 1
Sectional Committee I- Chair: Prof. Probal Chaudhuri, FNA

- **INSA Distinguished Lecture**
  - Prof. Manjunath Krishnapur
- **Lecture New Fellow**
  - Prof. Nitin Saxena
  - Prof. Neena Gupta
- **Lecture INSA Associate Fellow**
  - Dr Nishant Chandgotia

Session 2
Sectional Committee II- Chair: Prof. Anurag Sharma, FNA

- **INSA Distinguished Lecture**
  - Prof. Aswini Ghosh
- **Lecture New Fellow**
  - Prof. JR David
  - Prof. MM Deshmukh
  - Prof. Sandeep Krishna
  - Prof. Arul Lakshminarayan
  - Prof. Pratap Raychaudhuri
- **Lecture INSA Associate Fellow**
  - Dr Diptimoy Ghosh
  - Dr Mayanak Kumar Gupta
  - Dr Bhaskar Kanseri

Session 3
Sectional Committee III- Chair: Prof. VK Pillai, FNA

- **INSA Distinguished Lecture**
  - Prof. Asit Kumar Chakraborti
- **Lecture New Fellow**
  - Prof. AK Ganguli
  - Prof. SK Mandal

        - Dr DS Reddy
        - Prof. AK Tyagi
    - **Lecture INSA Associate Fellow**
        - Dr Anindita Das
        - Dr Ramendra Sundar Dey
        - Dr Achintya Kumar Dutta
        - Dr Subrata Kundu
        - Dr Prabhat Kumar Singh

Session 4

Sectional Committee IV- Chair: Prof. Archana Bhattacharyya, FNA

- **INSA Distinguished Lecture**
    - Dr Anil Bhardwaj
- **Lecture New Fellow**
    - Prof. SK Bhowmik
    - Prof. BS Daya Sagar
    - Prof. AP Dimri
    - Prof. Prantik Mandal
- **Lecture INSA Associate Fellow**
    - Dr Dhanya Chandrika Thulaseedharan
    - Dr Sajeev Philip
    - Dr Arvind Singh
    - Dr Vikram Vishal

Session 5

Sectional Committee V- Chair: Prof. Sushmita Mitra, FNA

- **INSA Distinguished Lecture**
    - Prof. GD Yadav
- **Lecture New Fellow**
    - Prof. Bijnan Bandyopadhyay
    - Prof. Swades De
    - Prof. Debasish Ghose
    - Prof. NK Mukhopadhyay
- **Lecture INSA Associate Fellow**
    - Dr Kaustav Chatterjee
    - Dr Aditya Gopalan
    - Dr Mudrika Khandelwal
    - Dr Rahul Mangal
    - Dr Sayan Ranu
    - Dr Aparna Singh
    - Dr M Tanveer

Session 6

Sectional Committee VI- Chair: Prof. Anil Kumar Tripathi, FNA

- **INSA Distinguished Lecture**
    - Prof. PP Majumder
- **Lecture New Fellow**
    - Prof. SD Biju
    - Dr Ashok Pandey
    - Dr Sheeba Vasu

Session 7

Sectional Committee VII- Chair: Prof. AS Raghavendra, FNA

- **INSA Distinguished Lecture**
  - Prof. Appa Rao Podile
- **Lecture New Fellow**
  - Prof. Lolitika Mandal
  - Dr SVS Mylavarapu
  - Prof. SC Raghavan
  - Dr MS Reddy
  - Dr PV Shivaprasad
- **Lecture INSA Associate Fellow**
  - Dr Amarjeet Singh

Session 8

Sectional Committee VIII- Chair: Prof. H Balaram, FNA

- **INSA Distinguished Lecture**
  - Dr Amitabha Chattopadhyay
- **Lecture New Fellow**
  - Prof. Ruchi Anand
  - Dr Sharmila S Mande
  - Prof. Samrat Mukhopadhyay
  - Dr Dibyendu Sarkar
- **Lecture INSA Associate Fellow**
  - Dr Shubhasis Haldar
  - Dr Shashank Tripathi

Session 9

Sectional Committee IX- Chair: Prof. Shinjini Bhatnagar, FNA

- **INSA Distinguished Lecture**
  - Prof. Subrata Sinha
- **Lecture New Fellow**
  - Prof. NR Mahapatra
  - Prof. Bushra Ateeq
  - Prof. Chandrasekhar Bal
  - Prof. Prasenjit Guchhait
  - Prof. AV Kurpad
  - Prof. Kalpana Luthra
  - Prof. Priya Abraham
- **Lecture INSA Associate Fellow**
  - Dr Ved Prakash Dwivedi
  - Dr Pavan Kumar N
  - Dr Rakesh Kumar Pilania
  - Dr Tarun Kumar Sharma

Session 10

Sectional Committee X: *Chair*- Prof. RV Sonti, FNA

- **INSA Distinguished Lecture**
  - Prof. TK Adhya
- **Lecture New Fellow**
  - Dr Sabhyata Bhatia
  - Dr NC Bisht
  - Dr PK Ghosh

- Dr Arvind Kumar
- **Lecture INSA Associate Fellow**
  - Dr Subhash Babu
  - Dr M Muthamilarasan
  - Dr Ashutosh Pandey
  - Dr Amit Kumar Rai
  - Dr Santosh Kumar Upadhyay

Session 11

Chair- Prof. S Sivaram, FNA

- **New Category**
  - Lecture New Fellow
  - Dr Pramod Shankar Kumbhar
- **Lecture New Foreign Fellow**
  - Prof. KM Venkat Narayan

D. INYAS Lectures- (7th December 2023) | Chair: Prof. Harsh K Gupta, FNA

i. Lecture on ***"Connecting Science and Society through INYAS"*** delivered by Dr Rajendra Singh Dhaka, Chairperson, INYAS.

ii. Lecture on "***Driving Success through Collaboration"*** delivered by Dr Veda Krishnan, Secretary INYAS.

The summary of the lectures and brief Profiles are attached at ***Annexure-IV.***

E. Admission of Fellows under Rule 11:

Prof. Ashutosh Sharma, President, INSA presented Scrolls and Angavastram to all 49 Fellows effective from January 1, 2024, including previous Fellows. Subsequently, the inducted Fellows took the oath and signed the Fellowship Register.

The list for the same is provided in ***Annexure-V****.*

F. Presentation of Awards under the following categories:

i. INSA Associate Fellows

ii. INSA Distinguished Lecture Fellows

28 selected INSA Associate Fellows received the Certificate and Angavastram from the President of INSA. They took the oath, signed the Register and have been officially inducted as INSA Associate Fellows. Additionally, 09 INSA Distinguished Lecture Fellows received the Citation and Angavastram from the President, INSA.

The list for the same is provided in ***Annexure-VI.***

G. Regular Agenda Items:

Following the above-mentioned presentations, regular agenda items were taken up by President, INSA:

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

The sad demise of Dr VP Kamboj, Prof. HD Kumar, Dr Prem Narain and Prof. MS Swaminathan were reported. The obituary notes were read by the President, INSA, and all those present stood in silence for a minute as a mark of respect to the deceased.

ii. **Confirmation of minutes of the AGM held on 12 September 2023:**
The minutes of the AGM held on 12 September 2023 were presented by Prof. Madhu Dikshit, Vice-President of INSA. These minutes were uploaded on the INSA website, and no comments were received. Thereafter, the minutes were confirmed.

iii. **To announce the voting results on amendments of INSA Rule 6 (b), Rule 25 (iii), and Rule 25 (v):**
The amendments of INSA Rule Nos. 6(b), 25 (iii) and 25 (v) were announced by Prof. Madhu Dikshit, Vice-President (Fellowship Affairs) to all Fellows. It will be included in the INSA Yearbook 2024 accordingly.

iv. **To read as required under Rule 40(c) the name of nominees for election as INSA Fellow from 26 August, 2023 to 15 November, 2023:**
Prof. Madhu Dikshit, Vice-President, read the names of nominees for election as INSA Fellow.

v. **Report of the Appointment/ Retirement / Resignation of Academy staff during the year 2023:**
Prof. Madhu Dikshit, Vice-President, announced the following Appointment/Retirement/ Resignation:

APPOINTMENT:

S.N.	Name & Designation	Level in Pay Matrix	Date of Joining	Appointment
1.	Dr. Brajesh Pandey Executive Director	13A	26.06.2023	Appointment

DEPUTATION / TECHNICAL RESIGNATION / RESIGNATION:

S.N.	Name & Designation	Level in Pay Matrix	Date of Resignation/ Repatriation	Deputation/ Resignation
1.	Smt. R. Alamelu (erstwhile CCSTDS Staff) Stenographer	8	06.07.2023	Deputation
2.	Sh. Abhishek Mishra Assistant-I	6	29.12.2022	Technical Resignation
3.	Dr. R. Bhuvneshwari (erstwhile CCSTDS Staff) Scientist-C	11	26.03.2023	Technical Resignation
4.	Sh. Arvind C. Ranade Executive Director (on Deputation)	13A	05.04.2023	Repatriated to Vigyan Prasar
5.	Sh. Sandeep K. Srivastava Programme Officer	9	01.05.2023 (forenoon)	Technical Resignation

RETIREMENT:

S.N.	Name & Designation	Level in Pay Matrix	Date of Retirement	Retirements
1.	Sh. P. K. Mishra Section Officer	8	31.01.2023	Retirement
2.	Sh. Prem Singh Manral Section Officer	8	31.03.2023	Retirement
3.	Sh. Tara Chand Multi Tasking Staff	4	31.05.2023	Retirement
4.	Sh. C. K. Sharma Programme Officer	9	31.07.2023	Retirement

vi. Presentation of mementos to outgoing Officers and members of the Council of INSA.

During the presentation ceremony honoring the outgoing Officers and members of the Council of the INSA, special recognition was accorded to Prof. Amit Ghosh Vice-President; Prof. DM Banerjee and Dr Shekhar Mande. The president of INSA bestowed upon them a shawl as a symbolic token of respect. (Additionally, the acknowledgement was extended to other esteemed members who were not present at the event, namely Prof. Santanu Bhattacharya, Prof. Anurag Kumar, Dr Subeer S Majumdar, Prof. V Nagaraja, Prof. TR Ramadas, Dr Tilak Raj Sharma, Dr Kunal Ghosh representing The Asiatic Society and Prof. R Ramamurthi, serving as the representative of The Indian Science Congress Associate). Expressing Profound gratitude, the President of INSA conveyed heartfelt thanks to the Council members for their unwavering support and dedicated services.

H. Any Other Items:

Under this President, INSA informed the following new initiatives taken up by the Academy:

1. **Regulations for INSA Associate Fellows:** A novel category, the INSA Associate Fellowship, was established in 2023 by the Academy. This annual recognition aims to honor young Indian scientists for their exceptional contributions in any field of science or technology falling under the Academy's purview. In a strategic move to actively engage Associate Fellows in various INSA activities, fostering a sense of belonging and facilitating networking, the Council has approved that the Associate Fellows may now be inducted using a process similar to that of INSA Fellows. Consequently, they will have the opportunity to attend the AGM, although without voting rights.

   As of now, the induction process during the AGM is reserved exclusively for INSA Fellows and Foreign Fellows. These esteemed individuals take an oath, sign the register, and are granted attendance at the AGM. Recognizing that Associate Fellows are integral members of INSA, it has been decided that the same rules and regulations governing the induction of Fellows will be applicable to Associate Fellows as well. This ensures a consistent and fair approach across all categories within the academy.

2. **New Fellowship Categories:**
   Two 'new committees' have been established at INSA to elect Fellows outside the regular subject-wise (10) sectional committees.

   The new categories are as follows: -
   Category-1: Science in Translation| The components of this category are as follows:
   - Scientific leadership in Science-Based Innovation
   - Scientific leadership in Industrial R & D
   - Scientific leadership in Technology Missions of National importance
   - Scientific leadership in the Management of Scientific Institution

   Category-2: Science for Society| Tentative Components of this category are:
   - Notable scientific work to combat societal challenges
   - Notable scientific research on issues of major societal impact
   - Generated scientific solutions to any major problem of everyday life
   - Response to societal needs and global challenges
   - Participation in the popularization of science
   - Any other societal impact (please specify)

   The purpose of the creation of the above-mentioned categories is to recognize the leaders of society and those who are users of science, as stated by the President of INSA.

   He also highlighted that the intake of INSA Fellows per year has been increased from 50 to 100 (a maximum of 20 from the new categories). This will provide greater opportunities for younger scientists and also to unrepresented categories.

3. **INSA's Capacity Development Initiatives:**
   i. **Leadership Development Program in Science & Technology (LEADS) 2023:** INSA, in collaboration with NCGG, successfully organized the LEADS program from July 12 to 18, 2023, at the INSA in New Delhi. A total of 44 scientists from prestigious institutes participated in this impactful program.
      - ***Upcoming LEADS Program – February/March 2024:*** The next LEADS program is scheduled to be held at INSA during February/March 2024.
      - This session is anticipated to generate approximately 20 lakhs per session, contributing to the ongoing success of INSA's capacity development endeavors.

ii. **INSA-American Chemical Society (ACS) Faculty Leadership Summit:**
   - INSA hosted the Faculty Leadership Summit in collaboration with ACS from November 3 to 5, 2023, at INSA.
   - ACS Outreach Summit held at INSA from November 6 to 8, 2023.

iii. **Taylor and Francis Joint Sessions:**
INSA collaborated with Taylor and Francis and organized the following two sessions:
   - Towards Human-Centric Sciences held on November 2, 2023.
   - Science Communication and Public Engagement: The Power of Diverse Voices in Research held on November 10, 2023.

These capacity development initiatives underscore INSA's commitment to fostering leadership, collaboration, and diverse engagement in the scientific community.

4. **INSA Distinguished Lectures- Categories for 2024:**
   i. **IDL-1|** Eligibility: Open to current INSA Young Associates, INSA Associate Fellows, INYAS, and INSA Women Associates exclusively.
   ii. **IDL-2|** Eligibility: Exclusive for INSA Fellows, excluding those covered under IDL-1.

5. **INSA Young Associates & INSA Associate Fellows - Categories Starting from 2024:**
   i. **INSA Young Associates (IYA)**
   Eligibility Criteria:
   - Any Indian citizen under the age of 40 as of December 31st of the preceding year.
   - Women candidates enjoy a relaxation of 3 years (maximum age limit: 43) for INSA Young Associates.
   - OCI/PIO card holders working in India for a minimum of 5 years are also eligible for nomination.

   ii. **INSA Associate Fellows (IAF)**
   Eligibility Criteria:
   - Any Indian citizen under the age of 50 as of December 31st of the preceding year.
   - OCI/PIO card holders working in India for a minimum of 5 years are also eligible for nomination.

These revised categories aim to encourage and recognize the contributions of young scientists, fostering a diverse and dynamic scientific community.

6. **Modifications in Guidelines & Nomination Forms:**
The Academy has modified the following guidelines and nomination forms for the INSA Fellow election to enhance the diversity and representation of various geographical locations, subject areas, age and gender in the INSA Fellowship.

The updated guidelines and forms will be available on the INSA website (*www.insaindia.res.in*).

i. Nomination Form for INSA Indian Fellowship (for SC-I to X)
ii. Nomination Form for INSA Distinguished Lectures
iii. Nomination Form for INSA Young Associates/INSA Associate Fellows
iv. Guidelines for Constitution of Sectional Committees
v. Guidelines for Sectional Committees
vi. INSA Chairs for Inviting Overseas Scientists under Sectional Committees
vii. Code of Conduct to be followed by the Sectional Committee/ Council Members and INSA Staff (Circulated before every meeting)
viii. Conflict of Interest Declaration for the Council Members
ix. Conflict of Interest Declaration for Sectional Committee Members

President INSA highlighted that Prof. Madhu Dikshit, along with the committee has prepared these guidelines to streamline the process of election of fellowship.

7. Science20 India 2023: Role of INSA:

The Science20 (S20), one of the Engagement groups of G20. Under India's presidency in the year 2023, S20 Meetings and Summit have been coordinated by the Academy (INSA) as the Knowledge partner:

- The theme of S20: Transformative Science for Sustainable Development
- President, INSA has been designated as Co-Chair of S20.
- It's furthering scientific research, education, and innovation through strong partnerships and multilateral collaborations.

Schedule of S20 meetings:

a) Inception meeting: Puducherry: 30 to 31 January 2023
b) Ist Thematic Conference: Clean Energy for Greener Future, Agartala: 3 to 4 April 2023
c) 2nd Thematic Conference: Universal Holistic Health, Lakshadweep: 1 to 2 May 2023
d) 3rd Thematic Conference: Connecting Science with Society & Culture, Bhopal: 16 to 17 June 2023
e) Final Summit Meeting| Coimbatore: 21 to 22 July 2023.

The Science20 communiqué 2023 has been prepared by INSA with the consensus of participants of International Science Academies and signed by them. The communiqué has been circulated to all Fellows, and also uploaded on the INSA's website.

8. INSA Distinguished Public Lecture Series:

The Indian National Science Academy (INSA) proudly introduces the "INSA Distinguished Public Lecture Series," an innovative initiative dedicated to advancing science and cultivating intellectual discourse. This series will feature distinguished scientists and researchers who will share their Profound insights with the broader community. The inaugural lecture of this esteemed series was delivered by Shri S. Somanath, Secretary, Department of Space (DoS) and Chairmen ISRO on "The space mission for exploration and scientific goals" on

September 26, 2023. This marks the commencement of a series that aims to engage and enlighten the public through the knowledge and expertise of eminent personalities in the field of science and research.

9. Proposal Submission:

i. To coordinate DST's "AWSAR (Augmenting Writing Skills for Articulating Research)" Scheme, a proposal has been submitted to DST.
ii. To establish DST-INSA Centre for Policy Research, a proposal has been submitted to DST.
iii. To coordinate DST's "Women's International Grant Support (WINGS)" programme, a proposal has been submitted to DST.

10. New Initiatives:

i. The Academy will start a new distinguished lecture programme in collaboration with various educational and research institutions (like IITs, IISERs, Central Universities, State Universities etc.) in India under the leadership of the INSA's local chapters, this programme will be named as INSA-_____(Institute) distinguished lecture series.
ii. President INSA highlighted that a Science Policy Cell has been established at INSA. All the Fellows are requested to contribute to this cell for its smooth operations.

11. Special Session on Science, Industry & Society by Potential Panelists:
(8th December, 2023)
Chair: Prof. Ashutosh Sharma, President INSA
Panellists: Dr. Rakesh Mishra, FNA; Prof. Sanghmitra Bandopadhyay, FNA; Dr Pramod Shankar Kumbhar, FNA; Prof. Deepak Pental, FNA and Dr Deepanwita Chattopadhyay, Chairman & CEO, IKP Knowledge Park.

Brief Profiles of the Chair and Panelists are attached in ***Annexure-VII.***

The meeting was end with the Vote of thanks.

Annexure-I

PRESIDENTIAL LECTURE

PROFESSOR ASHUTOSH SHARMA
President, Indian National Science Academy
Bahadur Shah Zafar Marg, New Delhi

ABSTRACT

Navigating Complexity by Scientific Common Sense: Harnessing Self-organization in Confined Soft Materials for Micro/Nanofabrication

The talk will focus on the central role of ideas and scientific common sense even in the cutting-edge science, rather than an exclusive reliance on the state-of-art infrastructure alone. I will discuss micro/nano fabrication across a variety of materials and length scales, which is a challenge that impacts important advances in functional interfaces, energy, electronics, health and environment. This talk will summarize some of the novel strategies pursued in our work on control of self-organization, structure formation and instabilities in highly confined soft materials such as thin films and nanofibers. The basic principles will be illustrated by some examples from directed dewetting of thin (5 nm-100 nm) polymer liquid films, elastic contact instability of soft solid films, electric field modulation of interfaces, directed electrospinning and diffraction patterned induced self-organization. The micro/nano structures created by self-organization are applied as cell-scaffolds, biosensors, actives delivery, energy storage, nanolens and nanowire arrays to a reusable pressure sensitive adhesive. I will discuss how removal of surface tension limitations brings the domain-size in physical self-organization to the sizes typically targeted by the chemical self-assembly techniques (< 100 nm).

SPEAKER PROFILE

Ashutosh Sharma is Institute Chair Professor at IIT Kanpur, President of the Indian National Science Academy (2023-25), Co-chair of S20/G20 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;

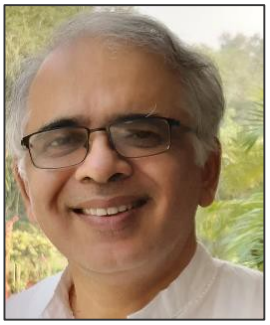
micro/nano-mechanics of soft matter; nano-patterning and nanofabrication; colloid and interfacial engineering; biomaterials & biosurfaces; wetting and adhesion. He has published over 350 peer reviewed papers, filed over 15 patents, given over 100 invited or key note conference presentations and mentored 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.

Annexure-II

AWARD LECTURE-1



PROFESSOR SC MANDE, FNA

Distinguished Professor

Bioinformatics Centre, Savitribai Phule Pune University Pune

Aryabhata Medal (2021)

ABSTRACT

Mechanisms of Electron transfer in Mycobacterial Ribonucleotide reductase complex

Ribonucleotide reductases (RNR) catalyze the reduction of ribonucleoside diphosphates to deoxyribonucleoside diphosphates through abstraction of 2' hydroxyl group, and are known to be essential for survival in all organisms. These follow a unique radical transfer mechanism, in which a Tyr-radical formed in one subunit is transferred to another, at a distance of more than 30Å. The initiation of radical formation in the Class Ib RNR of Mycobacteria is in the NrdF subunit at its di-manganese site. Allostery plays an important role, both in association of NrdF and NrdE subunits for facilitation of free radical transfer, and during catalysis within the NrdE dimer. We have been able to map such allosteric transitions through Cryo-electron microscopy structures of NrdE dimer, NrdE: NrdF binary complex and NrdE: NrdF: NrdI ternary complex. Apart from these, X-ray crystallographic structures of NrdI, and those of NrdF:NrdI complexes determined by us have also yielded useful insights into the radical transfer mechanism. 3D variability analysis revealed major allosteric changes. These in the NrdE dimer are mediated at the interface of the homodimer, and are characterized by sliding movement of α-helices and differences in atomic interactions near the active sites in the two monomers. Similarly, changes are seen prominently at the interface of NrdE and NrdF binary complex in the Cryo-EM structures. Moreover, the structural basis of electron transfer mechanisms to the NrdE subunit in a step-wise manner has also been elucidated in our group over the last 20 years. Thus, we have been able to map allosteric movements of different subunits in the important ribonucleotide reductase enzyme complexes by combination of the two structural techniques, and elucidating the electron transfer mechanisms.

SPEAKER PROFILE

Name Shekhar C. Mande

Date of birth 5-April-1962

Correspondence address Distinguished Professor
Bioinformatics Centre Savitribai
Phule Pune University Pune-
411 007

Contact No. Mobile: (0) 82750 67738

Email shekhar@csir.res.in, dg@csir.res.in

Educational qualifications

Qualification	*Year*	*University*	*Subjects*
Ph. D.	1991	Indian Institute of Science, Bangalore	Molecular Biophysics
M. Sc.	1984	Nagpur University, Nagpur	Physics (X-rays & Electronics)

Academic Experience/ Service Details:

As Distinguished Professor, Savitribai Phule Pune University	October 2022-
As Director General, Council of Scientific and Industrial Research-cum-Secretary, Department of Scientific and Industrial Research, New Delhi	October 2018- April 2022
As Director, National Centre for Cell Science, Pune	September 2011-October 2018
As Staff Scientist, Centre for DNA Fingerprinting and Diagnostics, Hyderabad	September 2001-August 2011
As Scientist C, Institute of Microbial Technology, Chandigarh	Dec 1995- Sept 2001
As Senior Fellow, University of Washington, Seattle, USA	Dec 1992- Dec 1995
As Post-doctoral Fellow, University of Groningen, Groningen, The Netherlands	Dec 1991- Nov 1992

Other Appointments:

- Distinguished Visiting Professor, IIT Kanpur
- Distinguished Visiting Professor, IIT Bombay
- Distinguished Visiting Professor, IIT Gandhinagar
- Adjunct Professor, NIAS, Bengaluru
- Adjunct Professor, University of Hyderabad, Hyderabad
- Honorary Distinguished Scientist, NCCS, Pune
- Independent Director on the Board of Tata Steel Limited

Fellowships and Memberships of professional bodies:

- Fellow, Indian National Science Academy, Delhi, Elected 2010
- Wellcome Trust International Senior Research Fellow, 2003-08
- Fellow, National Academy of Sciences, Allahabad, India, Elected 2003
- Fellow, Indian Academy of Sciences, Bangalore, Elected 2003

Awards:

- JC Bose Fellowship of DST, 2023
- Aryabhatta Medal, Indian National Science Academy, 2021
- HK Firodia Vijnan Bhushan Award, 2019
- Bharat Asmita Tantra-Vidnyan Shrestha Award of MIT WPU, 2019
- BC Guha Memorial Award of the Indian National Science Academy, 2017
- BK Bachhawat Memorial Award of the National Academy of Sciences, India, 2017
- Shanti Swarup Bhatnagar Prize for Biological Sciences, 2005
- B M Birla Young Scientist Award, 1999

Publications:

More than 100 in peer reviewed Journals

Number of students guided for PhD:

More than 15

AWARD LECTURE-2

PROFESSOR NARINDER. K. MEHRA, FNA

Former Dean
All India Institute of Medical Sciences
New Delhi 110 029

Professor Deepak Gaur Memorial Medal (2022)

ABSTRACT

Host immunity variation influences infectious disease expression

The unraveling of the human genome has ushered in an era of "omics" with i) F*unctional genomics* which deals with how genes, transcripts and/or proteins interact, ii) T*ranscriptomics*, which deals with the identification and quantification of all transcripts based on stage or tissue specific expression, iii) *Proteomics* that helps to understand production and turnover of proteins and identification of alterations in them e.g. glycosylation, phosphorylation etc, iv) *Immunomics* that deals with the study of genetic control of immune response and lastly v) *Pharmacogenomics* that deals with the study of interaction of drugs with various biochemical pathways. With this added knowledge, the field of clinical immunogenetics has thrown in several challenges and opportunities. There is greater understanding now than ever before on the differentiation of T cells into Th1 or Th2 cells that need instructions by an activated dendritic cell. Many of the world's major diseases – infection, cancer, autoimmunity and allergy critically involve the immune system. In recent years, impressive developments have taken place in diagnostics, vaccines and therapeutics. Of the 20–25,000 genes that comprise the human genome, >4000 is primarily associated with the immune system. Immune tolerance holds the key to controlling unwanted immunological attacks on self and transplanted tissues/organs. Further, protecting mucosal tissue from infection and inflammation is one of the most important challenges of immunology research today. By virtue of its major biological role of presenting peptides, the major histocompatibility complex (MHC) serves as an excellent minigenome model for exploring the association of diseases with specific HLA alleles or sequences and understanding their immune pathologies. The extraordinary genetic diversity observed in this region is a consequence of the host strategy to counter antigenic diversity in the environment caused by infectious agents. Different MHC haplotypes exist in a population, mainly as a result of geographically localized natural selection imposed by invading microbes and host-pathogens interactions. A high degree of linkage disequilibrium exists across the MHC and this may also be population specific. Accordingly, the observed HLA association with a disease is actually a reflection of its linkage with the neighboring genes. Further, other candidate genes may be equally important. This necessitates a genome wide scan involving SNPs and microsatellite markers to distinguish polymorphisms that influence disease, from those of linked genetic markers. Such a genetic approach is often complicated since susceptibility to infectious diseases (Leprosy, Tuberculosis, HIV/AIDS) is often multigenic. Further, environmental factors greatly influence disease susceptibility/progression. Nevertheless, a detailed understanding of the role of underlying genetic determinants is critical for developing improved diagnostic screening, genetic counseling and treatment strategies, all of which are the hallmark of modern pharmacogenomics. The lecture will focus principally on

the impact of genomics on three infectious diseases with specific reference to the Indian population and the evolutional significance of disease associated haplotypes.

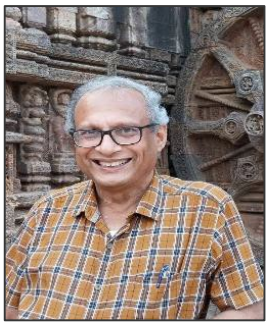
SPEAKER PROFILE

Prof Mehra is Honorary Emeritus scientist of the Indian council of Medical Research, and Former Dean and National chair of All India Institute of Medical Sciences, New Delhi. As vice-president (international affairs) of the Indian National Science Academy (INSA), he played a key role for the S20 engagement group during the G20 Presidency of India. He is an internationally acclaimed expert in the area of Transplant Immunology and Clinical Immunogenetics and is vastly experienced in policy, education promotion and strategic planning for science. He was the main resource for preparing the National Guidelines for Stem cell research and Therapy and Guidelines for Umbilical Cord Blood banking. During the COVID-19 pandemic, he published a white paper, "COVID-19: host immunity and vaccines" and took an active part in public education.

Prof Mehra has been the President of the Indian Immunology Society, councilor for the International Union of Immunological Societies, co-chair of the IUIS Gender equality committee and founder Secretary-General of the Federation of Immunological Societies of Asia-Oceania. He is a Fellow of the Indian National Science Academy, National Academy of Sciences, National Academy of Medical Sciences, Member Honoris Causa of the Hungarian Academy of Sciences and 'Fellow' of The World Academy of Sciences (FTWAS). He is also an Honorary Fellow of the Royal College of Physicians of UK.

He has over 100 scientific awards and academic honors including the coveted S.S. Bhatnagar prize of the CSIR, Khwarizmi international award from the Iranian Research Organization on Science and Technology, Dr B.R. Ambedkar Prize of ICMR for excellence in medical research and Tata Innovation Fellowship of the DBT, Govt of India. The French President conferred on him the Chevalier of the National Order of Merit. He also received the highest International Award from the Iranian Research Organization for Science and Technology. He was a member of the international jury for the high value Else Kroner Fresenius International Award in Immunology and for selecting high impact joint research projects of the Canadian Institutes of Health Research and the Israel Research Foundation (CIHR-IRF research awards). He has published over 480 research papers and regularly writes columns for the leading newspapers on COVID-19 and viral host immunity.

AWARD LECTURE-3



PROFESSOR ARNAB RAI CHOUDHURI, FNA

Distinguish Professor

Department of Physics, Indian Institute of Science, Bangalore

INSA-Vainu Bappu Memorial Award (2022)

ABSTRACT

The Dynamo Model of the11-year Sunspot Cycle

The Sun is the first astronomical object in which magnetic fields were discovered in 1908 by using the Zeeman effect. Even before this discovery of magnetic fields in sunspots, it was known that there is an 11-year cycle of sunspots, which could be identified as the magnetic cycle of the Sun after this discovery. Only within the last few decades, major developments in plasma physics and magnetohydrodynamics (MHD) have provided a broad framework for the theoretical understanding of how the 11-year sunspot cycle arises. I shall give an elementary introduction to the flux transport dynamo model – the currently favoured theoretical model of the sunspot cycle – with some emphasis on the research from our group. A more detailed account of this subject can be found in my popular science book:
http://www.amazon.in/Natures-Third-Cycle-Story-Sunspots/dp/0199674752/

SPEAKER PROFILE

Arnab Rai Choudhuri is an Honorary Professor of Physics at the Indian Institute of Science. He received his PhD in 1985 from the University of Chicago and joined the faculty of IISc in 1987, formally retiring from there in 2022. Choudhuri has carried on theoretical research on the formation of sunspots and the 11-year sunspot cycle. He was one of the originators of the flux transport dynamo model, the currently favoured theoretical model of the 11-year sunspot cycle. He is also interested in the history of science, currently involved in a study of how research in modern physics began in colonial India. Choudhuri is the author of two advanced textbooks, The Physics of Fluids and Plasmas (CUP, 1998) and Astrophysics for Physicists (CUP, 2010), used in many universities around the world. Astrophysics for Physicists has been translated into Japanese. Choudhuri is an elected Fellow of all the three science academies of India as well as TWAS. He was a recipient of the Alexander von Humboldt Fellowship and the JC Bose Fellowship. In 2022 he received the S. Chandrasekhar Prize of Plasma Physics, becoming the second Indian to win this prestigious internationalprize.

Annexure -III

Sectional Committee I

Chair:

Professor Probal Chaudhuri, FNA

Probal Chaudhuri is a Professor in Indian Statistical Institute, Kolkata. He had his undergraduate and postgraduate education from the same Institute and PhD in Statistics from University of California at Berkeley. His main research interest is in statistics and its application in different areas of science and technology. He is an elected fellow of all three national science academies in India and a fellow of the Institute of Mathematical Statistics (USA). He is a recipient of the Shanti Swarup Bhatnagar Prize and the National Award in Statistics in Honor of C.R.Rao.

Sectional Committee I

INSA Distinguish Lecture

PROFESSOR MANJUNATH KRISHNAPUR

Professor

Indian Institute of Science, Bangalore

ABSTRACT

Log-concavity of certain probability distributions in random matrix theory and last passage percolation

Abstract: Log-concavity is a special property of probability measures that implies many nice properties such as concentration and absolute continuity. Prime historical examples of log-concave distributions are Binomial distributions and Lebesgue measure and Gaussian distributions. A recent conjecture of Chen says that the distribution of the length of the longest increasing subsequence of a random permutation is log-concave.

We show that the Poissonization of these distributions is log-concave. While this does not prove the conjecture, it is the first positive result in this direction. In related investigations we discovered that several commonly occurring distributions in random matrix theory and in related fields are actually log-concave. In some cases, this adds to our understanding of these distributions. All of this is joint work with Jnaneshwar Baslingker and Mokshay Madiman.

SPEAKER PROFILE

Prof Manjunath Krishnapur did my undergraduate and masters at the Indian Statistical Institute and PhD at the University of California, Berkeley. Dr Krishnapur has been the Postdoctoral Fellow at SAMSI and UNC Chapel Hill during 2006 and at University of Toronto during 2007-2008. He has also served as Assistant Professor at Indian Institute of Science during 2009-2013. Presently Dr Krishnapur is serving as the Associate Professor at Indian Institute of Science from 2014.

Dr Manjunath Krishnapur is one of the leading probablilists in the country, who has been recognized world wide for his work on random analytic functions, arithmetic random waves, stochastic operators and other related areas. Manjunath Krishnapur's research contributions are deep and elegant, and those are published in topmost international journals in the field. He is also a good speaker capable of conveying technical ideas to a broad audience. His lectures will be of interest to a wide audience.

Sectional Committee I

Lecture New Fellow

PROFESSOR NITIN SAXENA

Professor

India Alliance at Indian Institute of Technology, Kanpur

ABSTRACT

Algebra powers computation. Modern economies run on algorithms; and algebra is a natural ally in algorithm design. I work on the mathematics that goes inside algorithms. My results fall in two broad categories--- algebraic circuit properties, and fast algorithms for algebra questions. In algebraic circuit theory, I'll motivate the ideas of zero-testing, geometry in identities, bootstrapping/duality in circuits, and approximation. Among the algebraic algorithms developed, I'll motivate those related to--- primality testing, algebraic dependence, Newton iteration, factoring, approximative roots, and Zeta functions.

SPEAKER PROFILE

Nitin Saxena completed his BTech CSE (2002) and PhD (2006) from IIT Kanpur. He was a scientific researcher in CWI, Amsterdam (2006-08) and a faculty in Hausdorff Center for Mathematics, Bonn (2008-13). He joined CSE IIT Kanpur as an Associate Professor in 2013 (became Professor in 2018; Chair Professor in 2019). His work appears in the premier research venues globally. His famous contributions are in the areas of computational algebra, number theory and complexity; more recently, he has been involved in the development of AI products and practical cryptographic protocols. He has taught many courses, has created many MooCs, and regularly gives talks to inspire the next generation in mathematical areas of computing. He has guided 24 Master theses and 15 PhD theses. He has mentored several postdoctoral researchers and undergraduate students. He has been honored with several awards--- Distinguished.Alumnus. IIT.Kanpur (2003); Gödel.Prize, Fulkerson.Prize (2006); Best.Papers (CCC'06, ICALP'11); INSA.Young.Scientist.Medal, DST.Swarna.Jayanti.Fellow (2015); Shanti.Swarup.Bhatnagar.Prize (2018); N.Rama.Rao.Chair (2019); FASc, FNASc (2021); FNAE (2022); FNA (2023); IITB.International.Award(2023); J.C.Bose.Fellowship(2023)

Details: https://www.cse.iitk.ac.in/users/nitin/about.html

Sectional Committee I

Lecture New Fellow

PROFESSOR NEENA GUPTA

Professor

Indian Statistical Institute (ISI), Kolkata

ABSTRACT

Some Problems on Polynomials Rings

Polynomials and power series, may they forever rule the world. Thus, begins a poem composed by Shreeram S. Abhyankar in 1970. Polynomials are introduced at a very early stage in our studies, yet there are many interesting fundamental problems on polynomial rings which are easy to state but difficult to approach. In this talk we shall discuss Cancellation and Epimorphism problems on polynomial rings and some recent progress on them.

SPEAKER'S PROFILE

Neena Gupta is a Professor at the Indian Statistical Institute (ISI), Kolkata, working in the area of Commutative Algebra and Affine Algebraic Geometry. Earlier she completed her Ph.D. at ISI Kolkata under the supervision of Professor Amartya Kumar Dutta.

She is known for providing the complete solution to Zariski Cancellation Problem for affine spaces in positive characteristic, developing general theories on a certain family of affine varieties which reveal surprising connections between various problems on affine spaces, constructing examples of non-cancellative varieties, establishing K-theoretic properties of the ring of invariants of G_a-actions on affine spaces, determining the structure of locally Laurent polynomial algebras, studying questions on finite generation of algebras arising out of Hilbert's fourteenth problem, obtaining results and examples on locally nilpotent derivations, characterisation of affine spaces, separable affine forms, affine fibrations, retractions of polynomial algebras, fibrations by punctured lines and related topics.

An invited Sectional Speaker at ICM 2022 in the sections ``Algebra" as well as ``Algebraic and Complex Geometry", she is a recipient of the Shanti Swarup Bhatnagar Prize in Mathematical Sciences for 2019, the DST-ICTP-IMU Ramanujan Prize for the year 2021, Nari Shakti Puraskar from the Honourable President of India for the year 2021 and the Ganit Ratna award for 2023. She is a Fellow of the Indian Academy of Sciences.

Sectional Committee II

Chair:

Professor Anurag Sharma, FNA

Anurag Sharma is presently an Emeritus Professor of Optics and Photonics and Physics and has been teaching at IIT Delhi since 1980. His research has been concerned with propagation of light in imaging and waveguiding devices. He has published over 110 journal papers and over 200 conference papers. He received the Shanti Swarup Bhatnagar Prize in 1998 for his research contributions. He is a recipient of the Lifetime Achievement Award of IIT Delhi. He is a fellow of all the three science academies (INSA, IAS and NASI) in India, the Indian National Academy of Engineering, and of Optica (USA) (formerly OSA). He has been the President of the Optical Society of India, a Vice-President of INSA and a Vice-President of NASI and is at present Chairperson of its Delhi Chapter of NASI. At IIT Delhi, he has served as Dean of Student Affairs and Dean of Academics and has been Head of the Physics Department. He has been an Alexander von Humboldt Fellow at University of Karlsruhe (Germany) and Senior Associate of the International Centre for Theoretical Physics, Trieste (Italy). He has held a Homi Bhabha Fellowship and a JC Bose Fellowship.

Sectional Committee II

Lecture New Fellow

PROFESSOR JR DAVID

Professor

Tata Institute of Fundamental Research, Mumbai (TIFR)-CAM

ABSTRACT

Entanglement properties of the graviton

Entanglement entropy has recently emerged as a useful quantity to study in quantum field theories. The entanglement properties of the spin-2 field have only been recently studied. After a brief introduction to entanglement entropy, its applications and how it is evaluated, we present some results for the entanglement properties of the linearised graviton in 4 dimensions. This includes the evaluation of the coefficient of the logarithmic term in the entanglement of gravitons across a spherical surface and the time dependent behaviour of entanglement entropy quantum quenches due to curvature excitations.

SPEAKER PROFILE

Prof. David obtained his Masters in Physics (Integrated) from IIT-Kanpur (1994) and his Ph.D from TIFR-Mumbai (1999). He was a post-doctoral researcher at the University of California, Santa Barbara, USA and the International Centre for Theoretical Physics, Trieste, Italy. He joined the Harish-Chandra Research Institute, Allahabad as a Reader in 2005 and then moved to the Indian Institute of Science, Bangalore in 2007 where he now Professor. Prof. David is a theoretical physicist who works in the area of String Theory, Black holes and Quantum Field theory. He has made significant contributions towards the understanding of black hole entropy in string theory, quantum entanglement and holography.

Prof. David was awarded the Ramanujan fellowship in 2009. He is a fellow of the Indian Academy of Sciences, Bangalore and the National Academy of Sciences, Prayagraj. Prof. David is an associate editor of the European Physics Journal -C and is on the editorial board of Current Science. He served as Chair, Centre for High Energy Physics, IISc from 2018 to 2023.

Sectional Committee II

Lecture New Fellow

PROFESSOR M M DESHMUKH

Professor

Tata Institute of Fundamental Research, Mumbai (TIFR)-CAM

ABSTRACT

Entanglement properties of the graviton

Entanglement entropy has recently emerged as a useful quantity to study in quantum field theories. The entanglement properties of the spin-2 field have only been recently studied. After a brief introduction to entanglement entropy, its applications and how it is evaluated, we present some results for the entanglement properties of the linearised graviton in 4 dimensions. This includes the evaluation of the coefficient of the logarithmic term in the entanglement of gravitons across a spherical surface and the time dependent behaviour of entanglement entropy quantum quenches due to curvature excitations.

SPEAKER'S PROFILE

Prof. David obtained his Masters in Physics (Integrated) from IIT-Kanpur (1994) and his Ph.D from TIFR-Mumbai (1999). He was a post-doctoral researcher at the University of California, Santa Barbara, USA and the International Centre for Theoretical Physics, Trieste, Italy. He joined the Harish-Chandra Research Institute, Allahabad as a Reader in 2005 and then moved to the Indian Institute of Science, Bangalore in 2007 where he now Professor. Prof. David is a theoretical physicist who works in the area of String Theory, Black holes and Quantum Field theory. He has made significant contributions towards the understanding of black hole entropy in string theory, quantum entanglement and holography.

Sectional Committee II

Lecture New Fellow

PROFESSOR SANDEEP KRISHNA

Professor

Study of Living Machines in NCBS, Bangalore

ABSTRACT

Entrainment and phase-locking of ultradian oscillations in biological cells

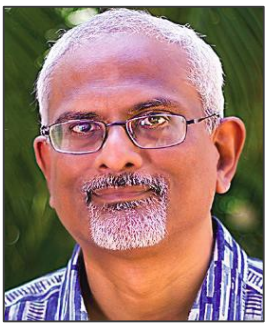
Oscillations in biological cells exhibit a very wide range of timescales, ranging from very fast calcium oscillations to relatively slow circadian rhythms, both of which have been widely studied. Much remains to be understood about ultradian oscillations, with an intermediate time period of a few hours, which arise for Example in the response of cells to inflammation or DNA damage. We suggest that Coupling these oscillators to an external controllable oscillation is a good way to probe their nonlinearities and feedback mechanisms. Coupled oscillators have long been known to produce entrainment and phase-locking with universal properties. I will describe a mathematical model for the NF-kB oscillator in mammalian cells driven by a periodic external stimulus. The model predicts a variety of complex dynamical behaviour, as the driving frequency and coupling strength is varied, ranging from simple entrainment within Arnold tongues, to mode-hopping, to chaos. I will compare these predictions with experiments and describe what we can thereby learn about these ultradian oscillators.

SPEAKER'S PROFILE

Sandeep Krishna is a Professor at the Simons Centre for the Study of Living Machines in NCBS, Bangalore. His research lies at the interface of biology and physics, examining biological phenomena spanning a wide range of length and timescales: for example, molecular mechanisms of protein regulation, cell fate decisions, and cooperation, communication and heterogeneity in microbial communities.

Sectional Committee II

Lecture New Fellow



PROFESSOR ARUL LAKSHMINARAYAN

Professor

Department of Physics, IIT Madras.

ABSTRACT

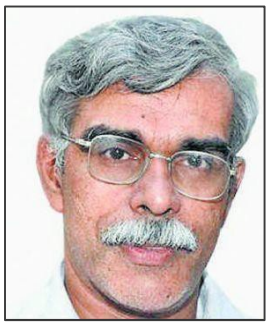
Adventures in Quantum Chaos and Information

I will summarize the intriguing interplay between chaos and quantum entanglement, generally believed to be purely classical and purely quantum phenomena respectively. We will also indicate how these lead to insights into quantum information itself and of many-body systems and thermalization.

SPEAKER'S PROFILE

- *Professor, Department of Physics, IIT Madras.*
- *Ph. D. SUNY Stony Brook, 1993.*

Sectional Committee III



Chair:

Professor VK Pillai, FNA

Vijayamohanan K. Pillai received his Ph.D. from the Solid State & Structural Chemistry Unit of the Indian Institute of Science, Bangalore in 1990 and subsequently joined the Physical and Materials Chemistry Division of the National Chemical Laboratory, Pune in 1991. He has authored over 270 publications and 28 patents related to many innovations in both Electrochemistry and Materials Chemistry, while advising about 25 Ph.D. students in Materials Electrochemistry. His area of interest are Self-assembled Monolayers, hybrid materials using functionalized carbon nanotubes, anisotropic metallic nanostructures, and electrochemical applications of 2D Materials. His group has developed highly sensitive nanostructured electrocatalysts for Polymer Eelectrolyte Fuel Cells (PEMFC) and many two-dimensional electrocatalysts include graphene and phosphorene as quantum dots. His research interests include Materials Electrochemistry, functionalization of carbon nanotubes/graphene nanoribbons and hybrid materials using many 2D systems for energy storage applications. His book on "Functional Materials: A Chemist's Perspective" published by university Press is a good source for teaching many topics in Materials Chemistry He has received many honors and awards like The MRSI Medal, Bangalore in 1996 and CRSI Bronze Medal in 2004 and is a Fellow of the Indian Academy of Sciences since 2008 and the Indian National Science Academy (2018). He has been an "Erudite visiting professor" at MG University, Kottayam since 2011 and has given "Professor K.S.G. Doss Memorial Lecture in 2011", "Professor Gurumurthy Mangalam Endowment Lecture, Annamalai University" in 2012, "R.K. Barua Memorial Lecture at the Gauhati University" in 2013, "Prof. Chelikani Chiranjeevi Endowment Lecture Award, Andhra University" in 2015, "IICT-Avon Padmashri Dr. G S Sidhu Chemcon Distinguished Speaker Award-2016", "Prof. B. Thimme Gowda endowment lecture 2015-16", Mangalore University, "National Prize for Research on Energy Materials and Devices" by JNCASR, 2016, "Prof. T. L. Rama Char Memorial Lecture - ECS India", 2016, "MRSI-ICSC Superconductivity and Materials Science Annual Prize", 2016, "Dr. K T Achaya Memorial Award" by OTAI, 2017 and ISCB Award for Excellence (Chemical Sciences), 2019. He has also visited many foreign countries like US, Germany, France, UK, Finland, Japan, China, Taiwan, South Korea, Australia for giving invited lectures and chairing conferences on many topics in Materials Electrochemistry and Electrochemistry. In addition to being Director of CSIR-CECRI (April 2012 – October 2018), he held the additional charge as Director, CSIR-NCL, Pune from June 2015 to February 2016. He has become a J C Bose Fellow of SERB in 2020 after joining IISER-Tirupati in2019.

He is at present functioning as a professor of Chemistry and Dean, R&D at IISER – Tirupati and may be contacted at vijay@iisertirupati.ac.in

Sectional Committee III

Lecture New Fellow

PROFESSOR AK GANGULI

Professor

Department of Chemistry, IIT Delhi

ABSTRACT

Design of Advanced Materials

The design of materials with controlled properties is of immense importance. The role of the structure and composition of the solid along with the morphology and size of grains/particles have a bearing on the properties. These attributes can be tuned by controlling the reaction conditions (pH, solvent, temperature, pressure, presence of additives such as ions, surfactants,) We focus on two classes of materials where we have contributed significantly, semiconductor Nano heterostructures and chalcogenide based superconducting materials.

References:

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10. M Naskar et al, Phys. Rev. B. 105, 014513(2022).

SPEAKER'S PROFILE

Professor Ganguli is currently the Director and Professor of Chemical Sciences at IISER Berhampur. He is on Lien from IIT Delhi where he is a Professor of Chemistry. He was Deputy Director, IIT Delhi and was also the founding Director of Institute of Nano Science and Technology (Mohali, India). He studied in University of Delhi (BSc and MSc) and obtained his PhD from SSCU, IISc Bangalore in 1990. He worked at Dupont R&D (USA) and Ames Lab (Iowa, USA) before joining IIT Delhi in 1995. His main interest is in the area of design of new materials, especially nanomaterials for energy conversion and superconducting materials. He has published over 350 papers and has filed five patents (two granted).

He is a recipient of the MRSI Medal, CRSI Silver & Bronze Medal & CRSI-CNR Rao National Prize, National Award of Nano Science and Nanotechnology (DST Govt. of India), Bangalore India Nano award (Karnataka Govt) and Distinguished Materials Scientist of the Year Award (2021), by the Materials Research Society of India, A V Rama Rao lecture Award and J N Mukherjee lecture award (Indian Chemical society). He is a fellow of the Indian Academy of Sciences and the National Academy of Sciences (India), Royal Society of Chemistry (London) and the Asia-Pacific Association of Materials. Dr Ganguli was keenly involved in the formation of Delhi S&T Cluster (DRIIV) part of the initiative of PSA, Govt of India. Dr Ganguli has very keen interest to promote outreach activities for underprivileged sections of society and has been to remotest schools and colleges in several states in the country.

Sectional Committee III

Lecture New Fellow

PROFESSOR SK MANDAL

Professor

Department of Chemical Sciences, IISER Kolkata

ABSTRACT

Transition Metal-Free Catalysis

The major concerns about industrially used catalytic systems today are: i) the high cost of catalysts; ii) the toxicity of heavy transition metals; iii) difficulties in removing trace amounts of toxic-metal residues from the desired product; and, finally, iv) rare transition metal depletion, which does not meet the requirement of sustainable development. Developing environmentally friendly catalysts is an excellent option in this regard. Naturally, the most recent trend in catalyst development heralded a new era of metal-free catalysis or catalysts based on earth-abundant, nontoxic, and low-cost metals. This talk will review our recent advances [1-6] in developing transition metal-free catalysis using small organic molecules [4-5, 7] to mimic transition metal-based catalysis systematically.

References:

Mandal and co-workers:

[1] *Chem Rev.* **2022**, *122*, 11369–11431

[2] *J. Am. Chem. Soc.* **2022**, *49*, 22611-22621.

[3] *Chemical Science* **2023**, *14*, 2606-2615.

[4] *Chem. Soc. Rev.* **2020**, *49*, 1233-1252

[5] *Acc. Chem. Res.* **2017**, *50*, 1679-1691.

[6] *Manuscript under revision*, **2023**.

[7] *Nature* **2013**, *493*, 509-513.

SPEAKER'S PROFILE

Swadhin Mandal is a professor at the Indian Institute of Science Education and Research (IISER) in Kolkata. Earlier, he was head of the Department of Chemical Sciences at IISER Kolkata from 2018 to 2020. He earned his BS and MS degrees from the University of Kalyani. In 2002, he received his doctorate from the Indian Institute of Science, Bangalore, under the supervision of Prof. S. S. Krishnamurthy. He then worked as a postdoctoral fellow with Prof. Robert C. Haddon at the University of California, Riverside, USA and as an Alexander von Humboldt fellow with Prof. Herbert W. Roesky at the University of Göttingen, Germany. He joined IISER Kolkata as an assistant professor in 2007 and was promoted to full professor in 2018. His current research interests include metal-free catalysis with reactive electron-rich main group species for discovering new chemical transformations of CO_2 and electron transfer catalysis with small molecules in various organic transformations. His research has been published in several high-profile international journals (over 125 publications and patents), including Nature, JACS, Angew Chem, Chem Sci, and others. To date, he has guided 14 students to their PhD degrees.

Professional Recognitions:

- Appointed (courtesy appointment) as Visiting Professor of Rutgers University, New Brunswick, USA, 2024
- Awarded the Friedrich Wilhelm Bessel Research Award by the Alexander von Humboldt Foundation, Germany, 2022
- Awarded the Erna and Jakob Michael Visiting Professorship at Weizmann Institute of Science in Israel, 2022
- Elected fellow, Indian Academy of Sciences, 2021
- Visiting Professor, IIT Bombay during 2020-2023
- Shanti Swarup Bhatnagar Prize in Chemical Sciences for 2018 (one of the most coveted awards by the Govt. of India in natural sciences, medicine and engineering)
- Editorial Advisory Board member:

  Chemical Science (2020-2022)

  Inorganic Chemistry (2019- 2022)

  Organometallics (2013-2015)

  J. Chemical Science (2018-2021)
- Fellow of the Royal Society of Chemistry (FRSC) since 2018
- Awarded the SERB Distinguished Investigator Award 2018
- CRSI (Chemical Research Society of India) bronze medal, 2018
- YIM-Young Scientist Award -2012 by YIM-Boston at MIT, Boston, USA

Sectional Committee III

Lecture New Fellow

Dr. DS REDDY

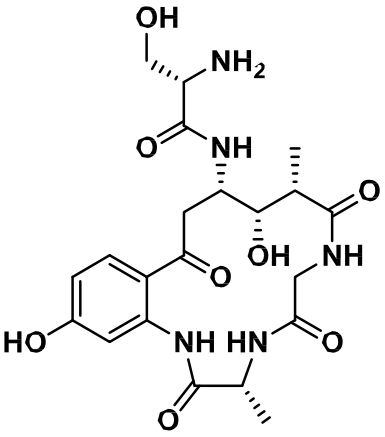
Director

CSIR- Indian Institute of Chemical Technology, Hyderabad

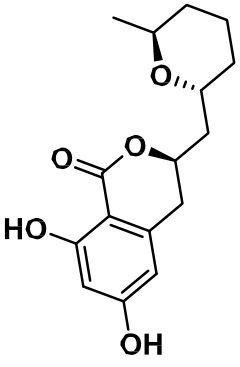
ABSTRACT

Natural Products-based Drug Discovery: Identification of Lead Molecules

Our research group focuses on total synthesis of biologically active compounds and medicinal chemistry with an ultimate aim of discovering drugs. We have accomplished the synthesis of >50 natural products which include cell-adhesion inhibitors, anti-bacterial, anti-inflammatory, anti-cancer agents, sex pheromones and insect repellents. In the medicinal chemistry front, several programs have been initiated with collaborations from academia and industry. In the first part, I will discuss more details in the projects of cladosporin and solomonmides and the way forward.



Solomonamide B
(antiinflammatory)



Cladosporin
(antimalarial)

SPEAKER'S PROFILE

D. Srinivasa Reddy
Director, CSIR- Indian Institute of Chemical Technology, Hyderabad

Background/Experience

- Ph.D., University of Hyderabad, 2000 (Advisor: Professor Goverdhan Mehta).
- Post-doctoral with Prof. Sergey A. Kozmin (University of Chicago, USA) and Prof. Jeffrey Aubé (University of Kansas, USA)
- 20+ Years of research experience (post-PhD) in total synthesis of natural products/ medicinal chemistry/ drug discovery
- 3+ Years of administrative experience (as a director of CSIR-IIIM, Jammu & as a director -additional charge CSIR-CDRI, Lucknow).
- 7+ Years of experience in pharmaceutical industry (Dr.Reddy's & TATA Advinus), A molecule discovered by his team at industry is currently in human phase-II clinical trials (Licogliflozin)
- Out-licensed patent/technology (two nos.) developed by team at CSIR-NCL
- Author of ~140 publications and an inventor in ~35 patents

Awards/Recognitions

- J. C. Bose National Fellowship by SERB, DST, Govt. of India
- Shanti Swarup Bhatnagar Prize in chemical sciences
- Fellow of the Indian Academy of Sciences, India (FASc), National Academy of Sciences, India (FNASc), Telangana Telangana Academy of Sciences (FTAS) and Maharashtra Academy of Sciences (MASc)
- NASI-Reliance Industries Platinum Jubilee Award in the field of physical sciences
- Sun Pharma Research (Ranbaxy) Award in the field of pharmaceutical sciences
- OPPI Scientist Award for contributions in pharmaceutical sciences
- Nominated member of the scientific body of Indian Pharmacopoeia, Govt. of India
- CRSI Bronze Medal in chemical science
- CDRI Award for Excellence in drug discovery research - chemical sciences
- Darshan Ranganathan Memorial Lecture Award by CRSI
- KKG Menon Memorial Lecture Award of ICT, Mumbai

Selected Recent Publications:

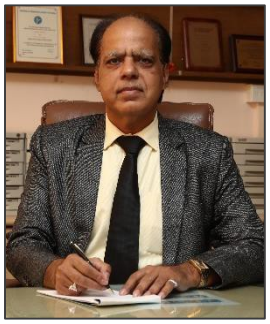
J. Org. Chem. *2023, 88*, 14227; ***Org. Lett.*** 2023, *25*, 6881; ***Eur. J. Med. Chem.*** 2023, 259, 115633; ***Eur. J. Med. Chem.*** 2022, 236,114245; ***J. Org. Chem.*** 2022, *87*, 3025; ***PNAS*** 2022, 119, e2110293119; ***J. Org. Chem.*** 2022, 87, 556***; Org. Lett.*** 2021, *23*, 6642; ***J. Org. Chem.*** 2021, *86*, 9200*;* ***ACS Infect. Dis.*** 2021**,** *7*, 1777*;* ***J. Med. Chem.***, 2020, *63*, 12171; ***Org. Lett.***, 2020, *22*, 3104; ***J. Org. Chem,*** 2020, 85, 5, 3297; ***Eur. J. Org. Chem.,*** 2019, 1257; ***J. Med. Chem.***, 2018, 61, 5664; ***Org. Lett.***, 2018, 20, 7003; ***J. Med. Chem.***, 2018, 61, 3779; ***J. Org. Chem.***, 2017, 82, 7614; ***Eur. J. Med. Chem.***, 2017, 135, 89; ***J. Nat. Prod.*** 2017, 80, 1125; ***Bioconjugate Chem.***, 2016, 27, 2062; ***Org. Lett.***, 2016, 18, 3178;

Selected Patents:

US20210395212A1; US011274081B2; USOORE49080E; US20220228086A1; US20180134650; US20170233324; WO 2015/015519; WO 2015/004687; US 20140256976; WO 2014/195970; WO 2014/181357; WO 2014/170915; WO 2014/128723; WO 2014115172; US 20140296133; WO 2014083578

Sectional Committee III

Lecture New Fellow



PROFESSOR A K TYAGI

Director, Distinguished Scientist

Chemistry Group, BARC

Distinguished Scientist, DAE, Senior Professor (Chemistry) at Homi Bhabha National Institute (HBNI), Mumbai

ABSTRACT

Rational design of functional materials: A Chemist's approach

New functional materials can be designed by interplay of synthesis and crystallographic structure. Unconventional synthetic routes play an important role in this direction as many of these new materials are metastable and hence it is not possible to prepare them by conventional synthesis methods. Of late, the focus of research has been shifted to multi-functional materials i.e., the materials which can possess two or more than two synergistic or antagonistic functionalities. Several materials with unusual coordination number and oxidation states will be discussed in this presentation. Rational concepts like tuning of radius ratio, degree of disorder, distortion, point defects engineering, unusual polyhedral sharing, unusual coordination numbers and counter-ion polarisability to prepare many new materials with desired functional properties. Some typical materials are $La_{1-x}Ce_xCrO_3$, $Pr_{1-x}Ce_xScO_3$ (materials with tunable band gap and magnetic properties), $CeScO_3$ (with unusual reversible conversion to fluorite lattice), $Gd_{1-x}Y_xInO_3$, $GdSc_{1-x}In_xO_3$, $YIn_{1-x}Fe_xO_3$ (tunable dielectrics) and several lead-free relaxor materials. Several interesting pyrochlore-based oxygen storage materials, viz. $Ce_2Zr_2O_{7+x}$ (x = 0.0 to 1.0), $Gd_{2-x}Ce_xZr_2O_7$ and $Gd_{2-x}Ce_xZr_{2-x}Al_xO_7$ (x = 0.0 to 2.0) have been prepared, which have shown interesting redox catalysis. The simple concepts like r_A/r_B ratio of $A_2B_2O_7$ pyrochlores could be used to tailor the properties like dielectric and catalytic behavior. Some recent results in the field of energy storage and photocatalysis will also be discussed. The major focus of this talk will be on the role of synthesis, novel properties exhibited by these functional materials, and their crystallographic correlation.

SPEAKER'S PROFILE

Dr. A. K. Tyagi joined Chemistry Division, BARC in 1986 through BARC Training School. He obtained PhD in 1992. He did postdoctoral research at Max-Planck Institute, Stuttgart, Germany (1995-96). Presently he is Director, Chemistry Group, BARC, Distinguished Scientist, DAE, Senior Professor (Chemistry) at Homi Bhabha National Institute (HBNI), Mumbai and Honorary Professor at JNCASR, Bengaluru. His research interests are in the field of nanomaterials, functional materials, nuclear materials, metastable materials and Hybrid materials. He has published more than 650 papers in international journals, 11 books and several review articles. He has supervised 35 students for their PhD and another 08 students are presently pursuing PhD under his supervision.

He has been conferred with a number of prestigious awards such as such as DAE-Homi Bhabha Science and Technology Award, DAE-SRC Outstanding Researcher Award, DAE-Group Achievement Award; MRSI Medal; MRSI-ICSC Materials Science Senior Award; MRSI-CNR Rao Prize in Advanced Materials; CRSI Bronze Medal; CRSI-CNR Rao National Prize in Chemical Sciences; CRSI-Silver Medal; Medal of Indian Nuclear Society; Rajib Goyal Prize in Chemical Sciences; Metallurgist of the Year award from Ministry of Steel, GoI; JNCASR-National Prize in Solid State and Materials Chemistry; ISCA Acharya PC Ray Memorial Award; JNCASR-Prof. AV Rama Rao Foundation Lecture Award; and NETZSCH – ITAS Award by Indian Thermal Analysis Society. Recently, he has been selected for MRSI-Distinguished Materials Scientist of the year award and Indian Ceramics Society's DN Agarwal Memorial Award.

He is a fellow of major science and engineering academies in India such as the Maharashtra Academy of Sciences; National Academy of Sciences, India; Indian Academy of Sciences and Indian National Academy of Engineering. Recently, he has been elected as Fellow of World Academy of Sciences also.

Sectional Committee V

Chair:

Professor Sushmita Mitra, FNA

Sushmita Mitra is a full professor at the Machine Intelligence Unit (MIU), Indian Statistical Institute, Kolkata. From 1992 to 1994 she was in the RWTH, Aachen, Germany as a DAAD Fellow. She was a Visiting Professor in the Computer Science Departments of the University of Alberta, Edmonton, Canada; Meiji University, Japan; and Aalborg University Esbjerg, Denmark. Dr. Mitra received the National Talent Search Scholarship (1978-1983) from NCERT, India, the University Gold Medal in 1988, the IEEE TNN Outstanding Paper Award in 1994 for her pioneering work in neuro-fuzzy computing, the CIMPA-INRIA-UNESCO Fellowship in 1996, and Fulbright-Nehru Senior Research Fellowship in 2018-2020. She was the INAE Chair Professor during 2018-2020. Dr. Mitra has been awarded the prestigious J. C. Bose National Fellowship, 2021. Dr. Mitra is the author of the books ``Neuro-Fuzzy Pattern Recognition: Methods in Soft Computing" and ``Data Mining: Multimedia, Soft Computing, and Bioinformatics" published by John Wiley, and ``Introduction to Machine Learning and Bioinformatics", Chapman & Hall/CRC Press, beside a host of other edited books. Dr. Mitra has guest edited special issues of several journals, is an Associate Editor of ``IEEE/ACM Trans. on Computational Biology and Bioinformatics", ``Information Sciences", ``Fundamenta Informatica", and is a Founding Associate Editor of ``Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery (WIRE DMKD)". She has more than 250 research publications in referred international journals and conferences.

Dr. Mitra is a Fellow of the IEEE, The World Academy of Sciences (TWAS), Indian National Science Academy (INSA), International Association for Pattern Recognition (IAPR), Asia-Pacific Artificial Intelligence Association (AAIA), and Fellow of the Indian National Academy of Engineering (INAE) and The National Academy of Sciences, India (NASI). She serves as a Member of the Inter-Academy Panel for Women in STEMM. She has visited more than 30 countries as a Plenary/Invited Speaker or an academic visitor. She served in the capacity of General Chair, Program Chair, Tutorial Chair, of many international conferences; was the Chair, IEEE Kolkata Section (2021-2022) and an IEEE CIS Distinguished Lecturer. Her current research interests include data science, machine learning, soft computing, medical image processing, and Bioinformatics.

Sectional Committee V

Lecture New Fellow

PROFESSOR BIJNAN BANDYOPADHYAY

Professor

Indian Institute of Technology, Bombay, Mumbai

ABSTRACT

Continuous Integral Sliding Mode control and Implementation of Super Twisting Control

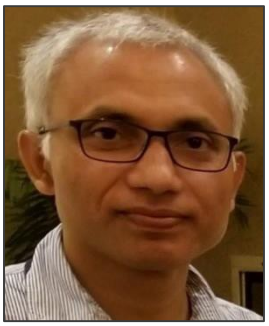
The talk will be on a new algorithm developed by the speaker on continuous sliding mode based on integral sliding mode control (ISMC) where the discontinuous part of the ISMC is replaced by continuous control. It is shown that the well-known super twisting control (STC) which replaces the discontinuous part of the ISMC acts as a disturbance observer and hence cancels the matched disturbance. As the overall controller is continuous, the proposed method is advantageous over the existing integral sliding mode control, which has a discontinuous term. Also from the practical implementation point of view, in particular for mechanical systems, discontinuous term will result in chattering which is very much undesirable. Some implementation results on a practical system and its superiority will be also discussed. In the second part of the talk, an output feedback stabilization of perturbed double integrator systems using super twisting control (STC) will be presented. It will be shown that when STC is implemented based on super twisting observer (STO) then it is not possible to achieve second order sliding mode (SOSM) using continuous control on the chosen sliding surface. Two methodologies are proposed to circumvent the above-mentioned problem. In the first method, control input is discontinuous which may not be desirable for practical systems. In second method continuous STC is proposed based on higher order sliding mode observer (HOSMO) which achieves SOSM on the chosen sliding surface. For simplicity, we are considering here only the perturbed double integrator, which can be generalized for an arbitrary order. Some Numerical simulations and experimental validation will be also presented to show the effectiveness of the proposed method

SPEAKER'S PROFILE

Bijnan Bandyopadhyay received his B.E. degree in Electronics and Telecommunication Engineering from the University of Calcutta, Calcutta, India in 1978, and Ph.D. in Electrical Engineering from IIT Delhi, India in 1986. In 1987, he joined the Systems and Control Engineering group, IIT Bombay, India, as a faculty member, where he served as Chair Professor during 2015- 2021. Since 2022 he is serving as Visiting Professor at IIT Jodhpur. In 1996, he was with the Lehrstuhl fur Eleck- trische Steuerung und Regelung, RUB, Bochum, Germany, as an Alexander von Humboldt Fellow. He was awarded Distinguished Visiting Fellow by the Royal Academy of Engineering, London in 2009 and 2012. Professor Bandyopadhyay is a Fellow of the Indian National Academy of Engineering, National Academy of Sciences, and the Indian Academy of Sciences. He has 450 publications which include monographs, book chapters, journal articles, and conference papers. He has guided 40 Ph.D. theses at IIT Bombay. His research interests include the areas of multirate output feedback based discrete- time sliding mode control, event- triggered sliding mode control, and nuclear reactor control. Prof. Bandyopadhyay served as Co- Chairman of the International Organization Committee and as Chairman of the Local Arrangements Committee for the IEEE ICIT, Goa, India, in 2000. He also served as one of the General Chairs of the IEEE ICIT conference, Mumbai, India in 2006. Prof. Bandyopadhyay has served as General Chair for IEEE International Workshop on VSSSMC, Mumbai, 2012. He has served as Associate Editor of IEEE Transaction on Industrial Electronics and IEEE/ASME Transactions on Mechatronics. He is currently serving as Associate Editor of IET Control Theory and Applications. Prof. Bandyopadhyay has been awarded the IEEE Distinguished Lecturer of IEEE IES society in 2019. Professor Bandyopadhyay is a Life Fellow of IEEE.

Sectional Committee V

Lecture New Fellow



PROFESSOR SWADES DE

Professor

Department of Electrical Engineering and an Institute Chair Professor at IIT Delhi

ABSTRACT

Cross-layer optimization strategies for sustainable and green wireless communications

In this presentation I will highlight my key contributions on communication network resource optimization strategies. Particular emphasis will be on some more recent research outcomes on energy sustainability. Green communication approaches via ambient energy harvesting and more futuristic wireless energy transfer techniques for on-demand energy replenishment will be also presented.

SPEAKER'S PROFILE

Prof. Swades De is currently a Professor with the Department of Electrical Engineering and an Institute Chair Professor at IIT Delhi. Before moving to IIT Delhi in 2007, he was a Tenure-Track Assistant Professor with the Department of ECE, New Jersey Institute of Technology, Newark, NJ, USA, from 2004–2007. He worked as an ERCIM Post-doctoral Researcher at ISTI-CNR, Pisa, Italy (2004), and has nearly five years of industry experience in India on telecom hardware and software development, from 1993–1997, 1999. His research interests are broadly in communication networks, with an emphasis on performance modeling and analysis. Current directions include resource allocation, energy harvesting, wireless energy transfer, energy sustainable and green communications, spectrum sharing, smart grid networks, and IoT communications. He has published over 250 journal and conference articles in top venues, 7 book chapters, 1 edited book, 1 US/EU/WO patent (which has been monetized), and filed 11 Indian patents and 6 US/EU patents. More details of Dr. De's research can be noted from his website at: https://web.iitd.ac.in/~swadesd/.

Among numerous awards and distinctions during his professional career, the recent ones include IEEE VTS Distinguished Lecturer (2022-2024), Abdul Kalam Technology Innovation National Fellowship (2021-2024), Best paper award (NCC, 2021), Om Prakash Bhasin award for Science and Technology (2019), IETE Ram Lal Wadhwa Award (2019), IEEE Wireless Communications Letters Best Editor Award (2022), and IEEE Communications Letters Exemplary Editor Award (2018, 2021, 2022). Dr. De is a fellow of Indian National Academy of Engineering (INAE) and National Academy of Sciences, India (NASI).

Dr. De currently serves as an Associate Editor of IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS, IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, and IEEE WIRELESS COMMUNICATIONS MAGAZINE.

Sectional Committee V

Lecture New Fellow

PROFESSOR DEBASISH GHOSE

Professor

Indian Institute of Science, Bangalore

ABSTRACT

Avoiding Collisions: In Robotics, Aerial Vehicles, and Autonomous Systems

Collision avoidance is an important aspect of autonomous systems, especially in modern times where autonomous systems are not only anticipated to operate in swarms, but are also expected to function in environments which have humans and other entities. Research in this area has explored various aspects of collision avoidance over the last three decades. This talk will present one particular aspect of collision avoidance based on a relative velocity framework that has shown promise in realistic usage in automated vehicles. It will introduce the notion of collision cones and show how the basic notion can expand to cover many real-world applications that may go beyond the mere requirement of a vehicle avoiding collision with another, and go into the realm of collision avoidance in higher dimensional spaces leading to conceptual applications ranging from opinion dynamics to intent prediction in knowledge graphs.

SPEAKER'S PROFILE

Debasish Ghose is a professor in the Robert Bosch Centre for Cyberphysical Systems and the Department of Aerospace Engineering, at the Indian Institute of Science. He received his Bachelor's degree from NIT Rourkela and Master's and Doctoral degree from the Indian Institute of Science. He has been a visiting faculty at the University of California at Los Angeles, as also in many other universities. His main areas of research are guidance and control of autonomous systems, distributed decision-making systems, and game theory. He is/was on the editorial board of many well-known journals, including several IEEE Transactions. He is a fellow of Indian National Academy of Engineering (INAE), The National Academy of Sciences, India (NASI), and an associate fellow of the American Institute of Aeronautics and Astronautics (AIAA).

Sectional Committee V

Lecture New Fellow

PROFESSOR N. K. MUKHOPADHYAY

Professor

Department of Metallurgical Engineering
Indian Institute of Technology (Banaras Hindu University)

E-mail: mukho.met @iitbhu.ac.in

ABSTRACT

Quasicrystals: A New Class of Structurally Complex Intermetallic Alloys

Quasicrystals (QCs) are considered as a new class of intermetallic phases lacking periodicity but with the long-range quasiperiodicity and forbidden rotation symmetry. These materials have attracted intense research interest due to their interesting structural complexities, unique physical/mechanical properties, and potentials for applications. They exhibit ultimate complexity in the 3-dimensional space, but give rise to sharp diffraction patterns with rotational symmetry forbidden for periodic crystals, defying existing crystallographic concept. The idea of quasiperiodic lattices or quasicrystal structures was challenged by conventional crystallographers. It took quite some times since its discovery in 1984 to settle the issue of the actual existence of quasicrystals beyond doubt and to establish a new architecture of solid by accepting a paradigm shift in crystallography leading to the award of 2011 Nobel Prize to Dan Shechtman for his discovery of quasicrystal. The crystal structure of quasicrystalline intermetallics can be understood in terms of appropriate decoration of 3-dimensional Penrose quasilattice using higher dimensional crystallography. The crystal structure of quasicrystalline intermetallics can be understood in terms of appropriate decoration of 3-dimensional Penrose quasilattice using higher dimensional crystallography. Here, we will review interesting research outcomes in the area of quasicrystals, with an emphasis on the synthesis, structure, stability, as well as properties, and potential applications. The unresolved issues in this area of complex metallic alloys will be addressed. We also will highlight the possibility of using QC as composite materials, coatings, hydrogen storage and 2D metallic layers (analogous to graphene) for their unique physical, mechanical and chemical properties.

SPEAKER PROFILE

Prof. N.K. Mukhopadhyay is a Professor (HAG) in the Department of Metallurgical Engineering at Indian Institute of Technology (Banaras Hindu University) Varanasi. After his B.E. in Metallurgical Engineering from Bengal Engineering College, Calcutta University (now known as IIEST), Shibpur, West Bengal, he did his M.E. and Ph.D. degrees from the Department of Metallurgy (now known as Materials Engineering), Indian Institute of Science, Bangalore. Prior to joining (IIT-BHU), he worked briefly at CSIR-National Metallurgical Laboratory, Jamshedpur as a Scientist and also as a postdoctoral Fellow at McMaster University, Canada. He has visited McMaster University (Canada) Yonsei University (Korea), IFW, Dresden (Germany) as a visiting Professor/Scientist. He is recipient of several prestigious awards, including INSA young Scientist Award, Alexander Humboldt Fellowship, Metallurgist of the Year by Ministry of Steel, GoI, MRSI Medal, Lifetime achievements Award of Electron Microscope Society, among several other awards. He is a Fellow of Indian National Academy of Engineering (INAE), National Science Academy, India (NASI) and West Bengal Academy of Science and Technology, Electron Microscope Society of India and Institutions of Engineers (India). His current research interests are related to physical metallurgy, quasicrystals, complex metallic alloys, high entropy alloys, mechanical alloying, severe plastic deformation, nanoindentation. He has published over 225 papers in international journals of repute. He has served as member of the Commission of 'Electron Diffraction' and 'Aperiodic Crystals' of the International Union of Crystallography (IUCr), UK and is still serving as a member of the International Advisory Body (IAB) and Conference series on 'Quasicrystals'.

Chair: **Professor Probal Chaudhuri, FNA**

Sectional Committee I

Lecture INSA Associate Fellow

DR. NISHANT CHANDGOTIA

Reader

Tata Institute of Fundamental Research, Mumbai (TIFR)-CAM

ABSTRACT

Dimer tilings in 3 dimensions

It is remarkable to observe patterns emerge in nature in somewhat unexpected situations. Mathematically, some of these patterns can be explained by the so-called large deviations principle. For instance, the deviation of the proportion of heads from half decays exponentially with the number of tosses. This can also be observed in some simple statistical physics models, for instance, in tilings of the 2-dimensional integer lattice by dominos (2 by 1, 1 by 2 boxes) by Cohn, Kenyon and Propp. In this talk I will present joint work with Sheffield and Wolfram which extends this to three dimensions.

SPEAKER'S PROFILE

Nishant Chandgotia is a Reader at TIFR-CAM interested in the fields of ergodic theory and dynamical systems, specifically, symbolic dynamics and related areas of harmonic analysis, statistical physics and probability

Chair: **Professor Probal Chaudhuri, FNA**

Sectional Committee I

Lecture INSA Associate Fellow

DR. HARIPADA SAU

Assistant Professor

Department of Mathematics, IISER, Pune

ABSTRACT

Representing certain affine varieties in terms of eigenvalues

An affine variety is considered a distinguished variety if it intersects the open bidisk and exits the domain through the torus. The distinguished varieties are important in the analysis of commuting matrices and the 2-variable Pick interpolation problem. We shall see two representations of these varieties in terms of joint eigenvalues of commuting matrices. This is a joint work with Tirthankar Bhattacharyya and Poornendu Kumar.

SPEAKER'S PROFILE

Dr. Haripada Sau is currently an assistant professor in the mathematics department of IISER Pune. He has 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 expertiese lies in Hilbert space operator theory, function theory, Pick interpolation problem, and certain affine varities.

Sectional Committee IV

Chair:

Professor Archana Bhattacharyya, FNA

Prof. Archana Bhattacharyya earned her PhD degree from Northwestern University, USA, in 1975, and joined the Indian Institute of Geomagnetism (IIG) in 1978. She has worked in the areas of plasma instabilities in Earth's ionosphere, ionospheric scintillations, geomagnetic field variations, and space weather. During 1986-87, she worked at the University of Illinois, Urbana, USA, and during 1998-2000, she worked at the Air Force Research Laboratory in Massachusetts, USA. Her work opened up a new area of investigation of the magnetic field fluctuations associated with the phenomenon of equatorial plasma bubbles in Earth's ionosphere. She was the Director of IIG during 2005 - 2010. She is an elected Fellow of all three Science Academies of India. She is also a Fellow of the Scientific Committee for Solar-Terrestrial Physics (SCOSTEP) of the ISC. She was a J.C. Bose National Fellow during 2013-2016. In 2019, she was made an Honorary member of the International Association of Geomagnetism and Aeronomy (IAGA). She was the Chairperson of INSA Joint National Committee for COSPAR, URSI & SCOSTEP during 2012 – 2015; and currently she is the Chairperson of INSA Joint National Committee for IUGG & IGU. At present she is an INSA Honorary scientist at IIG.

Sectional Committee IV

Lecture New Fellow

PROFESSOR SK BHOWMIK

Professor

Department of Geology & Geophysics, Indian Institute of Technology, Kharagpur
santanu@gg.iitkgp.ac.in)

ABSTRACT

Advent of Plate Tectonics in the Planet Earth: New Insights from the Western Dharwar Craton, South India

In recent years, there is a resurgence of interest to know the nature of tectonics processes that operated in Early Earth, and when and how it evolved from a mode of pre-subduction and vertical, gravity-driven subduction tectonics into the present style of asymmetric plate subductions. While for the Phanerozoic Earth, paired metamorphism that recognizes contrasting thermal gradients and metamorphism (high P/T vs. low P/T type) in orogen-parallel, metamorphic belts of the same age, is unequivocally considered as the classical petrological indicators of plate subduction, identifying
the same in the Archaean hotter earth is an extremely difficult task. In this study, a new approach that integrates metamorphic reconstructions (including critical metamorphic parameters such as values of P_{Max}, T/P ratio at the T_{Max}, and metamorphic P-T paths of evolution) with diffusion chronometry, the latter calculating metamorphic timescales and rate processes along retrograde metamorphic pathways, is developed to establish paired metamorphism and plate tectonics under warmer conditions of the Archean Earth. The methodology has been applied to representative rocks from the medium-grade and high-grade domains in the Western Dharwar Craton, South India to identify and model the paired metamorphism as part of a peel-back convergence style of plate tectonics at the Archaean-Proterozoic boundary in the planet Earth.

SPEAKER'S PROFILE

Santanu Kumar Bhowmik completed his graduation, post-graduation and doctoral research from the Department of Geological Sciences, Jadavpur University in the years 1987, 1990 and 1994 in sequence. Before joining the Indian Institute of Technology Kharagpur in 2000, Dr. Bhowmik worked in the Geological Survey of India at its Nagpur Office for six years from 1994 to 2000. He became the Professor in the Institute in 2010. He is a recipient of the National Mineral Award in Basic Geosciences (1999), Short-Tern Study visit fellowships by DAAD (2002) and INSA-DFG (2003, 2008-09) and Fellowship to the IASc (2018). He worked as a post-doc in the University of Bonn (2002, 2003), Ruhr University, Bochum (2008-09), Curtin University (2009) and Australian National University & University of Sydney (2017). He is a member of the European Association of Geochemistry and European Geosciences Union. Prof. Bhowmik guided seven number of PhD students. His research interest lies in decoding the styles of tectonism, present and past, from oceanic subduction to continental collisions and supercontinent assembly events, for which he uses metamorphic rocks of Archaean to Phaneozoic age and a variety of tools, including reconstructions of P-T-t paths, monazite and zircon geochronology and diffusion chronometry. His current research interest lies in studying the early earth orogenesis, centering around the question when and how did the modern-style plate tectonics begin on the Planet Earth.

Sectional Committee IV

Lecture New Fellow

PROFESSOR B S DAYA SAGAR

Professor

(Higher Administrative Grade) of the Systems Science and Informatics Unit (SSIU) and Head of the Indian Statistical Institute, Bangalore

ABSTRACT

Mathematical Morphology in Digital Elevation Models

Mathematical Morphology is an area of geoscience that most people don't realize will literally change the way they look at Earth and Planetary surfaces! This talk would provide a glimpse of how mathematical morphology (Matheron 1975, *Random Sets and Integral Geometry*, New York: John Wiley & Sons; Serra 1982, *Image Analysis and Mathematical Morphology*, Academic Press: London, p. 610; Sagar, 2013, *Mathematical Morphology in Geomorphology and GISci*, CRC Press: Boca Raton, p. 546) could be employed to treat Digital Elevation Models (DEMs) to derive scientific outcomes. DEM, with its rich geometric, morphologic and topologic information, is a black box for the Earth and Planetary scientists to characterize, model and visualize terrestrial and planetary surficial processes. Geoscientists with appropriate mathematical knowledge can better exploit the full potential of the DEM that has hitherto been underutilized. More details are available at "Digital Elevation Model (DEM): an Important Source of Data for Geoscientists", *IEEE Geoscience and Remote Sensing Magazine*, v. 8, no. 4, p. 138-142. 10.1109/MGRS.2020.3031910.

SPEAKER PROFILE

B. S. Daya Sagar is a Professor (Higher Administrative Grade) of the Systems Science and Informatics Unit (SSIU) and Head of the Indian Statistical Institute – Bangalore Centre. Sagar received his MSc and PhD degrees in Geoengineering and Remote Sensing from the Faculty of Engineering, Andhra University, Visakhapatnam, India, in 1991 and 1994, respectively. He is also the Founding Head of the SSIU. Earlier, he worked in the College of Engineering, Andhra University, and the Centre for Remote Imaging Sensing and Processing (CRISP), The National University of Singapore, in various positions from 1992 to 2001. He served as associate professor and researcher in the Faculty of Engineering & Technology (FET), Multimedia University, Malaysia, from 2001 to 2007. Sagar has made significant contributions to the field of geosciences, with particular emphasis on the development of spatial algorithms meant for geo-pattern retrieval, analysis, reasoning, modelling, and visualization by using concepts of mathematical morphology and fractal geometry. He has published over 90 papers in journals and has authored and guest-edited 14 books and special theme issues for journals. He authored a book entitled "Mathematical Morphology in Geomorphology and GISci," CRC Press: Boca Raton, 2013, p. 546. He co-edited two special issues on "Filtering and Segmentation with Mathematical Morphology" for IEEE Journal of Selected Topics in Signal Processing (v. 6, no. 7, p. 737-886, 2012), and "Applied Earth Observation and Remote Sensing in India" for IEEE Journal of Selected Topics in Applied Earth Observation and Remote Sensing (v. 10, no. 12, p. 5149-5328, 2017). His book "Handbook of Mathematical Geosciences", Springer Publishers, p. 942, 2018, crossed

One Million downloads. His two-volume Encyclopedia of Mathematical Geosciences (Springer Nature, 1756 pages) is released in 2023. He was elected as a member of the New York Academy of Sciences in 1995, as a Fellow of the Royal Geographical Society in 2000, as a Senior Member of IEEE Geoscience and Remote Sensing Society in 2003, as a Fellow of the Indian Geophysical Union in 2011, as a Fellow of the Indian Academy of Sciences in 2022, and the Indian National Science Academy in 2024. He has also been a member of the American Geophysical Union since 2004 and a life member of the International Association for Mathematical Geosciences (IAMG). He delivered the "Curzon & Co - Seshachalam Lecture - 2009" at Sarada Ranganathan Endowment Lectures (SRELS), Bangalore, and the "Frank Harary Endowment Lecture - 2019" at International Conference on Discrete Mathematics - 2019 (ICDM - 2019). He was awarded the 'Dr. Balakrishna Memorial Award' of the Andhra Pradesh Academy of Sciences in 1995, the Krishnan Medal of the Indian Geophysical Union in 2002, the 'Georges Matheron Award - 2011 with Lectureship' of the IAMG, and the Award of IAMG Certificate of Appreciation - 2018. He is the Founding Chairman of the Bangalore Section IEEE GRSS Chapter. He has been appointed as an IEEE Geoscience and Remote Sensing Society (GRSS) Distinguished Lecturer (DL) for three years from 2020 to 2023. He is a member of the AGU Honors & Recognition Committee (HRC). He is on the Editorial Boards of Computers & Geosciences, Frontiers: Environmental Informatics, and Mathematical Geosciences. For more details about him, the following Webpages may be referred at:
http://www.isibang.ac.in/~bsdsagar, https://en.wikipedia/wiki/B._S._Daya_Sagar, https://in.linkedin.com/in/bs-daya-sagar-a015495

Sectional Committee IV

Lecture New Fellow

PROFESSOR AP DIMRI

Director

Indian Institute of Geomagnetism (IIG), Mumbai

ABSTRACT

Himalayan climate and weather

Himalayas, the unique complex massif protruding out, modulated weather and climate over the region. It supports the river basin surrounding it and hence many habitats are dependent on it. It consists of cryosphere, glacier, permafrost etc. other than its unique geological and geomorphological evolutions. These consists of water reservoir in a way over the region. Climate over the elevation is changing and it's warming faster than rest of the globe. Glaciers are reported to be depleting except few which are either stable of amassing. Further, in recent decade southern rim of it has seen cascading disasters impacting the habitat.

SPEAKER PROFILE

Prof. A. P. Dimri has firmly established himself as the expert on the wintertime precipitation over the Indian subcontinent and Himalayan region. He is a leading expert globally on topics such as winter extra-tropical cyclones and Western Disturbances, their manifestation and interplay with Himalayan topography. His work has advanced our understanding of the dynamical and thermodynamical processes associated with winter events. Another unique contribution by Prof. Dimri lies in the development of Cloudburst analysis for the Himalayan region - as a convective initiated trigger by orographic locking around the western and central Himalayas. He continues to push the envelope of the accepted paradigms and help develop new understanding and proposed a novel method to study the temperature distribution over mountains in the form of Slope Environmental Lapse Rate modeling, essential to differentiate the atmospheric lapse rate for the monsoon glacio-hydrological regime of Himalaya.

Sectional Committee IV

Lecture New Fellow

PROFESSOR PRANTIK MANDAL

Chief Scientist

NGRI - National Geophysical Research Institute, Uppal Road, Hyderabad

ABSTRACT

Evidence for fluid-triggered earthquakes and structural segmentation in the Kumaon-Garhwal Himalayas of India

Through the examination of data obtained from an extensive network of 60 three-component broadband stations situated in the Kumaon-Garhwal Himalayas, spanning the timeframe from 2017 to 2022, our modelling has ascertained the existence of a low-velocity zone characterised by an inclination of approximately 2° towards the north. The observed region demonstrated a decrease ranging from 10% to 20% in both compressional wave velocity (Vp) and shear wave velocity (Vs), alongside a simultaneous increase of 10% to 15% in the Vp to Vs ratio. The detected low-velocity zone, which is of particular significance, was identified at depths between 10 and 20 km. It displayed a notable association with the fundamental fault accountable for the creation of the Himalayan Mountain range, commonly referred to as the Main Himalayan Thrust (MHT). It is important to note that the rupture zones associated with the 1803 M_w7.8 Garhwal, 1991 M_w6.8 Uttrakashi, and 1999 M_w6.5 Chamoli earthquakes demonstrate the presence of low-velocity zones. This implies that the presence of metamorphic or aqueous fluids within the MHT may be responsible for the occurrence of these earthquakes. This finding is reinforced by the significant modelled crack density and saturation rate values observed on the MHT, as predicted by the self-consistent crack theory proposed by O'Connell and Budiansky in 1974. The successful identification of a Double Moho structure beneath the specified rupture zones was achieved by the utilisation of the Common Conversion Point (CCP) stacking approach applied to radial P-wave receiver functions (PRFs). The findings of this study indicate that the build-up of substantial crustal stresses resulting from the presence of the modelled Double Moho Structure could potentially have a role in the occurrence of moderate to major earthquakes in the area. The use of radial PRFs has resulted in the production of CCP images that offer evidence for the presence of lower crustal eclogitization in the areas of Tibet and the Sikkim Himalayas. The results of this study provide support for the concept that the Double Moho structure observed in the Himalayas is a result of lower crustal eclogitization.

The utilisation of H-K stacking technique for radial PRFs, in conjunction with the simultaneous inversion of radial PRFs and Rayleigh wave group velocity dispersion, led to the

detection of three crustal blocks orientated in a NNE-SSW direction. These blocks demonstrate significant reduction in thickness of the mafic crust and are extending down to the boundary between the lithosphere and asthenosphere. These modelled three lithospheric blocks align well with the northward extension of the Delhi-Haridwar ridge (DHR), the intersection zone of rupture zones associated with the 1505 M_w8.2 and 1803 M_w7.8 earthquakes and the Great Boundary fault, respectively. Therefore, we hypothesise that the existence of these transverse lithospheric structures in the Uttarakhand Himalaya region could have resulted in the segmentation of the lithosphere beneath the MHT, resulting in shorter potential rupture lengths. Consequently, this could decrease the probability of future large earthquakes (M≥8) taking place in the area.

SPEAKER PROFILE

Dr. Prantik Mandal, born in 1965, earned his M.Sc. (tech) in Applied Geophysics at the Indian School of Mines in Dhanbad, Jharkhand, before joining CSIR-NGRI for a PhD programme in 1989. He joined CSIR-NGRI as Scientist-B in 1994 after receiving his PhD from Osmania University in Hyderabad, and rose to the position of Chief Scientist in 2015.

He has made significant contributions to Earthquake Seismology, with a focus on intraplate earthquakes. Through 3-D modelling of intraplate stresses, he quantified the role of variations in topography and density inhomogeneities in the genesis of intraplate earthquakes in Peninsular India for his doctoral work. He used local earthquake velocity tomography, P-receiver function (P-RF) study, Surface wave group velocity dispersion (SWD) study, and joint inversion of P-RFs and SWD data to delineate the 1-D and 3-D velocity (P- and S-) structure of the Kachchh rift zone, Gujarat, India. He proposed that CO_2 emitted by carbonatite melts in the asthenosphere plays a key role in triggering lower crustal earthquakes in the Kachchh rift zone. Through passive source seismological imaging, he has revealed the crust-mantle structure associated with the Eastern Indian Craton. Based on SKS splitting parameters, he discovered a Pan-African suture in Chotanagpur Granitic Gneissic Terrain. In 2017, he was instrumental in the deployment of a seismic network of 55 broadband seismographs and 20 strong motion accelerographs in the Uttarakhand Himalaya. His modelling revealed the presence of three NNE-SSW trending lithospheric transverse features in the UK Himalaya, exhibiting notable thinning of both the crust and lithosphere. Consequently, this configuration leads to a reduction in the length of existing rupture zones, which in turn reduces the likelihood of generating $M_w \geq 7.5$ earthquakes. He has also used local earthquake seismic velocity tomography to image the shallow north dipping main Himalayan thrust (MHT) as a low velocity layer in the Uttarakhand Himalaya, which has been attributed to the presence of metamorphic fluids resulting in fluid-triggered earthquakes on the MHT. He has 135 SCI research publications to his name, with 3196 citations, yielding an h-index of 34 and an i-index of 85. Under his capable guidance, seven students have already received PhD degrees in Geophysics (Seismology). In addition, he has written two books and three book chapters.

***Other Contributions**: His research in the Koyna region resulted in the rupture nucleation model of moderate size reservoir triggered earthquakes, in which the ruptures/foreshocks nucleate at the top 3 km and propagate downward, leading to larger main-shocks at 8-10 km depth, which has been patented by the USPTO.*

***Awards and Honors**: He has received several honours, including the National Mineral Award in 2007 and the CSIR YS award in 2000, for his contributions to earthquake seismology, with a particular emphasis on the understanding of seismogenesis of intraplate earthquakes in India. He received a CSIR Raman Fellowship in 2004, a Senior DAAD fellowship in 2010, and an INSA-JSPS fellowship in 2011. He was elected a fellow of the Indian National Academy of Sciences (FNA) in 2023, the Indian Academy of Sciences, Allahabad (FNASc) in 2020 and Telangana Academy of Sciences (TAS) in 2018.*

Sectional Committee IV

Lecture INSA Associate Fellow

DR. DHANYA CHANDRIKA THULASEEDHARAN

Professor

Department of Civil Engineering in Indian Institute of Technology (IIT) Delhi

ABSTRACT

Unravelling the Changing Dynamics of Hydrologic Extremes

Extremes, though rare, increase the stress undertaken by water sector owing to the compounding effects of growing population, globalization, and climate change. Recently, India has witnessed an increase in the occurrence of hydrologic extremes, i.e., both floods and droughts; the impacts of which had proved much detrimental to the Indian society and economy, especially due to the lack of any systematic early warning systems and subsequent strategic planning in our country. This talk will, in general, provide a glimpse on the recent research undertaken to generate fundamental scientific understanding of the hydrological extremes along with improvising the hydrological modeling, to provide operative early-warning methods and adaptation policies, for the country. The two-fold approach: (i) Statistical – learning from (reliable) time series of observations, and (ii) Theoretical modeling – hydrological and holistic models to simulate the regional hydrological cycle behaviour, adopted will be briefed. Finally, a brief visual demonstration of the real-time urban flood early warning developed for NCT Delhi, wherein all the above discussed frameworks/algorithms are implemented, will be presented.

SPEAKER PROFILE

Dr Dhanya C.T. holds the "Rama Kanta Chair Professor" position and is presently working as a Professor in Department of Civil Engineering in Indian Institute of Technology (IIT) Delhi, New Delhi, India. She is also serving as the Associate Dean, Academics (PG Research) in IIT Delhi. Her research interests include hydro-climatology, hydrologic extremes, water resources management, land surface modeling etc. Dr Dhanya's research attempts to generate fundamental scientific understanding of the hydrological extremes along with improvising the hydrological modeling, to provide early-warning methods and adaptation policies for sustainable water resources management.

PROFESSOR PRATAP RAYCHAUDHURI

Professor

Tata Institute of Fundamental Research, Mumbai

ABSTRACT

Visualising vortex liquid states in superconducting thin films

When magnetic field is applied in a Type II superconductor, the magnetic flux disperses inside the superconductor forming quantized flux tubes (each carrying a magnetic flux, $\Phi_0 = \frac{h}{2ee}$), that arrange themselves forming a period structure, called the Abrikosov vortex lattice. While in many ways the vortex lattice behaves like a soft crystalline solid, melting of this solid into vortex liquid state is rarely observed in conventional 3-dimensional superconductors. On the other hand, over the past few years, work carried out in our group showed that vortex liquid states can be realised in superconducting thin films, where the 2-dimensional vortex lattice is much more susceptible to thermal fluctuations. In this talk, I will describe how the melting of a 2-dimensional vortex solid can be directly visualised using a low-temperature scanning tunnelling microscope (STM) and elucidate the structure and dynamics of the 2-dimensional vortex liquid.

References:

1. I. Roy et al., Melting of the Vortex Lattice through Intermediate Hexatic Fluid in an $a-$MoGe Thin Film, Phys. Rev. Lett. **122**, 047001 (2019).

2. R. Duhan et al., Structure and dynamics of a pinned vortex liquid in superconducting a-Re_xZr (x ~ 6) thin film, arXiv:2304.10926 (to appear in Phys. Rev. B).

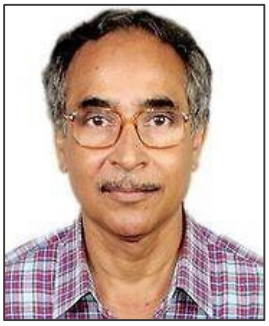
SPEAKER'S PROFILE

Pratap Raychaudhuri is a Senior Professor at the Tata Institute of Fundamental Research, Mumbai, where he heads the Superconductivity Laboratory. His research focuses on the study of superconductors using low temperature scanning tunnelling spectroscopy, transport measurements and the measurement of low frequency electrodynamic response. He is a recipient of the Shanti Swarup Bhatnagar Prize in Physical Science in 2014, and has been a Fellow of the Indian Academy of Science since 2015

Chair: Professor Anurag Sharma, FNA

Sectional Committee II

INSA Distinguished Lecture



PROFESSOR ASWINI GHOSH

Editor-in-Chief

Pramana - Journal of Physics published by Springer and Indian Academy of Sciences.

ABSTRACT

Dynamics of charge carriers and scaling in disorder conductors

The models developed based on linear response theory to describe the dynamics of charge carriers in ionic conductors will be first presented. The experimental data for the conductivity spectra at different temperatures for different types of conductors will be then presented. The results obtained from the analysis of the experimental data in the framework of the model will be discussed. The scaling models, which were developed to describe the mechanisms of charge carrier dynamics, and their dependence on the structure will be presented and their applicability in different conductors will be highlighted. It may be mentioned that this model has been widely accepted by the researchers in this and related fields for the analysis of relaxation data of various materials and referred to as Ghosh scaling model. Finally, the application of some developed materials in energy storage devices will be discussed.

SPEAKER PROFILE

Prof. Aswini Ghosh joined the Indian Institute of Technology Kharagpur, after completing Marie Curie Fellowship of the Commission of the European Commission. Thereafter he moved to the Indian Association for the Cultivation of Science, Kolkata. Presently he is working there in the School of Physical Sciences as a Raja Ramanna Fellow of the Department of Atomic Energy, Government of India. Prof. Ghosh has various academic distinctions and honours. He is a J. C. Bose National Fellow (Department of Science and Technology, Government of India). He is a Fellow of several scientific and learned academies such as the Indian National Science Academy (INSA), Indian Academy of Sciences (IASc), Indian Institute of Ceramics, etc. He was awarded D. N. Agrawal Memorial award by the Indian Ceramic Society. His research interest includes disorder materials, semiconducting and ion conducting glasses, ceramics, polymer electrolytes, perovskites and nanomaterials, investigating structure, charge carrier dynamics, relaxation and scaling and their applications in energy storage devices such as lithium/sodium ion batteries and supercapacitors. In particular, he has developed a scaling model, which is widely accepted by the researchers working in this and related fields and is referred to as "Ghosh scaling model". He was a previous Editor-in-Chief and now Editor Emeritus of the Indian Journal of Physics (Springer) founded by Sir C. V. Raman, NL, the discoverer of "Raman Effect". He is presently Editor-in-Chief of Pramana - Journal of Physics published by Springer and Indian Academy of Sciences.

Chair: Professor Anurag Sharma, FNA

Sectional Committee II

Lecture INSA Associate Fellow

DR. DIPTIMOY GHOSH

Associate Professor of Physics

Indian Institute of Science Education and Research, Pune

ABSTRACT

The Large, the Small, and the Extremes

Abstract: In this talk, I will review our current understanding of the universe at short and large distances which are packaged elegantly in the Standard Model of Particle Physics and the Standard Model of Cosmology (extended by Cosmic Inflation) respectively. I will emphasize that a good understanding of the latter requires knowledge of the former and some tools used therein.

SPEAKER PROFILE

Diptimoy Ghosh is an associate professor of physics at the Indian Institute of Science Education and Research, Pune. His main area of research is theoretical high-energy physics and cosmology.

Chair: Professor Anurag Sharma, FNA

Sectional Committee II

Lecture INSA Associate Fellow

DR. MAYANAK KUMAR GUPTA

Scientist

Solid State Physics Division, Bhabha Atomic Research Centre

Assistant Professor

Homi Bhabha National Institute, Anushaktinagar, Mumbai

ABSTRACT

Fast Ion Dynamics in solid Ionic conductors: A Perspective from Neutron Scattering Experiments and Simulations

The design of new solid electrolytes hinges on identifying and tuning relevant descriptors. Phonons describe the atomic dynamics in crystalline materials and provide a basis to encode possible minimum energy pathways for ion migration, but anharmonic effects can be large in SEs. Identifying and controlling the pertinent phonon modes coupled most strongly with ionic conductivity and assessing the role of anharmonicity could pave the way for discovering and designing new SEs via phonon engineering. I will discuss extensive investigation on argyrodites and Na-thiophosphate, which shows the strong influence of low energy anharmonic modes on the ionic and thermal transport properties [1-4].

[1] M. K. Gupta, J. Ding, D. Bansal, D. L. Abernathy, G. Ehlers, N. C. Osti, W. G. Zeier, and O. Delaire, Advanced Energy Materials **12**, 2200596 (2022).

[2] Q. Ren, M. K. Gupta, M. Jin, J. Ding, J. Wu, Z. Chen, S. Lin, O. Fabelo, J. A. Rodríguez-Velamazán, M. Kofu, K. Nakajima, M. Wolf, F. Zhu, J. Wang, Z. Cheng, G. Wang, X. Tong, Y. Pei, O. Delaire, and J. Ma, Nature Materials **22**, 999 (2023).

[3] M. K. Gupta, S. Kumar, R. Mittal, and S. L. Chaplot, Physical Review B **106**, 014311 (2022).

[4] M. K. Gupta, J. Ding, N. C. Osti, D. L. Abernathy, W. Arnold, H. Wang, Z. Hood, and O. Delaire, Energy & Environmental Science **14**, 6554 (2021).

SPEAKER PROFILE

Dr M K Gupta is a scientist at Solid State Physics Division, Bhabha Atomic Research Centre and assistant professor at Homi Bhabha National Institute, Mumbai. His research focuses on fundamental atomistic processes underpinning the energy and charge transport in solids using neutron/X-scattering and simulations.

Sectional Committee II

Lecture INSA Associate Fellow

DR. BHASKAR KANSERI

Associate Professor

Department of Physics, IIT Delhi.

ABSTRACT

Secure communication in the quantum world

Establishing secure communication in the quantum world is quite demanding and challenging affair. The quantum era is governed by rules of Quantum Physics, which has led to the development of quantum technologies aiming to harness applications in computing, communication, and precision sensing. Quantum key distribution (QKD) offers a means for information exchange, which is secure even in the presence of quantum computers. This talk will cover our recent efforts in developing sources of single and entangled photons, and would highlight some implementations of fiber based QKD in lab scale and in real field environment. Notably, the first Indian intercity QKD, long distance fibre-QKD up to 380kms, and entanglement based QKD for 50km would be discussed.

SPEAKER PROFILE

Dr. Bhaskar Kanseri is working as an Associate Professor at Department of Physics, IIT Delhi. Prior joining IITD he was postdoctoral fellow at Institut d'Optique, Palaiseau France, and earlier at Max Planck Institute for the Science of Light, Erlangen Germany. He received his PhD from University of Delhi and National Physical Laboratory New Delhi. His research interests are in optics and photonics, statistical optics, quantum optics, and photonic quantum technologies. He has been awarded "Teaching excellence award-2022" and "Veena Arora Early Career Research Award-2023" by IIT Delhi for his teaching and research contributions. In 2023, he has been selected as member of The National Academy of Sciences India (NASI), and Indian National Science Academy (INSA) Associate Fellow.

Sectional Committee VI

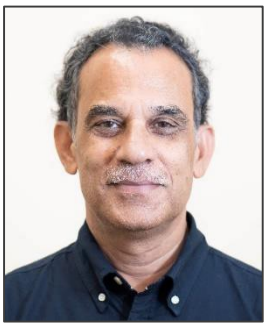
Chair:

Professor Anil Kumar Tripathi, FNA

Dr Anil Kumar Tripathi is a Senior Professor at School of Biotechnology and Director, Institute of Science at Banaras Hindu University, Varanasi. He also served as Director of CSIR-CIMAP (Central Institute of Medicinal and Aromatic Plants) at Lucknow (2014-2019). He conceptualized and led the CSIR-Aroma Mission in its formative years as Mission Director. Dr Tripathi obtained his M. Sc. and Ph. D degrees in Botany from Banaras Hindu University, published 92 peer-reviewed articles with an H-index of 29 and 4,000 citations and supervised 22 doctoral dissertations. His researches focus on genetics, genetic engineering, systems biology and synthetic biology of a plant growth promoting bacterium. He is a Fellow of the Indian National Science Academy (INSA), Indian Academy of Science (IASc), National Academy of Sciences India (NASI), National Academy of Agricultural Sciences (NAAS) and Association of Microbiologists of India (AMI). He is also a recipient of the prestigious J C Bose National Fellowship, Fulbright-Nehru Fellowship and a number of other national awards and grants. He made academic visits to more than 25 countries and delivered lectures at a large number of national and international conferences. At BHU, he was instrumental in establishing a DST-supported state-of-art Sophisticated Analytical Technical Help Institute (SATHI) and a BIRAC-supported Bioincubator for Nurturing Entrepreneurship for Scaling Technologies (BioNEST). He is Coordinator of both SATHI-BHU and BioNEST-BHU since their creation.

Sectional Committee VI

Lecture New Fellow



PROFESSOR SD BIJU

Senior Professor

Department of Environmental Studies, University of Delhi

ABSTRACT

Modern approaches to uncover India's biodiversity: from the view of amphibians

The science of discovery and documentation of biological diversity is foundational to biology. It is the starting point to understand the central units of life—the species themselves—to identify and classify them, assess the levels of diversity and relationships across and within taxonomic units, and comprehend how they interact with the environment. This reliable reference system of biological information is pivotal for further meaningful investigations on the origin, evolution, patterns of diversification and distribution, and ultimately conservation of life forms on Earth.

India is a major centre of biodiversity owing to its unique geological history, present-day geographical location, and the wide array of distinct biogeographical zones that support highly diverse and endemic flora and fauna. However, biodiversity research in the country was long held up in morphology-only and time-consuming traditional approaches, slowing down the pace of discovery and documentation of species. Emergence of new tools in the recent decades has not only facilitated rapid and reliable ways to understand and describe biodiversity, but also opened new avenues for deeper scientific research.

My 15 mins presentation will focus on some of the recent advancements that have modernized taxonomic approaches and transformed our understanding of species within larger frameworks as evolutionarily significant units. Through the view of amphibians, which have been the focus of my research for the past three decades, I will emphasise on the importance of integrating multiple lines of evidence such as external morphology, osteology using micro-CT, molecular phylogeny, bioacoustics, reproductive and developmental biology, as well as natural history, towards timely achieving a near-complete and more comprehensive inventory of India's biological diversity.

The urgency to advance this endeavour has never been the same before, as amphibians today, and likely other organismic groups tomorrow, stand on the brink of extinction as the most threatened group of vertebrates in India and world over.

SPEAKER'S PROFILE

S. D. Biju (Sathyabhama Das Biju) (b 1963) is a Senior Professor at the Department of Environmental Studies, University of Delhi, India. Biju is also an Associate of the Department of Organismic and Evolutionary Biology, elected Associate of the Museum of Comparative Zoology, and a Radcliffe Fellow (Hrdy Fellow) 2023–24 at Harvard University, USA. He has formerly served as a Scientist at the Jawaharlal Nehru Tropical Botanic Garden and Research Institute (formerly TBGRI); Dean, Faculty of Science; and Head, Department of Environmental Studies at University of Delhi.

Biju has made an indelible mark on the study of amphibians. A taxonomist par excellence, he is the only Indian herpetologist to describe 116 new amphibian taxa (2 families, 10 genera, 106 species) — nearly 25% of the country's diversity, published in top-tier journals such as Nature. His seminal contributions to taxonomy, systematics, evolution, biogeography, reproductive behaviour, and conservation have earned him global recognition. His discovery of the famed Indian Purple Frog and the new family Nasikabatrachidae that revealed an ancient biogeographical link between India and Seychelles is hailed as once-in-a-century find. Biju's work has accelerated amphibian research, triggered renewed interest in taxonomy, and inspired young researchers to pursue biodiversity research.

Biju earned his first PhD in botany from the University of Calicut (India) and contributed to knowledge on plants through several scientific publications and books. He obtained his second PhD in animal science from Vrije Universiteit Brussel (Belgium) and shifted his focus to amphibians. He has published nearly 100 articles in scientific journals such as Nature, PNAS, and Science. His findings have widely appeared in the popular press, including the BBC, CNN, the Economist, Forbes, the Guardian, National Geographic, and the New York Times. Biju's contributions have been recognized with the 2008 IUCN/ASG Sabin Award for Amphibian Conservation and the Kerala State Government's highest civilian award Kerala Sree 2022.

PROFESSOR ASIT KUMAR CHAKRABORTI

FRSC, LFICS, FASc, FNA

Raja Ramanna Fellow, School of Chemical Sciences
IACS, Jadavpur, Kolkata, West Bengal 700032

ABSTRACT

Sustainable Organic Chemistry in the Context of Drug Discovery and Development

School of Chemical Sciences, Indian Association for the Cultivation of Science (IACS), Jadavpur, Kolkata, West Bengal 700032

Organic chemistry is the core exercise in drug discovery and development.[1] However, the traditional approaches in organic synthesis need a paradigm shift in view of the adverse effect of chemical processes on the environment and eco-system.[2] Thus, there is need to develop new chemistries to enrich medicinal chemists' synthetic tool box[3] in compliance with the green chemistry principles. While the past couple of decades have witnessed the outpouring of discoveries of new chemistries inadequate representation of such fine chemistries in discovery medicinal chemistry appears to fall short to extract the due dividend with respect to exploring a broader chemical space and expanding the scope of generating IP.[4] Integration of the newly developed organic synthetic methodologies such as aquatic organic reaction, nano-catalysis, and late-stage functionalization through C-H activation with discovery medicinal chemistry constitutes the sustainable practices in medicinal chemistry[5] expanding the synthetic tool box[6] and would provide opportunities to transform the drug discovery.[7]

Towards this endeavour, the present deliberation would demonstrate sustainable medicinal chemistry approaches adopting newly developed synthetic methodologies devising novel concepts such as understanding the molecular level role of water as "electrophile-nucleophile dual activation" through "cooperatively formed hydrogen-bond network,"[8] cooperative catalysis by heterobimetallic nano-catalysts for C-Br/O/H bond activation[9] in the generation and optimization of new therapeutic leads[10] and development of greener processes of drug synthesis.[11]

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Chair: **Professor VK Pillai, FNA**

SPEAKER'S PROFILE

Professor Asit K. Chakraborti obtained M. Sc. degree in 1977 in Organic Chemistry from the University of Burdwan, West Bengal, India being placed first in the first class and Ph. D. degree in Synthetic Organic Chemistry from IACS, Kolkata, India in 1985. After post-doctoral research training in USA in the department of Chemistry, Clemson University, South Carolina, during 1985-1987 and in Medicinal Chemistry at Purdue University, Indiana, USA during 1987-1989 he joined the University of Burdwan as a faculty in the department of Chemistry and served for the period 1990-1994. He joined the department of Medicinal Chemistry, national Institute of Pharmaceutical Education and Research (NIPER), S. A. S. Nagar (Mohali), Punjab, India as Assistant Professor in 1994 and was elevated to the position of Assoc. Professor in 1999 and to Professor and Head in 2001. After superannuation from NIPER, Mohali in August 2019 he joined the Department of Chemistry, Indian Institute of Technology-Ropar, Rupnagar, Punjab, India as Visiting Professor till may 2021. Thereafter he joined the School of Chemical Sciences, IACS, Kolkata as Emeritus Fellow and is currently Raja Ramanna Fellow sponsored by DAE. He has guided 40 Ph. D. and 130 Masters' students, published 180 research papers (with > 12,600 citation with h index of 67), and filed 42 patents. He is among the top 2% Indian scientists in the field of organic chemistry according to the independent study of Standford University on World ranking 2022 of top 2% Indian scientists. Prof. Chakraborti received several awards and recognition such as University Gold Medal, Bardhaman Sammilani Gold Medal, ISMAS Eminent Mass-spectroscopist award, Ranbaxy Research Award (Pharmaceutical Sciences), Chemical Research Society of India Silver and Bronze Medals, Indian Chemical Society Professor P. K. Bose Memorial Award 2019, Dr. Nitya Anand Endowment Lecture 2021 of INSA, and INSA Distinguished Lecture Fellowship 2023 (Chemistry). He also received the Rajnibhai V. Patel PharmInnova Best Research Guide Awards for the most "Innovative Ph. D. Thesis" during 2017-2018 and 2016-2017 and the most "Innovative MS Thesis" during 2015-2016 2014-2015 in "Pharmaceutical Chemistry," Certificate of Appreciation for Ph. D. thesis Advisor of Eli Lilly and Company Asia Outstanding Thesis First Prize Awardee in 2013, 2012, and 2009 and Second Prize Awardee in 2009. He is Fellow of the Royal Society of Chemistry, Cambridge, UK and elected Fellow of Indian Academy of Sciences, Bangalore and Indian National Science Academy, New Delhi. His research interest is synthetic organic and medicinal chemistry with thrust in new drug development in tuberculosis, leishmaniasis, and inflammation to develop NMEs through development of novel synthetic methodologies [catalysis (solid-supported protic acids and transition-metal based catalysts, hetero bi-metallic nano-catalysts), C-H activation etc.] in compliance with the green chemistry principles and deriving novel concepts (understanding the molecular level role of acceleration of organic reactions in water and fluorous alcohols, the origin of the organocatalytic potential of ionic liquids etc.).

DR. ANINDITA DAS

Associate Professor

School of Applied and Interdisciplinary Sciences, Indian Association for the Cultivation of Science, 2A and 2B Raja S. C. Mullick Road, Jadavpur, Kolkata-700032, India

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ABSTRACT

Programmable Two-Dimensional Assemblies from Chromophore-Conjugated Polyesters

We present a versatile method based on polymer chain crystallization-driven self-assembly (CDSA)[1] for the programmed synthesis of monolayered two-dimensional (2D) architectures with exciting photophysical properties and predictable morphologies from chromophore-conjugated biodegradable polyesters. Poly(L-lactide) (PLLA) homopolymers, end-functionalized with different chromophores crystallize into precise diamond-shaped 2D platelets in isopropanol under suitable conditions.[2] This causes the terminally attached chromophores to assemble into a 2D array on the platelet surface, which confers tunable emissive properties to the polymeric 2D crystals.[2] By varying the nature of the chromophores, the photophysical and luminescent properties of the 2D surface could be tailored without disturbing the intrinsic crystalline packing. Further, we studied the impact of chain chirality and multicomponent dye assembly on the 2D surface for cascade energy transfer and white light emission.[3] This strategy provides an interesting avenue for the synthesis of purely organic functional 2D materials from biodegradable polymer scaffolds.

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SPEAKER PROFILE

Anindita Das received her Ph.D. degree from the Indian Association for the Cultivation of Science (IACS), Kolkata, India, in 2014 under the supervision of Professor Suhrit Ghosh. Subsequently, she worked as an Alexander von Humboldt Postdoctoral Fellow with Professor Patrick Théato at the University of Hamburg, Germany, during 2014–2016. In 2016, she joined the group of Professor E. W. Meijer at the Eindhoven University of Technology, The Netherlands, for a second postdoctoral stint. In 2017, she joined IACS as a Faculty Fellow, where she is currently holding the position of Associate Professor in the School of Applied and Interdisciplinary Sciences.

Awards/Achievements:

- *Associate Fellow of the Indian National Science Academy (2023)*
- *Associate of the Indian Academy of Sciences (2022)*
- *DAE-BRNS Young Scientist Research Award (2022)*
- *Author's Profile Published in Angewandte Chemie (2022)*
- *Early Career Advisory Board Member of the Journal ChemNanoMat since 2022*
- *Editorial Board Member of the Journal of Macromolecular Science, Part A: Pure and Applied Chemistry since 2022*
- *Alexander von Humboldt Postdoctoral Fellowship (2014)*

DR. RAMENDRA SUNDAR DEY

Scientist

Institute of Nano Science and Technology, Sector-81, Mohali-140306, Punjab, India.

ABSTRACT

Electrochemical Nitrogen Fixation for Sustainable Ammonia Synthesis: Favouring the Unfavoured

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. In 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.

Acknowledgement

R.S.D. acknowledges DST SERB (CRG/2020/005683) funding agencies for financial support.

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Chair: **Professor VK Pillai, FNA**

SPEAKER PROFILE

Dr. Ramendra Sundar Dey is a Scientist at Institute of Nano Science and Technology, Mohali, India. Prior, he was a Hans Christian Ørsted postdoc fellow at Technical University of Denmark (DTU), Denmark. He received Ph.D. in Chemistry at 2013 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 electrocatalytic ammonia synthesis and energy storage systems.

DR. ACHINTYA KUMAR DUTTA

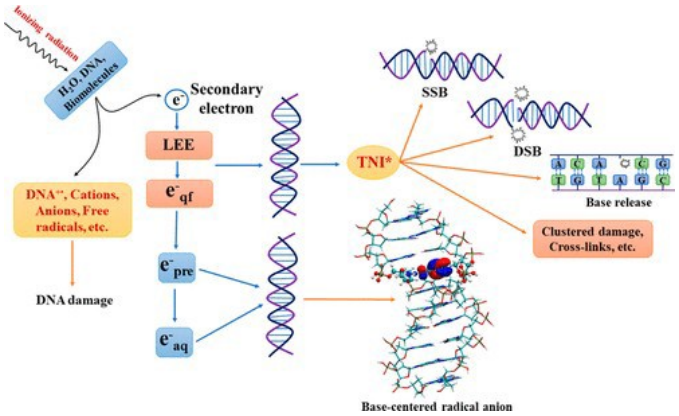
Associate Professor

Department of Chemistry, IIT Bombay, Mumbai

ABSTRACT

Secondary electron attachment induced radiation damage to genetic material.

Reactions of radiation-produced secondary electrons (SEs) with biomacromolecules (e.g., DNA) are considered one of the primary causes of radiation-induced cell death[1]. In this talk, we summarize the latest developments in the modeling of SE attachment-induced radiation damage. The initial attachment of electrons to genetic materials has traditionally been attributed to the temporary bound or resonance states. Recent studies[2] have, however, indicated an alternative possibility with two steps. First, the dipole-bound states are formed, which act as a doorway for electron capture. Subsequently, the electron gets transferred to the valence-bound state, in which the electron is localized on the nucleobase. The transfer from the dipole-bound to valence-bound state happens through a mixing of electronic and nuclear degrees of freedom. In the presence of aqueous media, the water-bound states act as the doorway state, which is similar to that of the pre-solvated electron. Electron transfer from the initial doorway state to the nucleobase-bound state in the presence of bulk aqueous media happens on an ultrafast time scale, and it can account for the decrease in DNA strand breaks in aqueous environments[3]. The fate of quasi-bound anionic states in the presence of the environment[4] and their implication in the radiation dame will also be discussed.



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SPEAKER'S PROFILE

Dr. Achintya Kumar Dutta is an associate professor in the Department of Chemistry at IIT Bombay. His primary research interest involves the development of four-component relativistic coupled cluster methods and simulation of radiation damage to genetic materials. He did his Ph.D. from CSIR-National Chemical Laboratory, Pune, in 2014 and was a postdoctoral researcher at Max-Plank Institute for Chemical Energy Conversion, Mulheim, Germany, from 2015 to 2017.

DR. SUBRATA KUNDU

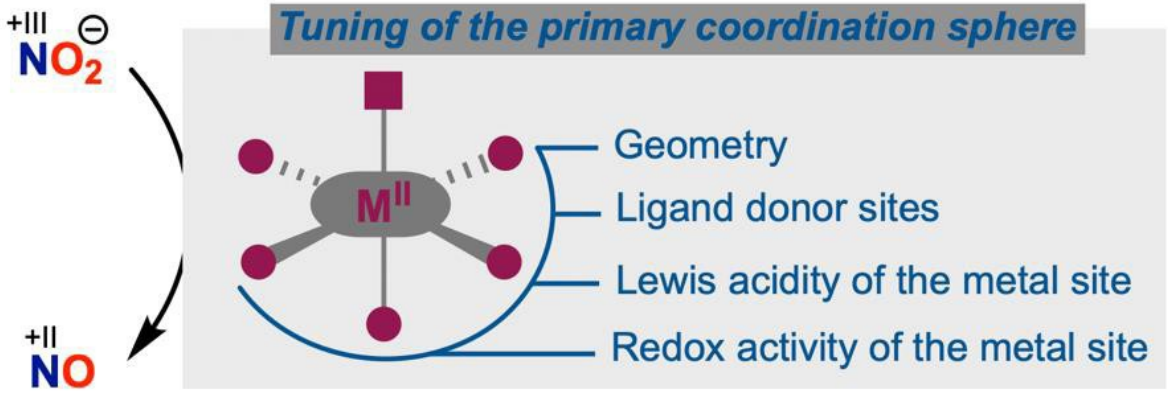
Associate Professor

School of Chemistry, Indian Institute of Science Education and Research (IISER), Thiruvananthapuram

ABSTRACT

Modelling Nitrite to Nitric Oxide Conversion at Mononuclear Copper(II) and Zinc(II) Sites

Transformations of nitrogen oxides (NO_x) are relevant to mammalian physiology, biogeochemical N-cycle, and environmental chemistry. This talk aims to show the reactivity of various structurally characterized mononuclear $[Cu^{II}(\text{nitrite})]^+$ complexes towards substituted phenols (as the tyrosine models) or *N*-benzyl-1,4-dihydronicotinamide (as the NAD(P)H model). This study highlights the tuning of the primary coordination sphere for modulating the NO_x-reactivity at the copper (II/I) redox couple. Furthermore, nitrite-to-NO transformation at the systematically tuned Lewis acidic zinc(II) site in the presence of external reductants (such as thiol and catechol) sheds light on the factors controlling the reactivity of the mononuclear $[Zn^{II}(\text{nitrite})]^+$ motifs.



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SPEAKERS PROFILE

Subrata Kundu obtained his Ph.D. from Humboldt-Universität zu Berlin (2013) under the supervision of Prof. Kallol Ray. Subsequent to a postdoctoral stint (Feb/2014-July/2017) in Purdue University and Georgetown University, Subrata's independent career began as an assistant professor of Chemistry (currently an associate professor) at Indian Institute of Science Education and Research Thiruvananthapuram (IISER-Tvm). Fascinated by the diverse bioactivities of metalloenzymes, his research efforts broadly focus on bioinspired coordination chemistry and elucidation of reaction mechanisms.

Chair: **Professor VK Pillai, FNA**

Sectional Committee III

Lecture INSA Associate Fellow

DR. PRABHAT KUMAR SINGH

Scientist G

Radiation & Photochemistry Division, Bhabha Atomic Research Centre, Mumbai

ABSTRACT

Fluorescence based sensors for Heparin: A widely used blood anti-coagulant

This talk explores the development of fluorescence-based 'turn on' sensors for Heparin, a highly sulfated, negatively charged glycosaminoglycan and a prevalent anticoagulant in clinical settings. The extensive use of Heparin in surgeries and thrombotic disease treatments necessitates precise monitoring to avoid complications like hemorrhages and Heparin-induced thrombocytopenia. Addressing the challenge of crafting these sensors from readily available materials, the presentation will highlight advancements in detecting Heparin levels using molecular rotor-based fluorescent probes, emphasizing their significance in safe anticoagulant therapy.

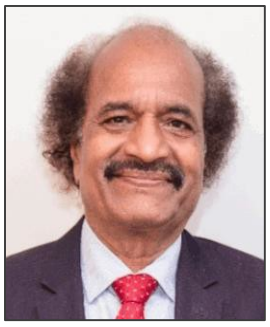
SPEAKER'S PROFILE

Prof. Prabhat K. Singh is Scientist (G) at the Radiation and Photochemistry Division, Bhabha Atomic Research Centre, Mumbai, and has made significant contributions in Ultrafast Spectroscopy, Supramolecular Chemistry, and Optical Sensor design. An alumnus of the University of Burdwan and Homi Bhabha National Institute, he has an impressive academic and research portfolio, including a postdoctoral stint at the University of Pennsylvania. His work is widely recognized, which is evidenced by numerous awards and honours, over 125 peer-reviewed publications, and his selection as a Fellow of the Indian Chemical Society and the Royal Society of Chemistry, along with his affiliation with the Global Young Academy (Member) and World Academy of Sciences (TWAS Young Affiliate).

Chair: **Professor Sushmita Mitra, FNA**

Sectional Committee V

INSA Distinguished Lecture



PROFESSOR GD YADAV

National Science Chair (SERB/GOI), Emeritus Professor of Eminence, Former Vice Chancellor

Institute Of Chemical Technology, Mumbai

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ABSTRACT

The Net Zero Goal & Sustainability: Green Hydrogen Technologies, CO2 refineries, Biomass Valorization & Waste Plastic Recycling

The net zero goal by 2050 is a cherished dream of all world economies. In achieving the 49000 TWh of energy by 2050 will have 73% of its contribution from renewables. In that hydrogen will have a share of 25%. The new trinity for science will be solar, wind and hydrogen. The leading economies of the world should go for production of green hydrogen in pursuit of the Net Zero goal of the Paris Agreement of 2015. Hydrogen is best suited for converting any biomass and carbon dioxide emanated from different sources, into fuels and chemicals. Hydrogen will also lead, on its own as energy source, to the carbon negative scenario in conjunction with other renewable non-carbon sources such as solar, wind, tidal, geothermal, nuclear or the like. Hydrogenation of biomass leads to many valuable products. So, tomorrow's refineries will be literally carbon dioxide refineries- converting it into hydrocarbons, methanol, dimethyl ether (DME), formic acid, alcohols, syn gas, electricity, hydrogen vehicles, fuel cells, ammonia, and fertilizers, etc. using hydrogen which should be obtained from water splitting. DME is the best replacement for diesel and LPG and the same infrastructure could be utilized. That will lead to carbon-negative economy bringing down the temperature of the globe below 1.5 oC. Today's crude oil-based economy for the manufacture of fuels, chemicals and materials will not have a sustainable future. Faced with the twin challenges of sustaining socioeconomic development and shrinking the environmental footprint of chemicals and fuels manufacturing, a major emphasis is on either converting biomass into low-value, high-volume biofuels or refining it into a wide spectrum of products. Using carbon for fuel is a flawed approach and unlikely to achieve any nation's socioeconomic or environmental targets. In controlling CO2 emissions, hydrogen will play a critical role. Hydrogen is best suited for converting waste biomass and carbon dioxide emanated from

different sources, whether fossil or biomass into fuels and chemicals as well as it will also lead, on its own as energy source, to the carbon negative scenario in conjunction with other renewable non-carbon sources. This new paradigm for production of fuels and chemicals not only offers the greatest monetization potential for biomass and shale gas, but it could also scale down output and improve the atom and energy economies of oil refineries. There is also a need to rethink on the ban on single use plastic (SUP) and a new policy is required to encourage general public to pay a deposit on every single article irrespective of size and get it refunded when it is returned which will allow segregation at source. Several hydrogenation reactions can be used to depolymerize or to make fuels from waste plastic and the nasty atoms in the plastic such as Cl, S, N can be converted into HCl, H2S and NH3 and absorbed. Waste plastic is a great source of fuel and chemicals.

SPEAKER PROFILE

Professor (Dr) Ganapati D. YADAV
B. Chem. Eng., Ph.D. (Tech.), D.Sc. (Hon. Causa), D. Eng. (Hon. Causa, NIT-A), USNAE, FNAI (US), FTWAS, FNA, FASc, FNASc, FNAE, FISTE, FRSC (UK), ChE, FIChemE (UK), FIIChE, FICS, FMASc

- *National Science Chair (SERB/DST/GOI) and Emeritus Professor of Eminence (Current Positions)*
- *Former Vice-Chancellor and R.T. Mody Distinguished Professor & Tata Chemicals Darbari Seth Distinguished Professor of Leadership & Innovation (2009-19)*
- *Padmashri Awardee by the President of India (2016)*
- *Former J.C. Bose National Fellow (2010-2020)*

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Founding Chair, ACS India International Chapter (2014-); President, Indian Chemical Society (2019-25); President, Maharashtra Academy of Sciences (2012-);
Past President, Catalysis Society of India (2014-18)

Chair: **Professor Sushmita Mitra, FNA**

Sectional Committee V

Lecture INSA Associate Fellow

DR. KAUSTAV CHATTERJEE

Associate Professor

Department of Civil Engineering, Indian Institute of Technology Roorkee.

ABSTRACT

Recent Advancements in Static and Seismic Stability Analysis of Geotechnical Structures

Abstract: Earthquake-resistant design of geotechnical structures like sheet pile walls, reinforced soil slopes and foundations are challenging problems in the areas of geotechnical engineering. To minimize the devastating effects of earthquakes on these geotechnical structures, determination of earth pressure coefficients and forces and its point of application for retaining structures are essential while the minimum length of reinforcement required to prevent direct sliding and overturning failure of slopes under seismic conditions are needed. In the design of foundations, determination of bearing capacity, settlement and base pressures are major focus of geotechnical engineers. The present study focuses on recent advancement in methodologies developed for earthquake resistant design of cantilever sheet pile wall (CSPW), caisson foundation and reinforced soil slopes.

SPEAKER PROFILE

Dr. Kaustav Chatterjee is Associate Professor in Department of Civil Engineering at Indian Institute of Technology Roorkee. He pursued his M.Tech. + Ph.D. Dual Degree program in Geotechnical Engineering from IIT Bombay in 2016 and was a Post-Doctoral Research Fellow in Kyoto University, Japan before joining IIT Roorkee in June 2016. His research area focuses on soil dynamics, geotechnical earthquake engineering, foundation engineering, theoretical and numerical modeling in geomechanics. He has published close to 70 research papers in SCI and SCOPUS indexed journals and reputed national and international conferences and has already supervised 8 M.Tech. and 2 Ph.D. students with 7 more Ph.D. students currently under his supervision. He has received sponsored research project from Board of Research in Nuclear Science (BRNS), the prestigious Young Scientist Research Award from BRNS, Young Engineer Award 2021-2022 in Civil Engineering discipline from Institution of Engineers, India in addition to Best Paper Awards from Indian Geotechnical Society (IGS).

Chair: **Professor Sushmita Mitra, FNA**

Sectional Committee V

Lecture INSA Associate Fellow

DR. ADITYA GOPALAN

Associate Professor

Dept. of Electrical Communication Engineering, Indian Institute of Science, Bangalore

ABSTRACT

Sequential data-driven learning and optimization

We will give an overview of approaches for several problems in online learning and inference. The general theme underlying such problems is of learning to simultaneously collect data as well as carry out a given task (like minimizing loss, estimating a parameter, etc.) in an optimal manner. This includes black-box optimization, multi-armed bandits, online learning with preferences, and adaptive monitoring for change detection.

SPEAKER PROFILE

Aditya Gopalan is an Associate Professor at the Indian Institute of Science, in the Dept. of Electrical Communication Engineering. He received his PhD in electrical engineering from UT Austin, and was a postdoctoral fellow at Technion, Israel. His research interests lie in algorithms for automation, with a focus on online and reinforcement learning, optimization and control, and statistical inference. He has been the recipient of the DST INSPIRE Faculty fellowship and the Qualcomm Innovation Fellowship. He was an associate editor for the IEEE/ACM Transactions on Networking.

Chair: **Professor Sushmita Mitra, FNA**

Sectional Committee V

Lecture INSA Associate Fellow

DR. MUDRIKA KHANDELWAL

Associate Professor

Indian Institute of Technology, Hyderabad

ABSTRACT

Magnetic Bacterial Cellulose Composites for Environment and Biomedical Applications

Superparamagnetic nanofibrous biocompatible composites with tunable hyperthermia and wettability are being sought for various biomedical and environmental applications. We demonstrate that in spite of keeping the magnetic content the same, simply by varying the precursor concentrations during in situ synthesis, rapid and controlled hyperthermia can be achieved. Also, while the composites are oleophobic, a transition from hydrophobic to delayed water absorption characteristic can be achieved. And in addition to these magnetic behaviours allows remote manipulability. These lead ways to utilisation of these composites for hyperthermia based and wettability facilitated elimination of environmental waste and targeting cancerous cells.

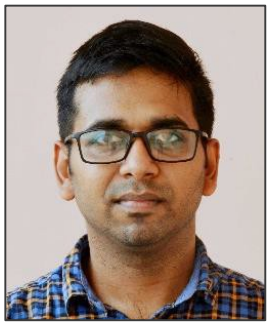
SPEAKER PROFILE

Mudrika Khandelwal is Associate Professor in the Dept of Materials Science and Metallurgical Engineering at IIT Hyderabad. She has a Dual Degree (B.Tech and M.Tech) from IIT Bombay and PhD from University of Cambridge. She has focussed on engineering nanofibres for energy health and environment. She is an alumni of INYAS, recipient of NASI - platinum jubilee young scientist award and INAE young engineer award, SERB women excellence awards in addition to the INSA young associateship.

Chair: **Professor Sushmita Mitra, FNA**

Sectional Committee V

Lecture INSA Associate Fellow



DR. RAHUL MANGAL

Associate Professor

Department Of Chemical Engineering at IIT Kanpur

ABSTRACT

Self-Propelled droplets in Complex Fluids

Typical bodily fluids encountered by biological swimmers are often non-Newtonian in nature. To understand their behavior, here we investigate the motion of micellar solubilization-induced swimming oil droplets, as model systems, in an aqueous medium dispersed with macromolecular solutes. With change in polymer concentration a mode-switching behavior (puller to pusher to quadrupole) is observed which is successfully captured by a robust Peclet (Pe) number-based framework. On further increasing the polymer concentration, the surrounding medium was made viscoelastic in nature. Under appropriate conditions, the droplet exhibits a steady deformed shape. A simple theoretical analysis based on the normal stress balance at the interface and associated Deborah number (De) is shown to accurately predict the droplet shape.

SPEAKER PROFILE

Dr. Rahul Mangal is an Associate Professor in the department of Chemical Engineering at IIT Kanpur. He did his B.Tech-M.Tech (Dual degree) from IIT Kanpur in 2010. In 2016, he completed his PhD from Cornell University. Before joining IIT Kanpur in 2017, he completed his postdoc from University of Wisconsin Madison. Presently, his group focuses on a variety of fundamental and applied problems on soft matter, colloids and polymer composites. Lately, his group has made significant progress in the field of artificial micro-swimmers and their dynamics in the complex surroundings.

Chair: **Professor Sushmita Mitra, FNA**

Sectional Committee V

Lecture INSA Associate Fellow

DR. SAYAN RANU

Associate Professor

Department of Computer Science and Eng. Yardi School of AI at IIT Delhi

ABSTRACT

Modeling Dynamic Interaction Systems with Graph Neural Networks: Predictive Precision and Optimization

Data from a variety of domains are modeled as graphs. Examples include chemical compounds, road networks, social networks, and protein structures. These systems often raise two fundamental questions: how do they evolve in response to their surroundings, and how can we optimize their behavior to attain desired outcomes? For instance, how can we forecast the binding affinity between a molecule and a target protein, efficiently allocate orders to delivery agents for swift food delivery, or recommend the Twitter accounts to follow for enhancing user engagement? In this talk, we will discuss our research on graph neural networks in modeling the dynamics of these systems and highlight their remarkable precision in predicting outcomes.

SPEAKER'S PROFILE

Sayan Ranu holds the joint positions of Nick McKeown Chair Associate Professor at the Department of Computer Science and Eng. and the Yardi School of AI at IIT Delhi. His research interests span the broad area of machine learning for graphs. Sayan has received several awards and recognitions including Mrs. Veena Arora Early Career Faculty Research Award-IIT Delhi, Associate of the Indian Academy of Sciences-2020, best paper award at the International Conference on Web Information Systems Engineering (WISE) 2016, and most reproducible paper award at ACM SIGMOD 2018.

Chair: **Professor Sushmita Mitra, FNA**

Sectional Committee V

Lecture INSA Associate Fellow

PROFESSOR APARNA SINGH

Associate Professor

Indian Institute of Technology Bombay, Mumbai

ABSTRACT

Microstructural length scale effects on strength-ductility-toughness tradeoff in nano-structured steels

Microstructural refinement enhances strength in engineering metals and alloys. However, this is accompanied by a concomitant loss in ductility barring a few exceptions. The reasons for this strength-ductility tradeoff are varied across different materials and are difficult to predict. Understanding the reasons for this tradeoff also holds the key to designing materials with a combination of high strength, ductility and fracture toughness. The same has been explored for a range of nano-structured steels where microstructural variation has been achieved by changing the thermo-mechanical treatment used for transformation. This has led to differences in the microstructural length scale and phase fraction of retained austenite and ferrite in nano-bainitic steels and interlamellar spacing in nano-pearlitic steels. We have been able to find conditions that give a combination of high strength and fracture toughness in both kinds of steels.

SPEAKER PROFILE

Prof. Aparna Singh did her PhD in Materials Science and Engineering at Massachussetts Institute of Technology in 2011 after finishing her undergraduate studies in Materials Science and Metallurgical Engineering at IIT Kanpur in 2007. She works at IIT Bombay in the areas of nano-structured steels, polymer matrix composites as well as fracture and fatigue.

Chair: **Professor Sushmita Mitra, FNA**

Sectional Committee V

Lecture INSA Associate Fellow

DR. M. TANVEER

Associate Professor and Ramanujan Fellow

OPTImization for MAchine Learning (OPTIMAL) Lab Indian Institute of Technology Indore

ABSTRACT

Classification and prediction of Alzheimer's disease using novel ensemble deep learning algorithms

Alzheimer's disease (AD) is the most common cause of cognitive disability and dementia. It is a major public health problem, with more than 35 million people affected today. This number is expected to reach 115 million cases in 2050. The cost of care is evaluated to approximately USD 600 billions worldwide. Early and accurate diagnosis of AD is crucial in order to enhance care for patients and for the development of new treatments. However, AD is currently under-diagnosed and most patients have not received a precise diagnosis. This talk aims to discuss recent development of ensemble deep learning algorithms for the diagnosis of Alzheimer's disease.

SPEAKER PROFILE

M. Tanveer is Associate Professor at IIT Indore. His research interests include machine learning, deep learning, applications to Alzheimer's disease and dementia. He has published over 120 refereed journal papers of international repute. His publications have over 5000 citations with h index 35 (Google Scholar, November 2023). He is the recipient of 2023 IIT Indore Excellence Research Award, 2017 SERB-Early Career Research Award in Engineering Sciences and the only recipient of 2016 DST-Ramanujan Fellowship in Mathematical Sciences. He is currently in the Editorial Board of several premium journals including IEEE TNNLS, PR, NeuNet, ASOC, Neucom, COGN, EAAI. He has organized several international conferences/symposiums/workshops/schools. Amongst other distinguished, international conference chairing roles, he was the General Chair of 29th International Conference on Neural Information Processing (ICONIP2022). Tanveer is currently the Principal Investigator (PI) or Co-PI of 12 major research projects funded by Government of India. Homepage: http://iiti.ac.in/people/~mtanveer/

Chair: **Professor Archana Bhattacharyya, FNA**

Sectional Committee IV

INSA Distinguished Lecture

PROFESSOR ANIL BHARDWAJ

Distinguished professor

Director, Physical Research Laboratory, Ahmedabad 380009
abhardwaj@prl.res.in, Bhardwaj_SPL@yahoo.com

ABSTRACT

My Contributions to the Planetary Missions of India

The Indian planetary exploration program began in 2008 with the launch of Chandrayaan-1 orbiter mission to the Moon. This was followed by the Mars Orbiter Mission (MOM), launched in November 2013 and arrival on Mars in September 2014. The second India lunar mission is the ongoing Chandrayaan-2 orbiter mission working well since last 4 years. India launched its third Moon mission – the Chandrayaan-3 Lander-Rover mission in July 2023: making Indian the first country to have a successful landing near polar region of Moon on 23 August 2023. The Aditya-L1 mission, launched on 2 September 2023, is on the way to L1 point to study Sun. Other planetary missions are being planned as well for future. This talk will discuss the Indian planetary missions, related challenges, and highlight my contributions to new science on Moon and Mars from these missions.

SPEAKER PROFILE

After M.Sc. from Lucknow University, and PhD from IIT-BHU, Dr. Bhardwaj joined ISRO in 1993 at Space Physics Laboratory (SPL), Vikram Sarabhai Space Centre (VSSC), Trivandrum. He was the Director of SPL-VSSC during 2014-2017. He worked at NASA Marshall Space Flight Centre for about 2 years during 2004-2005 as NRC-Senior Research Associate. His primary research field is planetary and space sciences and solar system exploration. He has used space-based (Chandra, XMM-Newton, Hubble), and ground-based (GMRT) Telescopes.

He was Principal Investigator (PI) of SARA experiment on the first Indian Lunar mission Chandrayaan-1, and MENCA experiment on the first Indian Mars Orbiter Mission. His team have PI-lead experiments on Chandrayaan-2, and Chandrayaan-3 missions, the first Indian Solar mission Aditya-L1, as well as upcoming Planetary and Space Science missions. Prof. Bhardwaj has over 200 peer-reviewed research publications and 7 Chapters in Books, and has supervised several Ph.D., M.Tech., M.Phil., M.Sc., B.Tech. students and PDFs. His research findings led to several Press Releases by NASA, European Space Agency, ISRO, and Cover pages of American and European journals, and media highlights. He has been the Editor/Editorial Board Member of several international journals, member of Governing Council of a number of elite research institutions in India, and Chairman/member of many National and International Science Committees.

Chair: **Professor Archana Bhattacharyya, FNA**

An elected Fellow of all the three National Science Academies in India as well as of other Indian Science Union/Societies, he is among the first to be elected AOGS Fellow (2023). He has received recognition at both national and international level – including two most prestigious science awards -Shanti Swarup Bhatnagar Prize (2007) and Infosys Prize (2016). Other awards include INSA-Vainu Bappu Memorial International Award (2016), Decennial Award of Indian Geophysical Union (2017), J.C. Bose Fellowship (2019), Prof. M. G. K. Menon Lecture Award of NASI (2021), and ISRO's Outstanding Achievement Award (2016), to name a few. The Distinguished Alumni Awardee of IIT-BHU (2015) and Lucknow University (2022), Prof. Bhardwaj is currently a Member of the NASI Council, Chairman INSA-ISC Committee for COSPAR, URSI and SCOSTEP, and Board of Trustee of International Academy of Astronautics.

Prof. Bhardwaj has delivered more than 100 public outreach lectures, and interacted with over one lakhs school and college students. A Chapter "A Rocket to Poke Martians" on the Life and work of Prof. Bhardwaj is published in Shweta Taneja's authored Children's Flip-Book "They Made What?" (2021), published by Hachette India.

Chair: **Professor Archana Bhattacharyya, FNA**

Sectional Committee IV

Lecture INSA Associate Fellow

DR. SAJEEV PHILIP

Assistant Professor

Centre for Atmospheric Sciences, IIT Delhi

ABSTRACT

Advances in satellite-based observations and chemical transport modeling to improve our understanding of surface air quality and climate

The satellite-based retrievals of atmospheric trace gases and particles, along with chemical transport modeling, help advance our understanding of the chemical composition of the lower troposphere and the emissions and fluxes leading to that composition. The molecules that can be retrieved from space range from the ones relevant to global surface air quality, such as nitrogen dioxide and formaldehyde, to those relevant to climate studies, such as carbon dioxide and methane. The recent advances in satellite-based observations and chemical transport modeling to improve our understanding of surface air quality and climate will be discussed.

SPEAKER PROFILE

Sajeev Philip, a recipient of the INSA Associate Fellowship for 2023, is an assistant professor at the Centre for Atmospheric Sciences, IIT Delhi. Before joining IIT, he was a visiting associate scientist at NAMS-USRA, NASA Ames Research Center. Sajeev's research is motivated by the pressing needs of the scientific community and policymakers to quantitively understand the chemical and physical processes driving the chemical constituents of Earth's troposphere, primarily using research tools such as satellite retrievals and chemical transport modeling.

Chair: **Professor Archana Bhattacharyya, FNA**

Sectional Committee IV

Lecture INSA Associate Fellow

DR. ARVIND SINGH

Associate Professor

Physical Research Laboratory (PRL), Ahmedabad

ABSTRACT

Can Ocean Alkalinity Enhancement help to remove atmospheric CO_2?

It is becoming increasingly clear that over the coming decades we might need reservoirs that can store up to trillions of tons of carbon dioxide (CO_2) emitted from the anthropogenic emissions. Based on our understanding of the chemical weathering resulting in global cooling at times in the geological past, it has been proposed that the enhanced ocean alkalinity through large scale mineral dissolution has potential to provide a solution to store large amount of CO_2 in the ocean. By adding minerals, it may be possible to sequester up to trillion tons of carbon without surpassing present day carbonate saturation states in the ocean. In turn, the impacts of elevated alkalinity will be potentially small and may even help to reduce the effects of ocean acidification on microbial ecosystem but these aspects have not been tested experimentally. In this talk, I shall discuss the concept of ocean alkalinity enhancement and its potential impacts on ocean biogeochemical cycling.

SPEAKER'S PROFILE

Arvind Singh is working as an Associate Professor in Physical Research Laboratory (PRL), Ahmedabad, India. His research interests lie in biogeochemical cycles of carbon and nitrogen and stable isotopes in the marine environment with a special focus on the Indian Ocean.

Chair: **Professor Archana Bhattacharyya, FNA**

Sectional Committee IV

Lecture INSA Associate Fellow

PROFESSOR VIKRAM VISHAL

Associate Professor & Convener, National Centre of Excellence in Carbon Capture and Utilization

Department of Earth Sciences, IIT Bombay, Mumbai

E-mail: v.vishal@iitb.ac.in

ABSTRACT

Resolving flow and deformation attributes of reservoir rocks

Efforts to decarbonize through geologic carbon sequestration while enhancing petroleum recovery will be key in ensuring India's energy security while addressing climate goals. A combination of techniques such as small angle scattering and gas sorption methods have led to new understanding of the microscale and nanoscale heterogeneity-anisotropy in the unconventional hydrocarbon reservoirs, that show a direct global correlation with organic matter maturity. India's theoretical CO_2 storage potential in depleting oilfields, coal, saline aquifers and basalts, and the associated geomechanical risks was estimated. Emphasis is laid on resolving rock deformation attributes during fluid flow at different stress states.

SPEAKER PROFILE

Dr. Vikram Vishal is an Associate Professor in the Department of Earth Sciences at IIT Bombay, and specializes in reservoir geomechanics, unconventional petrophysics and geologic carbon sequestration. He is a two-time national award winner, two-time Fulbright fellowship recipient, and holds recognitions from all major science academies in India. Dr. Vishal has authored 80 research publications and 8 international/national reports, and received 2 patents.

Chair: **Professor Anil Kumar Tripathi, FNA**

Sectional Committee VI

Lecture New Fellow

DR. ASHOK PANDEY

Distinguished Scientist

Centre for Innovation and Translational Research, CSIR-Indian Institute of Toxicology Research, Lucknow

ABSTRACT

Solid waste management: The issue of sustainability

Solid waste management is one of the primary concerns in any civilization. Generally, agrarian waste and household waste share the largest chunk. In general, the cost involved in managing these wastes is not an affordable deal for small farmers or poor. Therefore, an inclusive approach is required which creates a revenue sharing with all stake-holders, offering not only environmental sustainability but also social and economic prospects. In the waste to wealth or waste to energy concept, the approach should be integrative, involving all stakeholders. Feasibility assessment, appropriate technology, supply chain, revenue sharing, socio-political approach, and policy design and their enforcement are considered as key factors which influence the success. Various kinds of solid waste affect the environment and humanity. While municipal solid waste (MSW) is a burning issue globally, horrifying situation world has today on waste of food, generating he quantities of food waste. Identification of gaps to develop the R&D-based appropriate tools, techniques, and technology to meet the goal effectively is still a big challenge.

Waste-to-energy concept has gained much momentum in recent years as on one hand, it offers unique opportunity to handle and dispose solid wastes (municipal waste as well as agro-industrial wastes), and simultaneously provides alternative sources of renewable energy. Solid waste treatment and management is a major issue worldwide. Several countries lack proper basic waste management infrastructure and awareness. Thus, waste-to-energy could be an attractive solution for resource recovery, which eventually offers potential benefits when works on principles of biorefinery. A biorefinery is a facility that integrates biomass conversion processes and equipment to produce bio-products, including biofuels and chemicals. It is analogous to todays' petroleum refinery. By producing several products, a biorefinery takes the advantages of various components present in the biomass and their intermediates, therefore maximizing the value derived from the biomass feedstock. They also help in complete or near-complete utilization of the feedstock and reduction in solid, liquid or gaseous wastes. The

lecture will dwell upon opportunities and challenges on treatment and management of solid wastes with sustainability as key point.

Keywords: Municipal solid waste, Food waste, Agro-industrial residues, Lignocellulosic biomass, Pollution control, Biorefinery, Waste-to-energy, Biofuels, Platform chemicals, Renewable energy, Biomass valorization, Sustainable development

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SPEAKER PROFILE

Professor Ashok Pandey is currently Distinguished Scientist at Centre for Innovation and Translational Research, CSIR-Indian Institute of Toxicology Research, Lucknow, India. His major R&D interests are in industrial/environmental biotechnology and energy biosciences. He has 16 patents, 120 books, >1000 papers and book chapters, etc with h index of 135 and >79,000 citations. Professor Pandey Fellow of the World Academy of Sciences (TWAS), Fellow of Indian National Science Academy (INSA), Fellow of National Academy of Science, India (NASI), Fellow of World Society for Sustainable Energy Technologies, Fellow of Indian Chemical Society, Distinguished Fellow, the Biotech Research Society, India, Academician of European Academy of Arts and Science, etc. He has received several awards which include Clarivate Analytics (USA) Impactful Research and Highly Cited researcher award (2023), Careers360 Top Cited Research Award, # 1 in India (2023), Top Cited Researcher (Top 1% in the world), Clarivate Analytics (since 2018-till date); Top cited scientist in Biotechnology (no 1 in India), Stanford University world ranking (since 2020-till date), Rank #1 in India in Biology and Biochemistry, Research.Com (since 2022- till date), etc. He is Founder President of the Biotech Research Society, India (BRSI) and Founder of the International Bioprocessing Association (IBA).

PROFESSOR SHEEBA VASU

Professor

Chronobiology and Behavioural Neurogenetics Lab, Neuroscience Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore.

ABSTRACT

Circadian clocks - their evolution and underlying neuronal circuitry

While it is well known that circadian clocks or endogenous timekeeping entities modulate almost all facts of physiology and behaviour of living organisms, we usually simply assume that they have evolved to optimize appropriate phasing in the phase of daily environmental cycles. One of the lines of research in my group is to examine the consequences of selection for differential timing of circadian events on clock organization, sleep and life history traits using populations of fruitflies. In my talk, I will present our recent findings from populations that have been exposed to natural conditions for nearly 200 generations which hints at changes in underlying clock properties as well as their ability to tolerate environmental stressors.

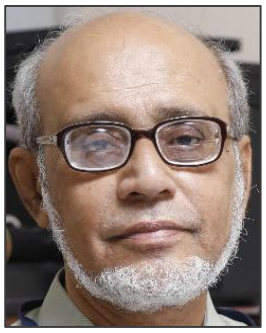
SPEAKER PROFILE

Professor, Chronobiology and Behavioural Neurogenetics Lab, Neuroscience Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore. 560064.

Chair: **Professor Anil Kumar Tripathi, FNA**

Sectional Committee VI

INSA Distinguished Lecture



PROFESSOR PP MAJUMDER

Distinguished Professor

John C. Martin Centre for Liver Research and Innovations, Kolkata and Emeritus Professor at Indian Statistical Institute

ABSTRACT

Genomics of Oral Cancer: Learnt, Learning and to Learn

Oral cancer is highly prevalent in India, especially among men. Our work on genomics of this form of cancer, using whole-genome and whole-exome sequencing, has provided deep insights on the genomic alterations that underlie this disease. We are still learning about the cellular heterogeneity within and between oral tumours, using the newly-introduced single-cell RNA sequencing technology. Many facets of this disease, especially connecting genomic alterations with observed clinical variability, remain to be learnt.

SPEAKER PROFILE

Partha P. Majumder is a National Science Chair (Scientific Excellence), Science & Engineering Board, Government of India; a Distinguished Professor of the John C. Martin Centre for Liver Research & Innovations, Kolkata; and, an Emeritus Professor of the Indian Statistical Institute. He has made significant contributions to human-, statistical- and population genetics and genomics. He has developed methodologies for mapping human disease genes, identified genomic factors underlying many diseases notably oral cancer, and has reconstructed the ancestries and relationships of ethnic populations groups of India and Asia using genomic methods and tools. He has immensely contributed to capacity-building in human and statistical genetics in India. He has published widely in journals of international renown. He has founded the National Institute of Biomedical Genomics, India. He is a Fellow of the Indian science academies and The World Academy of Sciences.

He is an elected Fellow of all the three science academies of India, of the West Bengal Academy of Science and Technology (WAST), The World Academy of Sciences (TWAS) and the International Statistical Institute. He is has served as the President of the Indian Academy of Sciences and of the West Bengal Academy of Science & Technology. He is a Member of the Executive Committees of the international Human Cell Atlas consortium and the International Common Disease Alliance. He serves as an expert on genomics for the World Health Organization.

Chair: **Professor Anil Kumar Tripathi, FNA**

He has been awarded the G.N. Ramachandran Gold Medal (2021) by the CSIR; Barclay Memorial Medal (2020) by The Asiatic Society; Sir P.C. Ray Memorial Medal (2020) by the University of Calcutta; Golden Jubilee Commemoration Medal (2018) by the Indian National Science Academy; Centenary Medal of Excellence (2014) by the School of Tropical Medicine; TWAS Prize in Biology (2009) of The World Academy of Sciences, Trieste; G.D. Birla Award for Scientific Research (2002) by the K.K. Birla Foundation, New Delhi and Kolkata; the Om Prakash Bhasin Award in Biotechnology (2001) by the Om Prakash Bhasin Foundation, New Delhi; the Ranbaxy Research Award in Applied Medical Sciences (2000) by the Ranbaxy Science Foundation, New Delhi; and the New Millennium Science Medal (2000) by the Indian Science Congress Association and the Council for Scientific and Industrial Research (CSIR), the Government of India.

Sectional Committee VIII

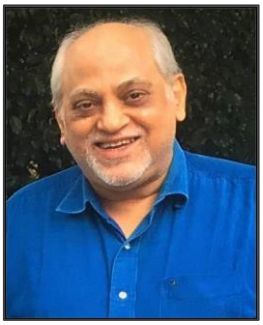
Chair:

Professor H. Balaram, FNA

Hemalatha Balaram served on the faculty of the Molecular Biology and Genetics Unit, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore from 1996 to 2021. During this period, she was the Dean of Academic Affairs from 2008 to 2011 and Dean of Faculty Affairs from 2015 to 2021. She is currently Resident Honorary Professor and JC Bose National Fellow at JNCASR. Her research contributions have been in the area molecular parasitology, molecular enzymology and protein structure-function analysis. She is a Fellow of the Indian Academy of Sciences and Indian National Science Academy. She is a recipient of the Dr. Raja Ramanna Award for Scientists, Karnataka State Council for Science and Technology.

Sectional Committee VIII

INSA Distinguished Lecture



PROFESSOR AMITABHA CHATTOPADHYAY

CSIR Bhatnagar Fellow

Centre for Cellular and Molecular Biology, Uppal Road, Hyderabad, India

ABSTRACT

G Protein-Coupled Receptors and Cholesterol Sensitivity: Excitements and Challenges

G protein-coupled receptors (GPCRs) are the largest class of molecules involved in signal transduction across membranes, and represent major drug targets in all clinical areas. The serotonin$_{1A}$ receptor is an important neurotransmitter receptor of the GPCR superfamily and is implicated in the generation and modulation of various cognitive, behavioral and developmental functions. In our earlier work, we demonstrated that membrane cholesterol is necessary for ligand binding, G-protein coupling and signaling of serotonin$_{1A}$ receptors. In the overall context of high-resolution structures of GPCRs showing bound cholesterol molecules, we previously reported the presence of cholesterol recognition/interaction amino acid consensus (CRAC) motifs in the serotonin$_{1A}$ receptor. In our recent work, we explored the molecular basis of cholesterol sensitivity exhibited by the serotonin$_{1A}$ receptor by generating mutants of key residues in CRAC motifs in transmembrane helices (TM) 2 and 5 of the receptor. Our results show that a lysine residue (K101) in one of the CRAC motifs is crucial for sensing altered membrane cholesterol levels. These observations are further supported from all-atom molecular dynamics simulations which reveal a tightly bound cholesterol molecule between TM1 and TM2 by establishing polar contacts with K101 that leads to stabilization of extracellular loop 1 (ECL1). Interestingly, the position of this cholesterol molecule is almost identical to a co-crystallized cholesterol molecule in the recently reported high-resolution cryo-EM structure of the serotonin$_{1A}$ receptor, thereby strongly validating the molecular mechanism for cholesterol sensitivity of the serotonin$_{1A}$ receptor proposed by us. These results constitute one of the first reports comprehensively demonstrating that cholesterol sensitivity could be knocked out by a single point mutation in a specific cholesterol binding site. I will end my talk by presenting our recent exciting observations on the role of cholesterol in GPCR endocytosis and their implications in pathophysiology and therapeutics.

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SPEAKER'S PROFILE

Prof. Amitabha Chattopadhyay is a global leader in membrane and receptor biology and biophysics and is a ***CSIR Bhatnagar Fellow*** *at the Centre for Cellular and Molecular Biology (CCMB) in Hyderabad (India), and Professor and Founding Dean of Biological Sciences at the Academy of Scientific and Innovative Research. In addition, he is a Distinguished Visiting Professor at the Indian Institute of Technology Bombay, Adjunct Professor at the Jawaharlal Nehru University (New Delhi), Tata Institute of Fundamental Research, Indian Institute of Science Education and Research (Kolkata), Swinburne University of Technology (Australia), and Honorary Professor at the Jawaharlal Nehru Centre for Advanced Scientific Research (Bangalore). Prof. Chattopadhyay received B.Sc. with Honors in Chemistry from St. Xavier's College (Calcutta) and M.Sc. in Chemistry from IIT Kanpur. He obtained his Ph.D. from the State University of New York (SUNY) at Stony Brook, and was a Postdoctoral Fellow at the University of California at Davis, prior to joining CCMB.*

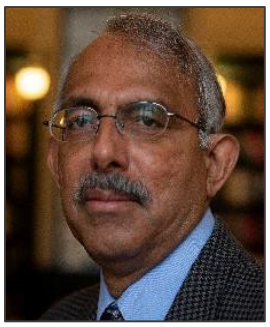
Prof. Chattopadhyay's work is focused on monitoring organization, dynamics and function of biological membranes in healthy and diseased conditions. His group has developed and applied novel, innovative and sensitive techniques based on fluorescence spectroscopy for monitoring solvent relaxation in membranes, membrane-mimetic media, and proteins. These insightful studies have led to a better understanding of the dynamics of hydration in membranes and proteins. A seminal contribution of Prof. Chattopadhyay's group focuses on the role of membrane cholesterol in regulating the organization, dynamics and function of G protein-coupled receptors (GPCRs), which are important cellular nanomachines that act as drug targets in a majority of human diseases. Pioneering work from his group showed that membrane cholesterol is necessary for the function, organization and endocytosis of GPCRs. Recent work from his group has revealed the molecular mechanism of cholesterol sensing by GPCRs. In addition, his work has provided novel insight in the role of membrane cholesterol in the entry of pathogens into host cells. Prof. Chattopadhyay has used fluorescence-based microscopic approaches such as Fluorescence Recovery After Photobleaching (FRAP), Fluorescence Correlation Spectroscopy (FCS), and Fluorescence Resonance Energy Transfer (FRET) to provide useful insight into organization, dynamics and function of membrane receptors. Overall, his work has contributed significantly to the understanding of membrane organization and dynamics, and the interplay between membrane lipids and proteins, especially in neuronal membranes, and its implications in healthy and diseased states.

Prof. Chattopadhyay's pioneering contributions in membrane and receptor biology and biophysics have been recognized by several awards and prizes. These include ***The World Academy of Sciences (TWAS) Prize, Shanti Swarup Bhatnagar Award****, Ranbaxy Research Award, Prof. G.N. Ramachandran Gold Medal, SERB Distinguished Fellowship, Prof. G.N. Ramachandran 60th Birthday Medal and J.C. Bose Fellowship. He is an elected Fellow of The World Academy of Sciences, Royal Society of Biology, Royal Society of Chemistry, and all the Indian Academies of Science. Prof. Chattopadhyay has served on the editorial boards of a large number of journals that include Biophysical Journal, The Journal of Physical Chemistry,*

Biophysical Reviews, Journal of Neurochemistry, BBA-Biomembranes, Journal of Membrane Biology, FEBS Letters, IUBMB Life and ACS Chemical Neuroscience. He has mentored ~20 Ph.D. students and has authored ~300 research publications (mostly as first or senior/corresponding author; ***total citations > 16,400, h-index 68, i-10 index 245****), two monographs, and national and international patents. He has delivered close to 650 invited lectures all over the world including keynote, plenary, colloquium, and award lectures. Prof. Chattopadhyay has organized a number of successful international conferences. He is a popular teacher and has designed and taught courses on biomembranes and fluorescence spectroscopy for Ph.D. students in India and abroad. Prof. Chattopadhyay is involved with science awareness and popularization programs among high school and college students in India, and national level workshops on manuscript and grant writing intended for students and junior faculty. He has extensively traveled across the globe and likes to experience diverse cultures and cuisines. He is an avid reader and a connoisseur of movies, music and cricket.*

Sectional Committee VIII

Lecture New Foreign Fellow



PROFESSOR KM VENKAT NARAYAN

Executive Director

Emory Global Diabetes Research Center

ABSTRACT

Type 2 diabetes in Indian People: Prevention and Management needs a Paradigm Shift

Indian people are at high risk for type 2 diabetes (T2DM) even at younger ages and lower body weights. Already 101 million people in India have the disease, and the proportion of those with T2DM is increasing across all strata of society. Unique aspects, related to lower insulin secretion or function, and higher hepatic fat deposition, accompanied by the rise in overweight (related to lifestyle changes) may all be responsible for this unrelenting epidemic of T2DM. Phenotypical frequency and presentation of T2DM in Indians also vary from those in other populations. Yet, research to understand the causes, pathophysiology, phenotypes, prevention, treatment, and healthcare delivery of T2DM in India seriously lags. There are major opportunities for scientific discovery and technological innovation, which if tapped can generate solutions for T2DM relevant to the country's context and make leading contributions to global science. India offers a fertile environment for shifting the paradigm from imprecise late-stage diabetes treatment toward early-stage precision prevention and care. Investing in and leveraging academic and technological infrastructures, across the disciplines of science, engineering, and medicine, can accelerate progress towards a diabetes-free nation.

SPEAKER'S PROFILE

K.M. Venkat Narayan, MD, MSc, MBA, FRCP is Executive Director, Emory Global Diabetes Research Center. He is Ruth and O.C. Hubert Chair of Global Health and Epidemiology at Rollins School of Public Health and a professor of medicine and endocrinology at Emory University School of Medicine. A leading international diabetes expert, a member of the National Academy of Medicine, he serves on the Committee of the Health and Medicine Division of the National Academies of Science, Engineering, and Medicine. Narayan is noted for substantial, multidisciplinary work in diabetes and noncommunicable diseases (NCD) epidemiology, pathophysiology, translation research and public health. He has been involved in several major national and international multi-center epidemiological studies, randomized controlled trials, public health surveillance, translation research and health policy studies. He is currently also exploring pancreatic beta cell biology and intriguing differences in the pathophysiology of type 2 diabetes in Asian, African, Native American and developing countries' populations globally. With more than 550 publications, including several high-impact studies, and over 185,000 citations, his work exemplifies his global leadership and influence in diabetes and noncommunicable diseases' science and public health.

Sectional Committee VIII

Lecture INSA Associate Fellow

DR. SHUBHASIS HALDAR

Associate Professor

Department of Chemical and Biological Sciences, S. N. Bose National Centre for Basic Sciences, Kolkata

Email: Shubhasis.haldar@bose.res.in

ABSTRACT

Real time observation of mechanical role of chaperone

We established covalent magnetic tweezers technology, which quantify five molecular properties – conformational change, chain flexibility, ΔG for folding/unfolding, unfolding and refolding kinetics- within a single experiment, performed in real time.

Using this technology, we observed that chaperones could behave differently from its canonical nature. Tunnel-associated chaperones (TF, PPID, BIP or DsbA) assist folding under force and generates energy to facilitate translation or translocation. However, cytoplasmic chaperones (PDI and thioredoxin) or well-known foldase chaperone (DnaKJE) does not possess this mechanical folding ability. Transferring chaperones (DnaJ, DnaK, SecB) act as unfoldases to prevent misfolding of client proteins. This reveals an emerging insight about the mechanical roles of chaperones where the chaperone can reshape the energy landscape that modulate the energy consumption in various biological processes.

SPEAKER PROFILE

Dr. Shubhasis Haldar is an associate professor in SN Bose Centre of Basic Science. He is working on the development of single molecule tools to understand complex biological phenomenon. He developed the first covalent magnetic tweezers in India and selected as Ratna Phadke Award by Indian Biophysical Society for outstanding contribution to Indian biophysics under 35 years of age.

Sectional Committee VIII

Lecture INSA Associate Fellow

DR. SHASHANK TRIPATHI

Faculty

Emerging Viral Pathogens Laboratory, Centre for Infectious Disease Research, Indian Institute of Science, Bengaluru

ABSTRACT

Novel Host-Directed Antiviral Strategies against Human Viruses

Antiviral drug development is prohibitively expensive and suffers from rapid development of resistance by the target virus. Repurposing clinically approved drugs and host-directed molecules as antivirals can pose higher resistance barrier, minimize the cost of drug development and potentially can provide broad spectrum action. We have developed multi-omics datasets analysis algorithms to identify host-directed antivirals. We have used this to identify and validate FDA approved drugs Auranofin and Nintedanib as promising antiviral agents against COVID-19. Furthermore, our group has discovered that Picolinic acid, a natural tryptophan metabolite, exhibits broad spectrum antiviral action against enveloped viruses by blocking viral-cellular membrane fusion.

SPEAKER PROFILE

Dr. Shashank Tripathi, currently a faculty the Microbiology & Cell Biology department of IISc, Bangalore. He is a virologist, did PhD from ICGEB, New Delhi and postdoc in the Icahn School of Medicine at Mount Sinai, New York USA. His lab in IISc studies virus-host interactions of important human RNA viruses such as Influenza, SARS-CoV-2, Dengue and Zika viruses. He will discuss host-directed antiviral development.

Sectional Committee VII

Chair:

Professor Agepati S. Raghavendra, FNA

Prof. Agepati S. Raghavendra is currently an Institution of Eminence (IoE) Research Chair Professor in Life Sciences at University of Hyderabad, India. He was elected as a Corresponding Member of American Society of Plant Biology in 2012. He is an elected fellow of all the four science Academies in India: Indian National Science Academy (INSA), National Academy of Sciences India (NASI), Indian Academy of Sciences (IASc), National Academy of Agricultural Sciences (NAAS), and two from abroad: the Third World Academy of Sciences (TWAS, Italy) and Royal Society of Biology (RSB, UK). Professor Raghavendra held the positions of SERB JC Bose National Fellow, DFG Mercator Visiting Professor (Germany), Alexander von Humboldt Fellow, and JSPS Senior Visiting Scientist (Japan). He elucidated the role of guard cell signaling components, including the cytoplasmic pH, during stomatal closure. His other research interests include the essentiality of mitochondrial respiration for optimizing photosynthesis, and biochemical cross-talk between plant cell organelles. Raghavendra published extensively and is one of the highly cited scientists from India in Plant Sciences.

Sectional Committee VII

Lecture New Fellow

PROFESSOR LOLITIKA MANDAL

Associate Professor

WellcomeTrust DBT Indian Alliance Senior Fellow, Senior Fellow, Indian Institute of Science Education and Research Mohali (IISER Mohali), Mohali Punjab.

ABSTRACT

A tale of cellular and metabolic control of blood cell development

Employing *Drosophila* blood cell system, we have tried to understand the crosstalk between the stem cell compartments. In this process, we have unraveled several new signals and metabolic cues essential for the maintenance and functionality of the stem cell niche and the blood progenitors.

Our recent work provides an example how cellular systems can maintain phenotypic stability despite multiple perturbations produced by environmental changes, stochastic events, and genetic diversity. Cues to which a cell needs to respond immediately would specifically utilize mechanisms that can initiate a rapid turnover of the functionally active entities of a cell. One such entity can be the translating mRNA requiring immediate clearance to cope actively with an environmental response triggered by cellular sensing. In this context we demonstrate that the miRNAs are not mere bystanders but active players in dictating how blood cells react to their environment, particularly under varying nutrient states. Employing *in vivo* (*Drosophila*) and *in vitro* (human primary and blood cell lines), our study establishes the functional association between an environmental signal of nutrient availability and active-miRNA machinery essential for hematopoietic growth and proliferation.

Title of India Alliance funded project:

Understanding the regulatory circuitry involved in maintain the homeostasis and physiological responses of blood cells and hematopoietic niche in *Drosophila*

SPEAKER'S PROFILE

The power of Drosophila as a model organism is very well established, most notably its genetics and developmental biology. Taking advantage of these strengths our group aims to find novel genes and mechanisms controlling hematopoietic progenitors cell specification and differentiation. Given the high degree of conservation of blood development between Drosophila and the vertebrates, we hope that the ability to manipulate the function of such genes in Drosophila would aid in understanding function and dysfunction in human hematopoiesis.

Education: *Banaras Hindu University: PhD*

University of California at Los Angeles: Post-doctoral Studies.

Indian Institute of Science Education and Research Mohali, Knowledge city, Sector 81, SAS Nagar, Manauli PO 140306 Punjab INDIA

Sectional Committee VII

Lecture New Fellow

DR. SIVARAM MYLAVARAPU

Professor and head

Laboratory of Cellular Dynamics at the Regional Centre for Biotechnology, Faridabad

ABSTRACT

Motoring through cell division - a tale of faithful promiscuity

The molecular motor dynein performs various functions in mammalian cells by virtue of its ability to transport intracellular cargoes along cytoskeletal fibres called microtubules. Remarkably, a single microtubule minus end-directed dynein is able to counter-balance the almost exclusively plus end-directed cargo transport mediated by almost fifty types of kinesins. This stark asymmetry in biochemical variety of the oppositely directed motors is offset by the vast cargo-binding repertoire of dynein. The molecular basis of dynein's cargo selectivity and diversity is only beginning to be understood. Our work has begun to reveal unexpected mechanisms by which dynein faithfully switches cargoes to mediate some of its multiple functions during the fundamental process of cell division.

SPEAKER PROFILE

Prof. Sivaram Mylavarapu has been heading the Laboratory of Cellular Dynamics at the Regional Centre for Biotechnology, Faridabad, India for the last thirteen years. His group has made seminal contributions towards discovering novel molecular mechanisms regulating cell division and intercellular communication in animal cells. They have delineated key aspects of how the intracellular motor dynein attains its vast mitotic functional diversity. Dr. Mylavarapu's group has discovered endocytosis-exocytosis crosstalk during cytokinesis, and identified novel regulators of germline stem cell division. In the field of intercellular communication, Dr. Mylavarapu's group has been at the forefront of delineating the molecular mechanisms driving the formation and function of tunneling nanotubes, which have gained significant biomedical importance over the past decade.

Sectional Committee VII

Lecture New Fellow

PROFESSOR SC RAGHAVAN

Professor

Department of Biochemistry, Indian Institute of Science, Bangalore

ABSTRACT

Understanding mechanism of chromosomal translocations: Implications in Oncogenesis

Hematopoietic neoplasia like leukemia and lymphomas constitute 8-10% of all cancers reported worldwide. These are characterized by the presence of specific chromosomal translocations, which act as genetic markers for the diagnosis and prognosis of the disease. Chromosomal translocations result from aberrant DNA double-strand breaks (DSBs) on the heterologous chromosomes, followed by their anomalous joining by DNA repair pathways. The mechanism underlying such atypical DNA breaks is largely unknown. We have shown recently that many translocation fragile regions adopt non-B DNA conformation, such as G-quadruplex DNA structures, Cruciform DNA, Triplex DNA, and R-loops. Further, we observed that RAGs and AID, which are normally responsible for immunoglobulin diversity, could play a role in generating such chromosomal translocations. Our recent studies also showed that a nonamer near non-B DNA structures could enhance RAG cleavage on such structures, thereby providing a novel mechanism of RAG-mediated chromosomal translocations in lymphoid cancers. I will highlight some specific examples during my presentation, highlighting the role of non-B DNA structures.

SPEAKER PROFILE

Dr Sathees C. Raghavan obtained his PhD from Banaras Hindu University, India, and then did his postdoctoral research at the University of Southern California, Los Angeles, USA. He is currently a "Professor" of the Department of Biochemistry and "Chair" of the Central Animal Facility of Indian Institute of Science (IISc), Bangalore. His research group at IISc focuses on deciphering the mechanism of genomic instability in leukemia and lymphoma. Besides, his group also explores the role of the immune system in the genesis of chromosomal abnormalities, DNA repair and cancer therapeutics. He has published over 170 research articles in internationally peer-reviewed journals and has obtained several patents. 27 students completed their PhD under his guidance. Dr. Raghavan is the recipient of several awards, including Shanti

Swarup Bhatnagar Prize (2013), the Leukemia Research Foundation (USA) 2010, the Kobayashi Foundation Award (KFA), 2016, NASI-Reliance Industries Platinum Jubilee Award (2015), Indian Society for Cell Biology (ISCB), S. P. RAY Chaudhuri Lecture Award (2023). He is also a "Fellow" of the National Academy of Sciences, Allahabad, Indian Academy of Sciences, Bangalore, and Indian National Science Academy, New Delhi 2023. He is currently an Editor of FEBS Journal, UK.

Sectional Committee VII

Lecture New Fellow

DR. MS REDDY

Professor

Laboratory of Cell Death & Cell Survival, Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad, INDIA

ABSTRACT

Mapping Interaction Network of Human Phosphatases

Phosphatases play a crucial role in biological functions and controls nearly every cellular process, including metabolism, gene transcription, translation, cell-cycle progression, protein stability, signal transduction, and apoptosis. However, the functional map of all human phosphatases and their interactome is not fully available. By using a biochemical purification followed by proteomic analysis, our lab has established the interaction network of nearly every human protein phosphatase in the cell. We found phosphatases associated with the components of varied cellular processes. Our work on some of the new functional phosphatase interactions would be discussed.

Sectional Committee IX

Chair:

Professor Shinjini Bhatnagar, FNA

Prof. Shinjini Bhatnagar is a physician scientist who worked with the Dept. of Pediatrics at AIIMS for 25 years as a pediatric gastroenterologist and as a research scientist. Her group's hypothesis driven research led to the introduction of the modified low osmolarity ORS and zinc in treatment of childhood diarrhea and diagnostic tests for Celiac disease. She is currently a Distinguished Professor at the Translational Health Science and Technology Institute, an autonomous institute of the Dept. of Biotechnology GOI where she heads large interdisciplinary research studies that bridge classical clinical research and modern biology to find solutions for diseases with public health importance in maternal and child health. One example is the Garbh-ini (an interdisciplinary group for advanced research on birth outcomes- DBT India initiative) programme that has a mandate to find innovative and accessible solutions for preterm birth and fetal growth restriction. Dr. Bhatnagar is a fellow of all the four national academies i.e. FAMS, NAMS, INSA and IAS.

Sectional Committee IX

Lecture New Fellow

PROFESSOR NR MAHAPATRA

Professor

Department of Biotechnology, IIT Madras

ABSTRACT

Chromogranin A: a key regulator of cardiometabolic diseases

Department of Biotechnology, Bhupat and Jyoti Mehta School of Biosciences, Indian Institute of Technology Madras, Chennai 600036, India

Chromogranin A (CHGA) is an acidic glycoprotein co-stored/co-secreted with catecholamines in/from dense-core secretory vesicles in neuronal/neuroendocrine cells. CHGA acts as a prohormone giving rise to several bioactive peptides including anti-hypertensive catestatin (CST) and dysglycemic pancreastatin (PST). Plasma CHGA level is elevated in several cardiovascular diseases including hypertension, myocardial infarction and acute coronary syndrome. Re-sequencing of the *CHGA* gene in human populations identified several single nucleotide polymorphisms (SNPs) in promoter region and non-synonymous polymorphisms in the CST and PST regions; most of these SNPs display significantly different allelic and haplotype frequencies in Indian population as compared to European population. Haplotype analysis shows five major *CHGA* promoter haplotypes, with haplotype 2 containing variant alleles at -1018, -415 and -57 bp positions exhibiting the highest promoter activity. The augmented activity of the haplotype 2 is due to its enhanced interactions with c-Rel transcription factor under basal as well as pathophysiological conditions (e.g., inflammation and hypoxia). Further, individuals carrying *CHGA* promoter haplotype 2 shows elevated plasma CHGA levels, body mass index, diastolic blood pressure and plasma glucose levels suggesting a functional role for this haplotype towards contributing to cardiometabolic risk. The PST-Gly297Ser variant enhances the risk for hypertension, type 2 diabetes and coronary artery disease; interestingly, this variant peptide exhibits enhanced interaction with insulin receptor. The CST-Gly364Ser variant increases the risk for hypertension, with the 364Ser allele carriers displaying increased blood pressure, possibly via diminished endothelial NO production due to differential interactions with β_2-adrenergic receptor. Thus, inter-individual variations in *CHGA* locus modulate cardiovascular homeostasis and alter the risk for cardiometabolic disorders.

SPEAKER PFOFILE

Dr. Nitish R. Mahapatra is a Professor in the Department of Biotechnology, IIT Madras. The broad area of his research is cardiovascular /metabolic disease pathogenesis. Studies from his laboratory identified several human genetic variants that significantly enhance the risk for cardiovascular and metabolic diseases. Their studies also revealed molecular mechanisms (at the transcriptional, post-transcriptional and post-translational levels) underlying the increased disease risk in the carriers of the identified genetic variations.

He has published >80 research articles in reputed international journals including Journal of Clinical Investigation, Diabetes, Hypertension, Human Molecular Genetics, Journal of Biological Chemistry, Journal of Cell Science and Cardiovascular Research.

He has received a number of awards/honours for his scientific contributions:

- *Fulbright-Nehru Academic and Professional Excellence Fellowship*
- *Torrent Research Award from the International Society for Heart Research*
- *C. R. Krishna Murti Award from the Society of Biological Chemists (India)*
- *JSPS (Japan Society for the Promotion of Science) Invitational Fellowship*
- *Elected as a Fellow of the National Academy of Sciences, India (FNASc)*
- *Elected as a Fellow of the American Heart Association (FAHA)*

Sectional Committee IX

Lecture New Fellow

DR. BUSHRA ATEEQ

Professor and Joy Gill Chair

Senior Fellow, DBT/Wellcome Trust India Alliance Department of Biological Sciences & Bioengineering Indian Institute of Technology Kanpur

ABSTRACT

Strategies to defeat the "Emperor of all Maladies": probing (many) Achilles' heel of cancer

Cancer is one of the most devastating diseases worldwide. It remains a challenge to treat owing to its heterogeneous nature, wherein multiple distinct subpopulations of cells are found within a single tumor. This intratumoral heterogeneity is one of the key causes of tumor relapse, drug resistance, and treatment failure. Hence, the identification of molecular signatures to categorize diverse cancer subtypes, and decipher their molecular underpinnings is critical to design effective treatment strategies. Over these years, my research group has been putting efforts to identify the crucial genetic and/or epigenetic alterations that are involved in tumor progression. Our overarching goal is to translate the mechanistic understanding of these tumor-specific alterations to decode the emergent properties of cancer such as drug resistance, immune evasion, and metastases. In my talk, I will share the inroads that we have made into the molecular understanding of two specific subtypes of prostate cancer, that are prevalent in India and globally. I will also elaborate on how our findings led to the identification of actionable genetic alterations or molecular pathways that paved the way for precision therapeutic interventions and strategies for disease management.

SPEAKER'S PROFILE

Professor Bushra Ateeq earned her Ph.D. from the Aligarh Muslim University. After a brief stint as a Research Associate at the AIIMS and NII in New Delhi, she moved to McGill University for her postdoctoral studies. Later, she joined the Michigan Center for Translational Pathology at the University of Michigan, where she also served as a Research Investigator. In February 2013, she joined the Department of Biological Sciences and Bioengineering at IIT Kanpur as an Assistant Professor, where she currently serves as a Professor and a Senior Fellow of the DBT/Wellcome Trust India Alliance.

Prof. Ateeq received the Shanti Swarup Bhatnagar Prize in Medical Sciences (2020), and several other national awards for her excellence in research, to mention a few, S. Ramachandran-National Bioscience Award, CSIR-CDRI Award, ICMR-Basanti Devi Amir Chand Prize, Sun Pharma Science Foundation and OPPI Scientist Awards. She also serves as an Editor-in-chief of the Translational Oncology (Elsevier).

Sectional Committee IX

Lecture New Fellow

PROFESSOR CHANDRASEKHAR BAL

Faculty and Head

Nuclear Medicine Department at AIIMS, New Delhi

ABSTRACT

Theranostics: Overcoming Challenges and Seizing Opportunities in Transitioning Molecules from the Laboratory to Bed-side; Paradigm Shift in Cancer Care

In the realm of cancer treatment, the pivotal modalities of surgery, radiation, and chemotherapy stand as the primary pillars. Surgery is typically administered at the early stages, followed by radiation therapy. In cases where the disease has spread to distant organs, drugs become the sole viable option. While external beam radiation and surgery are effective at a loco-regional level, they face limitations in treating extensive distant spreads. Theranostics, a term derived from 'seeing and treating,' introduces the concept of molecules labeled with radionuclides or radioisotopes that possess combined properties of internal radiation (unlike external beam radiotherapy) and the selectivity of chemotherapy.

This innovative approach aims to assess and treat using the same or similar biomolecules, enabling selective receptor-based dose delivery. This results in sparing surrounding healthy tissues, a notable advantage over external beam radiotherapy where excessive toxicity to healthy tissue is a limiting factor. Internal radiation using radiopharmaceuticals can utilize beta-radiation (e.g., I-131, Lu-177, Y-90) or modern alpha-radiation (e.g., Ac-225, Ra-223, Pb-212, At-221), and even tandem therapies employing both beta and alpha radiopharmaceuticals.

India has emerged as a leader in the theranostics domain over the past decade, earning recognition at the Annual Meeting of the North American Society of Nuclear Medicine. However, significant challenges persist, particularly the non-availability of high specific activity Lutetium-177 and alpha-emitting radionuclides from BARC, necessitating costly imports from Germany. Despite these obstacles, India's pioneering research has demonstrated the efficacy of treatments such as 177Lu/225Ac-DOTATATE for metastatic neuroendocrine tumors and 177Lu/225Ac-PSMA617 for metastatic castration-resistant prostate cancer (mCRPC), leading to prolonged survival and improved quality of life.

The evolving paradigm in cancer therapy now emphasizes targeting the cancer micro-environment (CME) rather than solely focusing on cancer cells. A significant portion of the cancer mass comprises supporting cells known as Cancer-Associated Fibroblasts (CAFs), which produce Fibroblast Activation Proteins (FAPs) crucial for tumor growth, neoangiogenesis, and improved nutrition to cancer cells. This shift opens up opportunities for imaging and therapeutic interventions targeting CAFs, paving the way for innovative cancer treatments.

Despite bottlenecks in the supply chain, regulatory requirements, and the cost of treatment, India has accumulated substantial experience in practical theranostic therapies, showcasing the nation's commitment to advancing cancer care.

SPEAKER PROFILE

- *Professor since 2005 & Head of Nuclear Medicine Department at AIIMS, New Delhi from 2013 and ongoing*
- *Oration Awarded*
  - *Brg. Mazumdar Oration by SNM, India*
  - *RD Lele Oration by ANMPI,*
  - *Oration Award by Indian Society of Thyroid Surgeons*
  - *Oration Award by IGCD Academy at Metabolic Conclave – Dubai*
- *AIIMS Excellence in Clinical Research 2015, 2017 and 2019, 2020 & 202*
- *EANM-Springer Award 2019 as Best Published Paper*
- *2021 & 2022 Dr. Henry N Wagner Jr. Best Research Paper of the Year by SNMMI, USA*
- *Special Interest in Therapeutic Nuclear Medicine: Radioiodine Treatment of Hyperthyroidism & Thyroid Cancer, PRRT in Neuroendocrine Tumours, PSMA Therapy in Prostate cancer (mCRPC), Neuroimaging, etc.*
- *Two of American Thyroid Association (ATA 2015) Guidelines are based on our Research Work in the field of Thyroid Cancer*
- *^{225}Actinium-DOTATATE Therapy in Neuroendocrine Tumour is pioneered by us*
- *Experience of Treating more than 12,000 plus Thyroid cancer patients at AIIMS*
- *Started DM in Therapeutic Nuclear Medicine in India, and even first time in the World*
- *Written 620 original research articles, edited 3 Books and contributed 40 book chapters*
- *Contributed to the Academic Community: Ex-President -ANMPI & Ex-President- Indian Thyroid Society, and Ex-President- FAIIMS, New Delhi*

Sectional Committee IX

Lecture New Fellow

PROFESSOR PRASENJIT GUCHHAIT

Professor

Regional Centre for Biotechnology, National Capital Region Biotech Science Cluster, Faridabad

email: prasenjit@rcb.res.in, Phone: +91 9711406397

ABSTRACT

Usage of αKG in COVID-19 treatment, and development of antivirals against Dengue: major outcomes of translational research in our laboratory

We discovered missense mutations in the *EGLN1* gene, which encodes prolyl hydroxylase 2 (PHD2), a protein that supports high-altitude adaptation in Tibetan highlanders. The O_2-dependent enzyme PHD2 negatively regulates the function of hypoxia-inducible factor (HIF)1α, the primary sensor of hypoxic cues. At high altitudes, lower pO_2 suppresses PHD2 activity and promotes HIF1α function. Therefore, non-Tibetan travellers like us experience HIF1α induced hypoxic maladies at high altitudes, whereas the Tibetan highlanders having gain-of-function $PHD2^{D4E;C127S}$ mutations are protected from such effects. Having a high affinity to O_2, this PHD2 mutant variant is capable of degrading HIF1α under low pO_2 at high altitudes. This observation in Tibetans serves as a model for us to appreciate the crucial role PHD2 plays in modulation of hypoxia-mediated inflammatory responses. Since PHD2 α-ketoglutarate (αKG) is a co-factor for its enzymatic activity, we used a strategy to metabolically enhance the activity of PHD2 using the metabolite *in vitro* and in mice model of inspired hypoxia. We confirm that augmented-PHD2 activity is a rate-limiting factor in prevention of inflammatory response to hypoxia (HIF1α), including reduced leukocytic infiltration in the lungs of mice. Similar to HIF1α, phosphorylated(p)-AKT is known to be another substrate of PHD2. We have shown that the αKG mediated augmentation of PHD2 significantly suppressed the p-AKT function and pAKT-associated symptoms like inflammation and thrombosis. Dietary αKG rescued inflamed lungs and reduced viral load in SARS-CoV-2 infected animals.

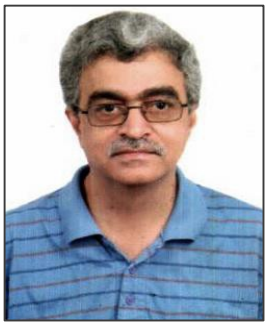
In another observation, we described that platelet factor 4 (PF4 or CXCL4), a chemokine secreted from activated platelets, inhibits IFN-α/β synthesis by inhibiting CXCR3: p38: IRF3 pathways, and promotes dengue virus (DENV) infection in host immune cells. Elevated CXCL4 directly correlates with DENV infection in dengue patients. We have shown that the antagonist to CXCR3 (receptor of CXCL4), AMG487, reversed the effects of CXCL4 and improved DENV infection. Unfortunately, the therapeutic usage of this antagonist has been limited as this drug was withdrawn from a Phase II clinical trial against rheumatoid arthritis

due to limited efficacy. We were able to screen various CXCR3 antagonists from an extensive compound library and identified 7D, which inhibits molecules like CXCR3 and Sirt-1, and DENV replication potently *in vitro*. Further, 7D supplementation to DENV2-infected mice significantly improved disease symptoms, including thrombocytopenia and leukopenia, decreased vascular leakage and increased survival. Also it induced IFNα/β production in plasma, and reduced the frequency of TNFα^{+ve} CD4 CD8 double positive T lymphocytes. Having deacetylase-inhibiting property, 7D promoted acetylation of STAT3 and increased the number of proliferating plasmablasts, antigen-specific B lymphocytes and neutralizing-antibodies in DENV2-infected mice. Together, our data identified compound 7D as a stimulator of IFN-α/β synthesis by suppressing CXCL4: CXCR3: p38 pathway, and also booster of neutralizing-antibody synthesis by promoting STAT3 acetylation in plasma cells, making it capable of protecting dengue infection.

SPEAKER PROFILE

Received both PhD and DSc form the Banaras Hindu University, India, Currently he is a Professor at the Regional Centre for Biotechnology (RCB), Faridabad, India. He served as Assistant Professor at the Baylor College of Medicine at Houston, USA during 2007-2012. Current research interest: Studying Molecular Signaling of Thrombosis, Inflammation, and Innate and Adaptive Immune Responses in Human Diseases (viral infections to genetic polymorphisms), and Identifying Biomarkers and Molecular Targets to Develop Potential Therapeutics. Published more than 50 original research articles including Journal like EBioMedicine, Clinical and Translational Medicine, Journal of Thrombosis and Haemostasis, Haematologica, Clinical Immunology, Journal of Clinical Immunology, FEBS J, etc. Member of the Editorial Board for the journals like Frontiers in Hematology, World Journal of Hypertension, etc. Reviewer for scientific journals like Blood, eLife, Frontiers in Immunology, Haematologica; He has four patents including anti-viral drugs.

Sectional Committee X



Chair:

Professor Ramesh V. Sonti, FNA

Dr. Ramesh Sonti obtained his B.Sc. degree (Botany, Zoology and Chemistry) from Andhra University in Visakhapatnam, India in 1980. He has obtained his M.Sc. and M.Phil degrees in Plant Sciences from the University of Hyderabad, Hyderabad, India and a Ph.D. in bacterial genetics from the University of Utah, USA. He did post-doctoral research on plant genetics at the Massachusetts Institute of Technology, Cambridge, USA. In 1993, he joined the CSIR-Centre for Cellular and Molecular Biology (CCMB), Hyderabad. In November 2017, he moved to the National Institute of Plant Genome Research, New Delhi and served as it's Director until May 2020. Subsequently, he served as Professor and Chairperson of the Biology Department as well as Dean of faculty at IISER-Tirupati. He is currently Director, International Centre for Genetic Engineering and Biotechnology, New Delhi. His research interests are in the area of plant-microbe interactions and in the application of biotechnological tools such as marker assisted selection for crop improvement. Dr. Ramesh Sonti is a recipient of the Shanthi Swarup Bhatnagar Prize in Biological Sciences and the National Bioscience Award of the Department of Biotechnology, Government of India. He is a recipient of the J. C. Bose fellowship of the Department of Science and Technology, Government of India. He is an elected fellow of the following science academies: Indian National Science Academy, New Delhi; National Academy of Sciences, Allahabad; Indian Academy of Sciences, Bangalore; National Academy of Agricultural Sciences, New Delhi. He is a fellow of the Telangana Akademi of Sciences.

Dr. Sonti has led a team of inter-institutional investigators at the Indian Institute of Rice Research and CCMB that has been involved in development and popularization of Improved Samba Mahsuri, a bacterial disease resistant rice variety. This team has been awarded the CSIR AWARD FOR S&T INNOVATIONS FOR RURAL DEVELOPMENT (CAIRD)-2014 and the BIOTECH PRODUCT PROCESS DEVELOPMENT AND COMMERCIALIZATION AWARD-2016 awarded by Department of Biotechnology, Government of India. Dr. Sonti is a recipient of the Prof. N. Appaji Rao Best Mentor award instituted by the Indian Institute of Science Alumni Association, Bengaluru.

Sectional Committee X

Lecture New Fellow

DR. SABHYATA BHATIA

Scientist

National Institute of Plant Genome Research (NIPGR), New Delhi

Email: sabhyatabhatia@nipgr.ac.in

ABSTRACT

Deconvoluting the molecular and genetic intricacies underlying the complex seed protein content trait in chickpea

An effective way of addressing the global problem of protein energy malnutrition is by augmenting the production of crop varieties with enhanced protein content. Legumes, especially chickpea, serve as an excellent source of plant based proteins for human consumption. The broad range of seed protein content (SPC) (17- 22%) across chickpea accessions strongly suggests the potential for breeding high SPC varieties for human consumption. However, development of protein enriched chickpea varieties necessitates an understanding of the genetic basis of the SPC and a detailed elucidation of the key signalling pathways that control the accumulation of seed storage proteins (SSPs). Therefore, both forward and reverse genetics approaches were employed to understand the molecular signatures that determine SPC of chickpea. Towards this, the first approach to expound the complex genetic mechanism of chickpea seed protein accumulation included identification of novel QTLs/genomic loci regulating SPC. For this, an integrated approach of QTL-Seq and candidate gene-based association mapping was employed. Whole Genome Re-sequencing based QTL-Seq analysis of bulked RILs from a mapping population contrasting for SPC led to identification of two QTLs encompassing three highly significant SNPs and the underlying genes. Candidate gene based association mapping revealed a tightly associated marker affecting *CaREN1 (ROP1 ENHANCER1)* that was subsequently converted into a cost effective allele specific PCR based marker that could be utilized for rapid screening of chickpea germplasm for SPC in marker assisted breeding. Further, *in planta* functional validation via knockdown of CaREN1 led to significant reduction in SPC of chickpea that was likely due to disruption in the formation of CaREN1 protein complexes that mediate folding, transport and accumulation of seed storage proteins as established through AP-MS.

Further, to unravel the key signalling networks that regulate the differential accumulation of seed proteins in chickpea, small RNA sequencing of chickpea seeds across various developmental stages was performed. Expression analysis led to the identification of Ca-miR164 that displayed reduced expression during late stages of seed development as well as in seeds of high-protein chickpea accessions. The direct interaction between Ca-miRNA164 and one of its target mRNA i.e. *CaNAC100*, that also exhibited co-expression along with seed storage proteins in chickpea, was established. Analysis of transcriptional properties demonstrated CaNAC100 to be a transcription factor that localized in the nucleus. Seed-

specific overexpression of the miRNA164 and *CaNAC100* were associated with considerable alterations of key seed traits in chickpea especially the total SPC and could be attributed to the direct binding and concurrent transactivation of the promoter of seed storage protein-encoding genes by the candidate transcription factor. Taken together, the current study provides crucial insight into the genetic and molecular basis of SPC in chickpea in addition to a PCR based screening marker that can be used for chickpea breeding. Furthermore, the comprehensive research effort shed light into the gene regulation at transcriptional, post-transcriptional and post-translational levels which would pave the way for devising strategies for developing chickpea cultivars with augmented SPC.

SPEAKER PROFILE

Dr. Sabhyata Bhatia is currently Scientist VII at the DBT- National Institute of Plant Genome Research (NIPGR), New Delhi. She is currently the Group Leader of the 'Plant Genomics and Biotechnology" group. She has contributed extensively towards utilizing integrated genomics strategies for effective delineation of novel genomic loci and genetic markers as well as functional characterization of novel trait-associated genes to assist breeders in enhancing yield and nutritional quality of legumes. She has pioneered the generation of large-scale genomic resources (SSRs, SNPs, ESTs, high-resolution genetic linkage maps, QTLs, whole genome and transcriptome sequences in legumes (chickpea, lentil and minor pulses) that were utilized for understanding genome structure, molecular diversity, variety identification, gene mapping and trait association analysis. SNP based QTLs and candidate genes responsible for yield (seed size, weight, number) and nutritional quality (seed protein content and seed Fe content) have been identified in chickpea and lentil and converted into cost-effective PCR based markers for use in marker assisted breeding. Significant contributions also include DNA fingerprinting in plants and the cracking of the whole genome sequence of chickpea and Black gram. Recent striking accomplishments in seed genomics include delineation of the novel gene regulatory network consisting of small regulatory RNAs and transcription factors that were found to be directly regulating Seed Protein Content in chickpea.

Currently she heads and guides a group of Ph.d Scholars and Post Doctoral Fellows. To her credit she has 12 completed Ph.Ds, 6 currently working and more than 35 M.Sc dissertations. Her major achievements include 63 research papers published in peer-reviewed journals of international repute, 7 book chapters and 1 book. She has 22 years experience teaching Plant Biotechnology / Plant Genomics to Ph.D students. During her research career she has been the lead Principal Investigator in several externally funded research projects some of which had international collaborations with France, Canada and Australia. In addition to her research activities, she also handles several institutional responsibilities in various capacities that include serving as the Program Director/ Scientist-incharge of the National Genotyping and Genomics Facility (NGGF) established at NIPGR by DBT, and was the CVO (Central Vigilance Officer) of NIPGR. Currently she serves as a member of several ministerial Task Forces such as the Chairperson of the DBT BIOCARE (Biotechnology Career Advancement & Reorientation Programme) Committee for Plant and Agriculture Sciences (April 2022 – continuing), Expert member of the BIRAC Area Review Panel on Agriculture, Veterinary Sciences and Aquaculture (June 2023 – continuing), Member of the Research Advisory Committee (RAC) of Regional Centre for Biotechnology (DBT- RCB), Faridabad. She has earlier served as a Committee Member of the DBT Task Force on Agricultural Biotechnology (2016 – 2019) and member of the SERB - Programme Advisory Committee (PAC) on Plant Sciences (2015 – 2019). In recognition of her work she was elected as a Fellow of the prestigious National Academy of Sciences, India in 2014 and recently as a Fellow of the Indian National Science Academy (INSA).

Sectional Committee X

Lecture New Fellow

DR. NC BISHT

Scientist (Plant Biologist)

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ABSTRACT

Glucosinolate Transport Engineering in Indian Oilseed Mustard for Higher Nutritional Value and Uncompromised Defense Response

The presence of high amounts of seed glucosinolates (>100 ppm) in Indian oilseed mustard cultivars is known to reduce the nutritional value vis-à-vis its acceptance in the global market. The conventionally bred Canola quality rapeseed and mustard cultivars are low glucosinolates in seeds (<30 ppm) as well as in vegetative parts of the plants, however, rendering them vulnerable to generalist pests and pathogens. Two groups of glucosinolate transporters, GTR1 and GTR2 are components of the source-to-sink translocation network of glucosinolates in the Brassicaceae family members. We identified multiple *GTR1* and *GTR2* homologs in Indian oilseed mustard (*Brassica juncea*) and performed in-depth functional characterization based on gene expression data, biochemical analysis, gene-complementation studies in the *GTR*-deficient mutant and RNAi-based knockdown followed by insect feeding experiments. Very recently, we also reported the development and characterization of ideal mustard plants by CRISPR/Cas9-based editing of multiple glucosinolate transporters. Our results show the requirement of editing multiple *GTR1* and *GTR2* homologs to achieve the desired phenotype. We have analyzed the *GTR*-edited plants through three generations, developed homozygous lines that are free of the vector DNA, and shown that the edited plants are normal in their growth and development and similar to wild-type mustard in their yield-related parameters and plant defense traits. The development of low-seed, high-leaf glucosinolate mustard plants presents a breakthrough in the breeding of oilseed Brassicas for improving the oil and seed-meal quality without compromising the protection provided by glucosinolates to all the vegetative parts of the plant.

SPEAKER'S PROFILE

Dr. Naveen Bisht is a Plant Biologist working as a group leader at NIPGR, New Delhi. He has made significant contributions in the area of plant secondary metabolism and nutritional genomics in Indian oilseed mustard. To enhance the nutritional quality of the Indian oilseed mustard, his group reported (i) the development of stable low glucosinolate transgenic mustard lines and (ii) bio-fortification with a high amount of anti-cancer compound, glucoraphanin. His group for the first time elucidated the structure-function relationship of methylthioalkylmalate synthases (MAMS) that contribute to glucosinolate diversity in the Brassicaceae family. Dr. Bisht's group has recently demonstrated the CRISPR/Cas9-mediated editing of the glucosinolate transporter gene family to develop low-seed, high-leaf glucosinolate mustard with improved nutritional value and uncompromised defense and yield traits.

The quality of his research is evident by his impressive list of publications in highly reputed plant science journals (like The Plant Cell, The Plant Journal, Plant Biotechnology Journal, Plant Cell & Environment, Journal of Experimental Botany), well-written reviews and book chapters, and four Patents to his credit. With his outstanding contributions to plant biology, Dr. Bisht has been awarded the prestigious DBT- S. Ramachandran National Bioscience Award for Career Development, NASI-Scopus Young Scientist Award, Max Planck India Fellow, DBT-Innovative Young Biotechnologist Award, NIPGR-DDPSC Visiting Scientist Fellowship, and INSA Young Scientist Medal. He is an elected fellow of all the national science academies including The Indian National Science Academy (INSA), New Delhi; The Indian Academy of Sciences (IAS), Bangalore; The National Academy of Science (NASI), India; and the National Academy of Agriculture Science (NAAS), India.

Sectional Committee X

Lecture New Fellow

DR. PK GHOSH

Director and Vice-Chancellor

National Institute of Biotic Stress management, Raipur

ABSTRACT

Addressing Abiotic Stresses to impart Sustainability in Indian Agriculture

Indian agriculture, a cornerstone of the nation's economy and the sustenance of a vast population, grapples with several pressing edaphic, climatic, and socio-economic challenges. While the Indian agriculture sector has made remarkable progress since the era of the Green Revolution, leading to enhanced food security, it has done so at the cost of significant resource degradation, affecting soil, water, and environment the most. Currently, widespread soil degradation, declining groundwater resources, and discernible climate fluctuations have emerged as the primary obstacles to achieving sustainable agriculture and ensuring the projected food demand for the future. This adverse situation needs new science-led innovative solutions. Our research outcomes, encompassing conservation agriculture modules for smallholders, soil moisture conservation using locally available bio-resources, crop diversification incorporating legumes to diversify cereal-dominating production systems, integrated plant nutrient supply to enhance nutrient efficiency, climate-adaptive intercropping systems that efficiently manage resources, cropping systems aimed at higher carbon sequestration, and improved fallow management (rice fallows and kharif fallows) hold significant potential for improving soil health, crop productivity and climate adaptation. Innovative approach of developing agri-flim based low cost water harvesting structure like "jalkund," and their widespread adoption, could enhance sustainable intensification, enabling double/triple cropping in handicapped rainfed hill ecosystem. Implementing these sustainable soil and crop management practices, in conjunction with effective policy interventions, is crucial for safeguarding the future of Indian agriculture, ensuring food security and achieving sustainable development goals (SDGs). These research endeavor also remains centered on balancing the imperative for increased agricultural productivity with environmental sustainability and social equity. However. there is a need for continuous research efforts to focus on technology development, refinement, and their wider adoption among farmers to minimize yield gaps.

SPEAKER PROFILE

Born on 13th December 1962 at Murshidabad, West Bengal obtained B.Sc. Agri. (1985) with First Class (70.2%) from Visva-Bharati, West Bengal, M.Sc. Agronomy (1988) with First Class First (90 %) and Gold Medal from G. B. Pant Univ. Agric & Tech, Pantnagar, India; and Ph.D. (1992) with a First Class First (90 %) from GBPUAT, Pantnagar. Dr. Ghosh served as Scientist (1993-99) at ICAR-DGR, Junagadh, Gujarat; Senior Scientist (1999-2006) at ICAR- IISR, Bhopal, Principal Scientist (2006-09) at ICAR Research Complex for NEH Region, Meghalaya; and Head, Crop Production (2009-2012) at ICAR-IIPR, Kanpur Director,IGFR, Jhansi(2012-2017)and National Coordinator (NAHEP) (2017-2020) at ICAR. He joined as Founder Director and Vice-Chancellor (2020 to till date) at ICAR-NIBSM, Baronda, Raipur. His pioneering works on carbon sequestration, resource use efficiency, conservation agriculture, crop diversification and sustainable intensification, soil water conservation, Integrated Farming System (IFS), have been considered as outstanding contributions benefitting large numbers of farming community across the globe, as a result as top two percent of agricultural scientists at global level. He published 24 books and 173 research papers in the high impact factor journals with the total citation of 9278, h-index of 46 and i-10 index of 122. He is recipient of 19 national awards including M.S. Randhawa Memorial Award for best Administration, Excellence in Science Award, Sardar Patel Outstanding–Best ICAR Institute Award for leadership, Harikrishan Shastri Award (IARI), ISA Gold Medal, Dr K.G. Tejwani Award, ICAR Vasantrao Naik Award for Dryland Agriculture, ICAR Inter-disciplinary Team Award, IMPHOS-FAI Award, PPIC-FAI Award, AAAS Senior Award, etc and Fellow of top three Academy of country (INSA,NASI and NAAS) and three professional society ISA,Indian Society of plant Physiology and West Bengal Academy of Science and Technology. He is also Member, Royal Society Research (London).He demonstrated scientific leadership as Chairman by organizing 23rd International Grassland Congress (IGC) held first time in India with 450 internationals delegates, Executive Member, IGC continuing committee (South-East Asia), Sectional President, Agricultural Section (2013) Indian Science Congress. Dr Ghosh hold many important positions nationally and internationally, few of them are Member, DST task force on Climate change forestry, Chairman, National fodder planning committee, Chairmen/Coordinator/Convener of many seminar / workshop / conference / brainstorming, Member, Board of Management / Academic Council / of 9 Universities including Country expert / Coordinator of many international projects funded by CGIAR/FAO/World Bank.

Sectional Committee X

Lecture New Fellow

DR. ARVIND KUMAR

Deputy Director General-Research

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) Patancheru, 502 324, India

ABSTRACT

Developing climate resilient rice utilizing genomics and phenomics approaches

Drought and water-limited conditions are a regular problem on more than 20 million hectares in Asia and more than 80% of the rice area in Africa. The eastern Indo-Gangetic Plains is one of the major drought-prone rice producing regions of the world. Of the 20.7 million hectares of rainfed rice area in India, around 13.6 million hectares are prone to drought. It has been estimated that 36% of the total value of rice production is lost during a drought year in eastern India and the economic costs of drought have reached USD 100 million per year. Climate change predictions indicate more frequent and severe drought stress appearance and severe water shortages to rice cultivation especially in the rainfed regions. Several physiological traits have been reported to be linked to drought tolerance. However, it has been very difficult to combine such physiological mechanisms appropriately to obtain the desired yield increase under drought. Direct selection for grain yield under drought and combining high yield potential and good yield under drought has been suggested as an efficient alternative strategy. The focus over the last twenty years shifted from using secondary traits to grain yield under drought through repeated phenotyping experiments utilizing standardized phenomics tools and techniques. Grain yield under drought was found to be moderately heritable and this suggested the possibility of improving yield under water-limited conditions. We identified 14 stable QTLs for grain yield under drought: qDTY1.1, qDTY1.2, aDTY2.1, qDTY2.2, qDTY2.3, qDTY3.1, qDTY3.2, qDTY4.1, qDTY6.1, qDTY6.2, qDTY8.1, qDTY9.1, qDTY10.1, and qDTY12.1. These QTLs showed effect under different genetic backgrounds as well as under diverse ecologies. Several large-effect QTLs for grain yield under drought such as qDTY1.1, qDTY2.1, qDTY2.2, qDTY3.1, qDTY4.1, qDTY6.1, qDTY9.1, qDTY10.1, and qDTY12.1 showed effect under both upland and lowland reproductive-stage drought. Unfavorable linkages of qDTY s with low yield potential, very early maturity, tall plant height was successfully broken. Identified QTLs were used on large scale in marker assisted breeding programs to develop rice varieties with improved yield under drought and improved versions of Vandana, Anjali, IR64, Sambha Mahsuri, Swarna sub1, MTU1010 from India, Sabitri from Nepal, MR219, MRQ 74 from Malaysia were developed. The study also developed lines

combining tolerance to submergence and drought by introgressing qDTY1.1, qDTY2.1, and qDTY3.1 in Swarna sub-1. Developed near isogenic lines (NILs) for different drought grain yield QTLs as well as breeding lines possessing up to 11 genes/QTLs for drought, submergence, and resistance to diseases-insects. Pyramiding of qDTYs into a single genetic background has shown a yield advantage over genotypes with a single QTL under drought. The introgression of one QTL led to a yield increase of 0.5 t/ha in Vandana and the introgression of two QTLs showed a yield advantage of >1.0 t/ha in Sambha Mahsuri and IR64. The addition of three QTLs in Swarna led to a further increase of >1.5 t/ha under drought. IR64 introgressed with qDTY2.2 and qDTY4.1 was released recently as variety DRR dhan 42 in India, Sukha dhan 4 in Nepal, and Yeanelo 4, 5, 6, and 7 in Myanmar. Three lines combining submergence and drought tolerance are released as varieties- CR dhan 801 in India and Baghuguni dhan 1, Baghuguni dhan 2 in Nepal. Further, the study identified superior haplotypes for known genes that can contribute to increase in- tiller number by 13-20%, panicle length by 18-27%, yield by 17-26%, Zn by 29-34%, Fe by 34-46% were identified that could help bring a significant increase to rice yield.

Direct seeded rice has emerged as another area for increasing rice resilience to climate change and looming water shortage scenario. Currently, dry direct seeded rice (DDSR) is becoming more popular in South Asia, Southeast Asia, and, to some extent, in West Africa. The cultivation of DDSR is being practiced with several modifications of tillage or land preparation and crop establishment with a site-specific package but has not gained the required popularity because of absence of required traits in rice cultivars for adaptation to DDSR and yield decline under DDSR situation of currently grown varieties suited for transplanted situation. The development of DDSR varieties depends on several factors, such as selection of traits, identification, and introgression of genomic regions associated with those particular traits of interest. The traits that are expected to play an important role in providing yield stability and adaptability under directseeded conditions include germination from deeper soil depth, early vigor, anaerobic germination, root plasticity for enhanced nutrient use efficiency, tolerance to nematode, tolerance to lodging and grain yield under DDSR in addition to resistance/tolerance to prevalent insects-diseases. We identified 16 QTLs for grain yield and related traits under dry direct seeded situation: qGYDS1.1, qGYDS6.1, qGYDS8.1, qGYDS10.1 for grain yield under dry direct seeded situation; qEUE1.1, qEUE11.1-QTLs for early uniform emergence; qEVV9.1, qEVV5.1- QTLs for high early vegetative vigor; qLDG3.1- QTLs for lodging resistance; qRHD1.1, qRHD8.1,qRHD5.1- QTLs for root hair density, high nutrient uptake (N,P), and qNR4.1 for nodal root, high nutrient uptake; qMG7.2 – for nematode tolerance; qGYLD5.1, qGYLD10.1- for grain yield under nematode infestation. Introgressed these qQTLs into improved genetic backgrounds and developed more than 50 near isogenic lines with different combinations of QTLs showing improved yield and adaptation under DDSR.

SPEAKER PROFILE

Dr. Arvind Kumar has been the driving force of research on drought tolerance and direct seeded rice for water short rainfed areas of Asia and Africa. His work on developing crop varieties with better climate resilience using genomics and phenomics tools, training scholars and scientists to use the advanced technologies in breeding and working with seed system to enable quick access of seed of the newly developed varieties have benefited farmers of more than ten countries including India. PhD from Indira Gandhi Krishi Vishwavidyalaya, Raipur- International Centre for Genetic Engineering and Biotechnology, New Delhi in plant breeding, genetics and post-doctoral training from the International Rice Research Institute, Philippines on drought molecular breeding, Dr. Kumar carries with him more than 30 years' experience in crop improvement, trait discovery for tolerance to drought, direct seeded rice, disease- insect resistance and translational research. Starting his professional career with Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh and climbing ladders to move to International Rice Research Institute IRRI), Philippines and then to International Crops Research Institute for the semi-arid tropics (ICRISAT), Hyderabad as its Deputy Director General-Research. At, IRRI, Philippines, Dr. Kumar served at different positions including scientist, senior scientist, interim head, Division of Plant Breeding, Genetics and then as Director, IRRI South Asia Regional Centre, Varanasi. Dr. Kumar established the IRRI South Asia Hub, Hyderabad as well as IRRI South Asia Regional Centre, Varanasi and served as its first Director. Dr. Kumar has to his credit more than 65 varieties released and being cultivated in 10 different countries of Asia and Africa including more than 20 varieties in cultivation in India. He identified 7 of the ten known genes for resistance against rice gall midge (gm 3, Gm 4, Gm 5, Gm 7, Gm 8, Gm 9 and Gm 10 of the ten known Gm 1, Gm 2, gm 3, Gm 4, Gm 5, Gm 6, Gm 7, Gm 8, Gm 9 and Gm 10), 14 stable QTLs for grain yield under drought (qDTY1.1, qDTY1.2, aDTY2.1, qDTY2.2, qDTY2.3, qDTY3.1, qDTY3.2, qDTY4.1, qDTY6.1, qDTY6.2, qDTY8.1, qDTY9.1, qDTY10.1, and qDTY12.1) for grain yield under drought in rice, stable QTLs for grain yield related traits under dry direct seeded situation (qGYDS1.1, qGYDS6.1, qGYDS8.1, qGYDS10.1 for grain yield under dry direct seeded situation; qEUE1.1, qEUE11.1-QTLs for early uniform emergence; qEVV9.1, qEVV5.1- QTLs for high early vegetative vigor; qLDG3.1- QTLs for lodging resistance; qRHD1.1, qRHD8.1, qRHD5.1- QTLs for root hair density, high nutrient uptake (N,P), and qNR4.1 for nodal root, high nutrient uptake; qMG7.2 – for nematode tolerance; qGYLD5.1, qGYLD10.1- for grain yield under nematode infestation, and 02 QTLs for high Fe, high Zn. Several large-effect QTLs for grain yield under drought such as qDTY1.1, qDTY2.1, qDTY2.2, qDTY3.1, qDTY4.1, qDTY6.1, qDTY9.1, qDTY10.1, and qDTY12.1 showed effect under both upland and lowland reproductive-stage drought. Unfavorable linkages of qDTY s with low yield potential, very early maturity, tall plant height was successfully broken. Dr. Kumar took initiatives to introgress drought grain yield QTLs as well as QTLs enhancing rice adaptation to direct seeded situation to improved popular varieties of rice of different countries using genomics tools and also for combing tolerance to drought together with submergence tolerance and resistance to diseases and insects and developing breeding lines up to 11 genes/QTLs. IR64 introgressed with qDTY2.2 and qDTY4.1 was released as variety DRR dhan 42 in India, Sukha dhan 4 in Nepal, and Yeanelo 4, 5, 6, and 7 in Myanmar. Three lines combining submergence and drought tolerance are released as varieties- CR dhan 801 in India and Baghuguni dhan 1, Baghuguni dhan 2 in Nepal. For direct seeded rice, Dr. Kumar introgressed these qQTLs into improved genetic backgrounds and developed more than 50 near isogenic lines with different combinations of QTLs showing improved yield and adaptation under DDSR. These identified QTLs are now being used on large scale in marker assisted breeding programs across the globe the world to develop rice varieties with improved yield under drought.

He trained scholars and scientists from India to use genomic tools in breeding and have developed a good strength of rice scientists using genomic tools in breeding in India. Dr. Kumar is also credited for identification of superior Haplotypes for yield and related traits that can contribute to increase in- tiller number by 13-20%, panicle length by 18-27%, yield by 17-26%, Zn by 29-34%, Fe by 34-46% and could help bring a significant in breaking the yield barrier in rice. He has also developed speed breeding protocols and facility for rice in India. He has published more than 205 research manuscripts, 34 book chapters, 5 books, possess 1 patent and 6 germplasm registrations. Arvind has supervised more than 33 scholars and Post-Doctoral Fellows, many of them have successful careers in agricultural research including some in the CGIAR system. Arvind has been bestowed with several awards during his successful research career. These include- Honor from Government of Nepal for contribution to Agriculture in Nepal, Rafi Ahmad Kidwai Award, 2014 in Crop and Horticultural Sciences, Government of India, Fellow, National Academy of Agricultural Sciences (FNAAS), Best Scientist Award of Indira Gandhi Agricultural University, Raipur, Young Scientist Award from Madhya Pradesh Council of Science & Technology (MPCOST), Madhya Pradesh, India and University Gold medal of Indira Gandhi Agricultural University, Raipur, India.

Chair: **Professor AS Raghavendra, FNA**

Sectional Committee VII

Lecture New Fellow

DR. PV SHIVAPRASAD

Plant Molecular Biologist

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ABSTRACT

Histone variant H4.V: a gatekeeper to H4K5Ac marks and salt stress transcriptome

Paralogous variants of canonical histones guide accessibility to DNA and function as additional layers of genome regulation. Across eukaryotes, mechanism of action and functional significance of several variants of core histones are well-known except that of histone H4. We identified a novel variant of H4 (H4.V) expressing tissue-specifically among *Oryza* members. This variant mediated specific epigenetic changes contributing to salt tolerance. H4.V was incorporated to specific chromosomal locations where it blocked deposition of active histone marks. Stress dependent re-distribution of H4.V enabled incorporation of active H4 Lysine5 Acetylation (H4K5Ac) marks. Mis-expression of H4.V led to defects in reproductive tissues and in mounting stress responses. H4.V mediated these alterations by condensing chromatin as seen with cryo-EM structures of reconstituted nucleosomes. These results not only uncovered the presence of a H4 variant among plants, but also of a novel chromatin regulation that might have contributed to the adaptation of semi-aquatic *Oryza* members.

SPEAKER PROFILE

P.V. Shivaprasad is a plant molecular biologist with training in molecular virology, gene silencing, genetics and epigenetics. His lab identified regulators of fruit coloration, molecular mechanism of indica rice domestication, mechanisms of microRNA biogenesis and regulators of plant chromatin boundaries. His lab at National Centre for Biological Sciences Bangalore works at atomic level to organism level and uses genomic, genetic, molecular and biochemical approaches to understand plant processes.

Chair: **Professor AS Raghavendra, FNA**

Sectional Committee VII

INSA Distinguished Lecture

PROFESSOR APPA RAO PODILE

Senior Professor and JC Bose Fellow

Department of Plant Sciences, University of Hyderabad, Hyderabad
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ABSTRACT

Chitin, chitosans and chitooligosaccharides for fungal disease control in plants

Chitin is a polysaccharide of repeated units of N-acetyl glucosamaine (A). The presence of decetylated residues (D) in the chitin, converts it to different chitosans. Chitooligiosaccharides (COS) are the oligosaccharides derived from chitin/chitosan. Chitin, chitosans and COS are now defined in terms of the degree of polymerization (DP-number of monomeric residues) and degree of acetylation (DA/FA – number/proportion of 'A' and 'D' residues), and the pattern of acetylation (PA – the arrangement of 'A' and 'D' residues in the polymer/oligomer).

We showed that chitin supplemented formulations of chitinolytic bacteria showed improved performance in controlling fungal diseases of plants. Further, we also reported the utility of chitinase and crude mixture of COS in reducing the severity of plant diseases. We have characterized an array of bacterial chitinases with special focus on those which show transglycosylation (TG). Using TG improved chitinases, long chain COS were generated to induce immunity in plants. In a collaborative effort, we have also demonstrated the significance of PA of COS in priming of plant cell cultures. The lecture will highlight the work done by 6 of the doctoral students in our lab in understanding the mechanism by which the chitin/chitosans/chitooligosaacharides can contributed to the control of fungal diseases of plants, highlighting our lab's contribution in understanding the transglycosylation by bacterial chitinases and its utility in crop protection.

SPEAKER PROFILE

Professor Appa Rao Podile *has over 34 years of teaching and research experience. He served as the* ***Vice Chancellor*** *of the University of Hyderabad- In Institution of Eminence of Ministry of Education, for about 6 years and is currently a Senior Professor. He works in the area of molecular plant-microbe interactions, with a more recent focus on the soil and crop microbiome of legumes.*

Professor Podile is an ***elected Fellow of all major science academies of India*** *including Indian National Science Academy, Indian Academy of Sciences, Bangalore, National Academy of Agricultural Sciences, New Delhi, National Academy of Sciences, Allahabad, Association of Microbiologists of India, New Delhi, and*

founding Fellow of Telangana Academy of Sciences, Hyderabad. Professor Podile served as President of the Association of Microbiologists of India.

A recipient of the prestigious J.C. Bose Fellowship from DST, the Tata Innovation Fellowship from DBT, the K.C. Mehta Memorial Award in Crop Protection from National Academy of Agricultural Sciences, the Rangaswami Award in Agricultural Microbiology from the Association of Microbiologists of India, the Outstanding Young Scientist Award from the Indian Society of Mycology and Plant Pathology and the Goyal Science Foundation's Rajib Goyal Young Scientist Award in Agriculture. Professor Podile was a Fulbright Fellow in the Academic Leadership Seminar at Cornell.

A committed teacher, Prof Podile has guided 28 students towards their PhDs, besides 4 M.Phils. Prof Podile has a formidable publication and citation record, with about 110 papers in high-impact journals and about 25 book chapters with about 5500 citations with an H-index of 41.

Sectional Committee VII

Lecture INSA Associate Fellow

DR. AMARJEET SINGH

Associate Professor

School of Life Sciences, Jawaharlal Nehru University (JNU, New Delhi)

ABSTRACT

Dissecting the signaling networks for enhanced stress tolerance and crop improvement

Plant's tolerance or susceptibility to stresses, and ultimately the productivity is determined by coordinated function of various genes and proteins. Thus, we have been characterizing key abiotic stress and development signaling genes, including protein phosphatases and phospholipases in rice and chickpea. These genes have been utilized for generating abiotic stress tolerant crop varieties. Also, novel regulators of macronutrient (N, P, K) deficiency have been characterized in Arabidopsis, rice and chickpea. Understanding the function of these regulators and their networks have helped in deciphering the molecular mechanism of macronutrient deficiency tolerance in crop plants. These genes are being utilized for developing crop varieties with improved nutrient use efficiency (NUE) and yield. It will eventually reduce the use of expensive and polluting chemical fertilizers in Agriculture.

SPEAKER PROFILE

Dr. Amarjeet Singh is an Associate Professor at School of Life Sciences, Jawaharlal Nehru University (JNU, New Delhi). He completed his Ph.D. in Plant Molecular Biology at University of Delhi and did the post-doctorate at Washington State University, USA. His area of research interest is Molecular biology and functional genomics of stress tolerance in crop plants for crop improvement He has published more than 40 Research/Review articles in reputed international journals. He has also edited two books and published about a dozen book chapters for his significant research contribution, he has been awarded with prestigious awards including:

- **Pran Vohra Award-2018-19**, Indian Science Congress Association (ISCA), India.
- **Young Scientist Platinum Jubilee Award-2017**, National Academy of Sciences, India (NASI).
- **SERB-DST Young Scientist Award**-2015, DST, Govt. of India.
- **Membership** of NASI, 2021.

PROFESSOR RUCHI ANAND

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Wellcome Trust-DBT India Alliance Senior Fellow

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ABSTRACT

Deciphering the mechanism of ribosomal methyltransferases mediated antibiotic resistance

Antibiotic resistance has become a silent epidemic that will result in more than 300 million deaths by 2050, if no appropriate action is taken. Repurposing of existing antibiotics and devising strategies to curb resistance is an uphill task and has become increasingly difficult. Towards addressing this grave problem here, we combat the problem of origin of resistance itself and focus on understanding the mechanisms by which pathogens become resistant to existing drugs. One of the prevalent mechanism by which resistance is conferred is by post translationally modifying the protein synthesis machinery, the ribosome. Several antibiotics such as erythromycin bind to the ribosome and kill the pathogens by selectively stalling their protein synthesis. Ribosomal modifying enzymes such as methyltransferases (Mtases) do not allow certain antibiotics to bind the ribosome by methylating select ribosomal bases thereby, cause a steric clash at the antibiotic binding site, thus result in evading their action leading to antibiotic resistance. Here, we decipher the mechanism of action and selective targeting of these resistant conferring Mtases. We have used two enzymes KsgA and Erm both enzymes methylating adenine bases at the N6 position of select bases on 50S and 30S respectively[1]. A combination of Cryo-EM, biochemical, fluorescence and MD approaches on both the Mtases as well as chimeric version of the enzymes revealed that apart from base flipping at the target site, that is crucial for methylation, base flipping at a distal allosteric site, within the Mtase[1,2]. is key in selective recognition of the target RNA. These studies serve as stepping-stone towards development of exclusive inhibitors that can aid in resisting resistance.

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Chair: **Professor H. Balaram, FNA**

SPEAKER PROFILE

Ruchi Anand completed her PhD in 2004 from the Department of Chemistry and Chemical Biology at Cornell University, USA. After conducting postdoctoral research at Sloan Kettering and the University of Pennsylvania she joined IIT-Bombay in 2008 as an Assistant Professor. Her laboratory employs a combination of X-ray Crystallography, Cryo-EM, biochemical and biophysical tools to understand molecular mechanisms with implications to human health. Her current research interests follow a multipronged approach where she has contributed to two major areas, antimicrobial resistance and biosensors development. Towards the first goal of combating drug resistance, she focuses both on unearthing enzyme systems that can serve as new therapeutic targets as well as is involved in understanding the origins of antibiotic resistance itself. Her recent work with bacterial transcription factors has paved the way to structure-guided development of biosensors for aromatic pollutants. Since 2016, she has been serving on the Editorial Advisory board for ACS Sensors. She was the recipient of the National Academy of Sciences Fellowship (FNASc) in 2019 and also won the National Women Bio-scientist Award, Department of Biotechnology, in 2018 and was awarded the CRSI bronze medal for 2020. She is also the recipient of the DBT-Wellcome Trust Alliance Senior Fellowship in 2020. She was admitted as a fellow to the Indian Academy of Science (IASc) in 2022.

Chair: **Professor H. Balaram, FNA**

Sectional Committee VIII

Lecture New Fellow

DR. SHARMILA S. MANDE

Ayush Distinguished Scientist Chair

Ministry of Ayush, GoI,(Former Distinguished Chief Scientist, TCS Research)

ABSTRACT

'Microbiome' for Health & Wellness

The diverse complex microbial communities (called 'Microbiome') inhabiting within and around us play a significant role in our wellbeing. Recent advances in science and technology have enabled studying these innumerable microbes that are present in our body. The emerging field of metagenomics is rapidly becomingthe method of choice for studying the microbiomes present in various parts of the body.The sequencing data obtainedfrom metagenomicsstudies are not only voluminous, fragmented and noisy, but also complex in terms of taxonomic composition. In order to obtain biologically meaningful insights from the enormous volume of the complex data, it is necessary to have appropriate analytics approaches.

The microbial communitiesthat inhabit our body (called'*human microbiome*') outnumber our own cells. An imbalance in thiscommunity has been associated with several diseases and metabolic disorders. Can thisimbalance be captured and utilized as diagnostic markersfor identifying potential driver microbes, predictingthe presence and/or stage of diseasesas wellas for monitoring health?I will exemplify them with some of the exciting outcomes from a select few studies by mygroup.'Microbiome-based'biomarkers hold a lot of promise, especially for early diagnosis of 'asymptomatic' diseases. I will discuss our work on 'microbiome-based'biomarker which can predict the risk of pre-term delivery as early as in the 1sttrimester. I will also talk about how functional potentialof bacteria can be utilized for monitoring gut health of an individual.

Chair: **Professor H. Balaram, FNA**

SPEAKER PROFILE

Dr. Sharmila Mande *received her PhD degree from Indian Institute of Science (IISc), Bangalore in 1991. She had her post-doctoral trainings in Rijksuniversiteit Groningen, The Netherlands and University of Washington, Seattle, USA. After returning to India, she continued her research in Institute of Microbial Technology (IMTech, Chandigarh) and Post Graduate Institute of Medical Education and Research (PGIMER, Chandigarh). She joined TCS in 2001 to start TCS' Bioinformatics and Computational Biology R&D activities and has created a world-class group focusing on Fundamental & Translational Research in niche areas. Post her superannuation last year, she continues as advisor to Life Sciences Research at TCS. She is presenting holding an 'Ayush Distinguished Scientist Chair' position from Ministry of Ayush. She is also a Guest Professor at IIT-Gandhinagar and Visiting Professor of Practice at IIT-Kanpur.*

She is a pioneer in the niche 'Microbiome'/'Metagenomics' field in India and has developed algorithms and solutions having huge translational potentials. These innovations include novel methods for disease-diagnostics, therapy, health-monitoring and other industrial applications. The translational value of her work is evident from her patent-portfolio (54 Granted-patents and several filed-patents). She also has more than 100 publications in peer-reviewed International-journals. She has a number of projects in collaboration with several renowned National and International academic institutes as well as hospitals.

Her immense contributions to the field of 'Computational Biology' has been recognized with several awards which include the 'TATA-Innovista' award for 'Microbiome-based' methods for predicting risk of diseases/disorders and TCS' Distinguished Scientist award. She is a fellow of Indian National Academy of Engineering (INAE).

Chair: **Professor H. Balaram, FNA**

Sectional Committee VIII

Lecture New Fellow

PROFESSOR SAMRAT MUKHOPADHYAY

Associate Professor

Indian Institute of Science Education and Research (IISER) Mohali

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ABSTRACT

Biological Phase Transitions: Where Chemistry and Physics Meet Biology

Cells contain membrane-enclosed organelles that compartmentalize cellular constituents and regulate biochemistry. A growing body of fascinating research now reveals that there is also an alternative mechanism of spatiotemporally-controlled intracellular compartmentalization and organization via liquid-liquid phase separation of intrinsically disordered proteins/regions (IDPs/IDRs) and nucleic acids into noncanonical membrane-less organelles [1]. These functional liquid-like biomolecular condensates can undergo aberrant irreversible phase transitions into gel-like or solid-like amyloid aggregates associated with a range of debilitating human diseases [2,3]. Our longstanding interest in this field led us to discover that the prion protein (PrP) (well-known for its association with mad cow disease and Creutzfeldt-Jakob disease) can undergo phase separation via weak, multivalent, transient intermolecular interactions between the N-terminal domain. An intriguing disease-associated amber stop codon mutation (Y145Stop) of PrP yields a C-terminally truncated intrinsically disordered fragment. We demonstrated that this fragment spontaneously phase-separates into highly dynamic liquid droplets under physiological conditions [3]. Upon aging, these highly dynamic liquid droplets undergo a liquid-to-solid phase transition into highly ordered, β-rich, amyloid-like aggregates that exhibit a characteristic autocatalytic self-templating behavior. The propensity for the aberrant phase transition is much lower for the full-length PrP indicating an evolutionarily conserved role of the folded C-terminal domain. Our recent results also showed intriguing spatiotemporal modulations in complex coacervation of PrP with other neuronal IDPs (α-synuclein and tau) into heterotypic, multicomponent, multiphasic, multilayered condensates in the presence of RNA [4,5]. I will also discuss our surface-enhanced Raman scattering (SERS) and single-molecule FRET (Förster resonance energy transfer) studies that capture exquisite molecular details of biomolecular condensates and dissect the crucial molecular events of phase separation of neuronal proteins that are associated with Amyotrophic Lateral Sclerosis and Frontotemporal Dementia [6,7].

References:

1. Mukhopadhyay *J. Phys. Chem. B.* (2020) 124, 11541 (Feature Article). **2.** Dogra et al. *J. Am. Chem. Soc.* (2019) 141, 20380-20389. **3.** Agarwal et al. *Proc. Natl. Acad. Sci.* (2021) 118, 45, e2100968118. **4.** Agarwal et al. *Nature Communications* (2022) 13, 1154. **5.** Rai et al. *Proc. Natl. Acad. Sci.* (2023) 120, e2216338120. **6.** Avni et al. *Nature Communications* (2022) 13, 4378. **7.** Joshi et al. *Nature Communications* (accepted).

SPEAKER PROFILE

Prof. Samrat Mukhopadhyay was born in Calcutta (now Kolkata), India. After his B.Sc. (Honors in Chemistry) from Jadavpur University, Kolkata, he joined the integrated Ph.D. (M.S. and Ph.D.) program at the Indian Institute of Science, Bangalore in 1997. He did his Ph.D. thesis work (2000-2004) in Organic Chemistry with Prof. Uday Maitra. At that time, he was interested in protein folding and misfolding and decided to have a short stint as a Visiting Fellow at the Tata Institute of Fundamental Research (TIFR), Mumbai where he worked with Prof. G. Krishnamoorthy and Prof. Jayant Udgaonkar. He did his postdoctoral work with Prof. Ashok Deniz at the Scripps Research Institute, La Jolla, California, USA (2005-2008). During his postdoctoral work, he worked in single-molecule biophysics and collaborated with Prof. Susan Lindquist (Whitehead Institute, MIT, Cambridge, USA). He returned to India in late 2008 and joined the faculty of a newly established institution, the Indian Institute of Science Education and Research (IISER) Mohali, where he rose through the academic ranks from Assistant Professor to Professor. His laboratory at IISER Mohali has been interested in the study of intrinsically disordered proteins that undergo amyloid formation and phase separation associated with physiology and disease. His research contribution cuts across the boundaries of biology, physics, and chemistry, and contributed to key conceptual and methodological advancements in the rapidly evolving field of condensate biology. His work has been widely recognized by the international scientific community as demonstrated by his international standing, invitations to speak at prestigious conferences and top-tier institutions across the globe, and appointments to the editorial boards of several reputed international journals. He is a member of the editorial board of the Biophysical Journal (Cell Press) and editorial advisory boards of the Journal of Physical Chemistry (American Chemical Society) and Essays in Biochemistry (Biochemical Society, London, UK). He has also served as an Ambassador of the Biophysical Society (USA). He is a Fellow of the Indian Academy of Sciences (FASc) and the Indian National Science Academy (FNA). He is committed to working to build a diverse and inclusive academic environment, through research, teaching, and mentoring.

Chair: **Professor H. Balaram, FNA**

Sectional Committee VIII

Lecture New Fellow

DR. DIBYENDU SARKAR

project leader

CSIR-Institute of Microbial Technology, Chandigarh

ABSTRACT

Probing *Mycobacterium tuberculosis phoP/phoR* system and its regulatory involvement in mycobacterial physiology and virulence regulation

Our research interest is organized around understanding regulation of mycobacterial physiology, where a small number of proteins like virulence regulator PhoP impacts expression of a large number of apparently unrelated genes, some being turned on and others being turned off by the same protein. In keeping with this, PhoP interacts with a large number of other regulators and DNA sites at numerous locations across the *M. tuberculosis* H37Rv chromosome. We have discovered cross-talk between various regulatory circuits showing convergence of PhoP and other transcription factors to coordinate regulation of ESX-1 dependent ESAT-6 secretion, maintenance of pH homeostasis, switching metabolic status of the bacilli under hypoxia, and coupling of stress responses for better survival of mycobacteria under phagosomal environment. These studies have led to the consideration of how these global regulatory proteins function. Using high throughout assays coupled with traditional microbiology/ biochemical assays, we continue to probe the origin(s) of binding specificity in protein complexes, and investigate the determinants of complex formation to understand the biological consequences of these interactions on mycobacterial physiology, and virulence regulation.

SPEAKER PROFILE

Dibyendu Sarkar received his Bachelors in Science with Chemistry Honours from Presidency College, University of Calcutta and Masters in Biophysics, Molecular Biology and Genetics from University of Calcutta. For doctoral studies, he joined the Biophysics department of the University of Calcutta and received his Ph.D. in 1997. During his post-doctoral stint, he worked at the Molecular biology, Cell Biology, and Biochemistry (MCB) Department of Brown University, USA from early 1998 to late 2002. Since September 2002 he has been working as an independent project leader in CSIR-Institute of Microbial Technology, Chandigarh. His research is organized around understanding transcriptional reprogramming and its impact on mechanisms of stress response, intracellular survival and virulence of the pathogenic tubercle bacilli.

Chair: **Professor Shinjini Bhatnagar, FNA**

Sectional Committee IX

Lecture New Fellow

PROFESSOR AV KURPAD

Professor

St John's Medical College, Bengaluru

ABSTRACT

Human indispensable amino acid requirements and their bioavailability from foods

The indispensable amino acid requirements of humans is important as it defines the quality and types of protein-containing foods that need to be eaten daily, and their national production through agriculture and livestock. This was earlier measured by the N balance method, which gave very low values for the daily requirement; however, this method is not accurate, and was confounded by high 'protein-sparing' energy intakes in the experimental evidence database. We devised an accurate method using carbon-balances with stable isotope (^{13}C) labelled amino acids, that were able to define the requirements in different conditions. This led to a series of published RCTs that became the primary evidence for WHO/FAO/UNU to redefine amino acid requirements in 2007. The main outcome was an increase in the requirement which meant that more quality protein food was required in the diet. The next problem was to define the bioavailability (or digestibility) of these amino acids from dietary protein. This is an important limiting factor. Digestibility has been used to measure protein quality in an index called the Digestible Indispensable Amino Acid Score (DIAAS). Protein quality is important for vulnerable populations subsisting on cereal based diets, and living in challenging environments where intestinal dysfunction may exist. Since the digestion of protein occurs only in the small intestine, which is remote for measurement, and since the activity of colonic bacteria confounds faecal level measurements, amino acid digestibility required measurements at the ileal exit, using invasive techniques like intestinal intubation and perfusion, or the use of ileostomates. We developed a non-invasive dual-stable isotope tracer method (^{2}H and ^{13}C) to characterize IAA digestibility of several uniformly labelled proteins like rice, finger millet, mung bean, chickpea, yellow pea, spirulina, hen's egg and skeletal muscle, and milk protein. These are being entered into a FAO database presently. We have also measured digestibility in young children to optimize cereal-legume mixtures to meet the age-specific DIAAS requirement in complementary foods.

Chair: **Professor Shinjini Bhatnagar, FNA**

SPEAKER PROFILE

Anura Kurpad is Professor of Physiology at St John's Medical College, Bengaluru. He received his MD from St John's Medical College, and PhD from Bangalore University. His research focuses on the physiology, clinical, and public health aspects of human macro- and micronutrient metabolism and requirements, at all stages of the lifecycle. Some concerns that he is investigating include childhood undernutrition and its nutritional rehabilitation while being mindful of creating a double burden of malnutrition, and in the same light, the aetiology of anaemia and micronutrient deficiency in relation to micronutrient requirements and toxicity. He is particularly passionate about the dynamic aspects of metabolism and the adaptability of the human state, to which end he has used stable isotope approaches to non-invasively measure and model these aspects. He is a Fellow of the Royal College of Physicians, London, the Indian Academy of Sciences, the National Academy of Medical Sciences, and the International Union of Nutritional Sciences.

DR. KALPANA LUTHRA

Professor

Department of Biochemistry, All India Institute of Medical Sciences (AIIMS), New Delhi

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ABSTRACT

1038 Coevolution of virus and antibody responses, a guide to HIV-1 vaccine design

More than 90% of the HIV-1 infections in India and more than 50% worldwide are caused by clade C viruses. Broadly neutralizing antibodies (bnAbs) develop in a subset of HIV-1 infected individuals over 2–3 years of infection. In a 5-year longitudinal study conducted in a pair of antiretroviral naïve chronically HIV-1 clade C-infected monozygotic paediatric twins who acquired the infection by vertical transmission, we observed the persistence of bnAbs over time in one of the twin elite neutralizers. Further, we evaluated potential viral characteristics associated with the varied immune profiles by generating single genome-amplified pseudoviruses. The plasma from both donors, sharing a similar genetic makeup and infecting virus, showed the evolvement of bnAbs targeting common epitopes in the V2 and V3 regions of the viral envelope glycoprotein gp120, suggesting that bnAb development in these twins may perhaps be determined by specific sequences in the shared virus that can guide the development of immunogens aimed at eliciting V2 and V3 bNAbs. Characterization of the neutralization-sensitive and resistant viruses coevolving with bNAbs in the contemporaneous AIIMS_330 plasma provides information toward understanding alterations that may have contributed to the development of viral resistance to bnAbs.

Infected infants develop plasma bnAbs frequently and as early as 1-year post-infection suggesting factors governing bnAb induction in infants are distinct from adults. Understanding viral characteristics in infected infants with early bnAb responses will provide key information about antigenic triggers driving B cell maturation pathways towards induction of bnAbs. Herein, we evaluated the presence of plasma bnAbs in a cohort of 51 HIV-1 clade-C infected infants and identified viral factors associated with early bnAb responses. Plasma bnAbs targeting V2-apex on the env are predominant in infant elite and broad neutralizers and circulating viral variants in these infants are susceptible to V2-apex bnAbs. Further, multivariant infection is associated with plasma bnAbs targeting diverse autologous viruses. Our data provides information supportive of polyvalent vaccination approaches capable of

inducing V2-apex bnAbs against HIV-1. Studying the co-evolution of virus and antibody responses during natural infection defining clade C specific epitopes contributes information towards design of a clade C HIV-1 based immunogen.

SPEAKER PROFILE

Dr. Kalpana Luthra is a Professor in the Department of Biochemistry, All India Institute of Medical Sciences (AIIMS), New Delhi, India. She completed her PhD at AIIMS in 1994 and joined as faculty at AIIMS in 1998. She was awarded the Fogarty fellowship in 2002 and availed training in HIV-1 antibody related work at New York University. The major focus of her work has been towards understanding the immune responses elicited by HIV-1 infected adults and children; generation of human anti-HIV-1 recombinant monoclonal antibodies as potential therapeutic reagents against HIV-1 and to map the neutralization determinants on the HIV-1C to identify Indian clade C specific epitopes for immunogen design. She is actively involved in ongoing national and international collaborative research projects in this area of research. Recently, her research group successfully generated an anti-HIV-1 broadly neutralizing antibody from an Indian paediatric elite neutralizer. This antibody is being further characterized to evaluate its potential as an anti-HIV-1 reagent. Further her team has shown that distinct circulating viruses in chronic HIV-1 infected children are associated with maintenance of elite neutralizing activity in chronically HIV-1 clade C infected monozygotic pediatric twins. Her work on circulating HIV-1 in perinatally infected infants defined viral factors associated with early bnAb responses, supportive of polyvalent vaccination approaches capable of inducing bnAbs against HIV-1 (Nat.Commun.,2020). She is a Fellow of the National Academy of Medical Sciences (FAMS).

PROFESSOR PRIYA ABRAHAM

Sr. Professor

The Christian Medical College (CMC) Vellore

ABSTRACT

Cervical cancer screening - changing paradigms

Cervical cancer is the second most frequent cancer in Indian women. Cancer screening guidelines are constantly evolving globally. The Papanicolaou test or Pap smear, used to be the traditional method for cervical cancer screening. It was the mainstay of cancer screening in developed countries from the 1940s. The Pap smear per *se* however has been replaced by liquid-based cytology to increase diagnostic accuracy. More recently, cytology is being replaced by human papillomavirus (HPV) DNA PCR testing and co-testing as per clinical guidelines.

HPV DNA testing has a higher sensitivity than cytology-based screening (94.6% v. 55.4%), but a lower specificity (94.1% v. 96.8%). This implies that a greater proportion of patients without cervical disease would get positive test result, though HPV testing has a strong negative predictive value. Some clinicians prefer a combination of Pap smear and DNA testing (co-testing) to enhance effectiveness of screening. In resource-constrained settings, cytology however is challenging because of poorer quality control, insufficiently trained technologists and lower sensitivity.

To increase the specificity of HPV based testing, HPV genotyping, mRNA testing, and methylation markers are recommended. Self-collected swabs and urine for HPV testing would increase compliance for screening considerably. Most recently, advances in artificial intelligence (AI) show great potential for a more objective, automated detection of cervical precancer and cancer lesions. AI-based methods using smartphones and colposcope images have been introduced in some regions of the world, and are showing very promising results, especially where there is a lack of healthcare infrastructure and trained personnel.

SPEAKER PROFILE

Professor (Dr.) Priya Abraham completed her MBBS, MD and PhD from Christian Medical College. Her main areas of interest are blood borne hepatitis viruses and human papillomaviruses (HPV).

She was Co-PI in one of the first studies in India on molecular epidemiology of HPV infection among Indian women with invasive cervical cancer which was funded by NIH-DBT. Subsequently she undertook studies on prognostic factors in cervical carcinomas which was funded by DBT. She has worked with the

Centre Hospitalier Universitaire Vaudois, Laussane, Switzerland to develop an in-house PCR-reverse hybridization assay for HPV genotyping. She has also worked on an NIH-ICMR funded study, studying the burden of HPV in HIV positive men who have sex with men. She was the laboratory lead in studying the burden of HPV in HIV infected women and more recently studied the burden of HPV genotypes in women with squamous cell carcinoma of the cervix (industry funded). Currently, she is funded by ICMR to study HPV infection in women with Systemic Lupus Erythematosus.

Likewise, she has received ICMR, DBT, British Council, World Health Organization (WHO) support for studies on blood borne hepatitis viruses. Her group investigated novel laboratory markers, molecular epidemiology and resistance markers for these viral infections. She has served as a WHO consultant in Myanmar to formulate National Hepatitis Testing and WHO consultant to Guidelines and Operational Plan for Hepatitis/HIV &STI in Sri Lanka Member of Technical Resource Group (TRG) on Surveillance of Viral Hepatitis, NCDC, Ministry of Family Health and Welfare, New Delhi. She currently serves in three more WHO committees.

She is the recipient of the Business Excellence and Innovative Best Practices Academia Award, 2020 from the New Delhi Institute of Management, the Janani award for Medical Research Leadership, JC Bose Award and Rajiv Gandhi Mahila Shakti National Award. She served as Director of the ICMR-National Institute of Virology for three years (2019-2022), during the most crucial period of the recent pandemic, leading ICMR-NIV to achieve many firsts in country in diagnosis and vaccine related work in SARS-CoV-2. She was also instrumental in the establishment of rabies virus diagnostics in ICMR-NIV. She is now back in CMC Vellore as Senior Professor.

She has 228 national and international publications to her credit.

Chair: **Professor Shinjini Bhatnagar, FNA**

Sectional Committee IX

INSA Distinguished Lecture

PROFESSOR SUBRATA SINHA

National Science Chair (SERB-DST)

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ABSTRACT

Studies on multigenerational endogamous families with a high prevalence of dyslexia indicate that multiple molecular alterations can predispose to this disability

Dyslexia is a common specific learning disability and manifests as difficulty in reading and writing. It does not include difficulties resulting from global deficiencies, either in intelligence or in social opportunity. Interactions of different genes and also gene environment interactions may predispose to dyslexia. There may be different biological components acting in different individuals, giving rise to different endophenotypes – ie. a common endpoint on an assessment scale that can result from diverse biological causes. Dyslexia also has a strong familial pattern. Methods of classical genetics as well as next generation sequencing have been utilized to study dyslexia. There have been a number of candidate genes demonstrated with varying degrees of replicability, though the global preponderance of a set of susceptibility genes has not been seen. We have studied large extended multi-generational families from distinct endogamous groups in order to understand how different the genetic and biological cues can predispose to dyslexia. It is expected that the relative genetic homogeneity within such families would assist in the identification of susceptible genes. India has a large number of endogamous groups, which have arisen from extreme founder events, as shown by a study of Thangaraj and co-workers, 2017, and hence provides a number of opportunities for such studies.

We have studied 3 such distinct families, each one with its own distinct pattern of inheritance. One such family with an autosomal dominant pattern revealed we identified a block of 17 polymorphisms on a 1.9 Mb stretch of chromosome 5q31.3. This comprised of the protocadherin PCDHG cluster genes and TAF7, PCDH1 and ARHGAP26. Modern humans preponderantly have the non-risk form of seven of these variations, while the risk alleles are ancestral and preponderant in Neanderthals and Denisovan genomes as well as in non-human primates and other mammals. Protocadherins are essential for neural migration. This study indicates the role of these variants in the generation of cognitive processes important for proficient reading and writing. Similarly, our other work indicates the role of alternative neurodevelopmental processes in dyslexia predisposition, which may be distinct to the family

being studied. In addition to identifying basic processes related to neurodevelopment, such studies would go beyond a syndromic approach and also help in the reclassification of disorders based on their molecular pathogenesis.

SPEAKER PROFILE

Subrata Sinha is a National Science Chair (SERB-DST) at AIIMS, Delhi and was a J C Bose fellow prior to this. Before his superannuation in Jan 2023, he was Professor and Head, Departments of Biochemistry and of Laboratory Medicine, AIIMS, Delhi as well as Head, Department of Biotechnology for some time. He has also been Dean (Academics/Research/Examinations) at AIIMS. He is fellow of INSA (Vice President (2020-22), IASc, NASI and the National Academy of Medical Sciences. He has also been Director, National Brain Research Centre, Manesar from 2010 to 2017. He has done MBBS and MD (Biochemistry) from AIIMS, Delhi and PhD from the MRC Toxicology Unit, UK.

Dr Sinha's research interests include the molecular basis for specific disease phenotypes. He has been studying the effect of genetic alterations as well a gene expression on glioma, a tumour of the supporting cells of the brain. He has, more recently, studied multi-generational families with a high incidence of dyslexia, in order to identify predisposing genetic variants and to elucidate their role in basic neurobiology. For this he has collaborated with Neurosurgeons, Neuropathologists, Cognitive Scientists, as well as other experts in genomics and molecular and cell biology. Another area of research is recombinant antibody technology where he and his collaborators have generated targeting antibodies to tumour antigens as well as neutralizing antibodies to infectious agents. He has published extensively in important scientific journals and 6 Indian and 3 US patents have been awarded for his work.

Chair: **Professor Shinjini Bhatnagar, FNA**

Sectional Committee IX

Lecture INSA Associate Fellow

DR. VED PRAKASH DWIVEDI

Group Leader

Immunobiology Group, ICGEB, New Delhi

ABSTRACT

Novel Vaccination and Immunotherapeutic Approaches to Combat Tuberculosis

Despite self-reliant rescue from infection, BCG vaccination, and treatment, long-term memory is rarely established against *Mycobacterium tuberculosis* (*M.tb*) resulting in recurrent tuberculosis (TB). Here, we show that berberine (BBR) enhances innate defense mechanisms against *M.tb* and stimulates the specific effector memory (T_{EM}), central memory (T_{CM}), and tissue-resident memory (T_{RM}) responses leading to enhanced host protection against drug-sensitive and drug-resistant TB. Through whole proteome analysis of human PBMCs we identified BBR modulated NOTCH3 pathway as the central mechanism of elevated T_{EM} and T_{RM} responses in the human $CD4^+$ T cells. Moreover, BBR-induced glycolysis resulted in enhanced effector functions leading to superior Th1/Th17 responses in human and murine T cells. This regulation of T cell memory by BBR remarkably enhanced the BCG-induced anti-tubercular immunity and lowered the rate of TB recurrence due to relapse and re-infection. These results thus suggest tuning immunological memory as a feasible approach to augment host resistance against TB.

SPEAKER PROFILE

I am heading Immunobiology Group at ICGEB, New Delhi. My lab is working on understanding the host protective immunity against tuberculosis. We have patented and published various novel immuotherapeutic and immunoprohylatic formulations against tuberculosis.

DR. N. PAVAN KUMAR

Scientist C

ICMR-National Institute for Research in Tuberculosis, Chennai

ABSTRACT

"Immune Biomarkers for Diagnosis of Tuberculosis"

We have identified and validated a set of immune biomarkers from non-sputum specimen samples (plasma) from children with clinical TB, adult TB patients undergoing therapy. The biomarker tests passed the WHO recommended Target Product Profile in this study and therefore holds great promise in revolutionizing TB diagnostics and treatment strategies. Furthermore, our identification of biomarkers that stratify TB infection sites (pulmonary and extrapulmonary) and stages (latent, active, incipient, subclinical, incident) will aid in diagnosis and prognosis. Our work on biomarkers of adverse TB treatment outcomes could potentially transform the approach to TB treatment by identifying patients that may be cured with shorter antibiotics regimens.

SPEAKER PROFILE

A clinical immunologist by training and currently Scientist of ICMR-NIRT. His major areas of research are (1) biomarker discovery in TB infected adults and children (2) understanding host immune responses contribute to the outcomes of TB treatment (3) Vaccine Immunology. He has published around than 125 research articles in peer reviewed journals.

Chair: **Professor Shinjini Bhatnagar, FNA**

Sectional Committee IX

Lecture INSA Associate Fellow

DR. RAKESH KUMAR PILANIA

MD (Pediatrics), DM (Pediatric Clinical Immunology and Rheumatology), MAMS, Assoc-FAMS

Mobile: +91-88721-14008; Email: kumarpilania007@gmail.com

ABSTRACT

Kawasaki disease, and NOT rheumatic fever, now the commonest in India: a message for all patients and health care providers

Kawasaki disease (KD) is a common pediatric vasculitic disorder with a predilection to coronary arteries. We have the country's largest experience on this childhood vasculitides over 30 30-year period. We follow the largest cohort of KD in India and are the only centre that has provided data on the epidemiology of KD in any developing country. Based on our data and extrapolation, we have shown that KD is now the most common cause of acquired heart disease in children in India. We have also demonstrated that the genetic spectrum of KD in India is different from that in Japan and the Western hemisphere. We have shown that transthoracic echocardiography has several limitations for imaging coronary arteries in children with KD. We have recently demonstrated that a Dual Source CT coronary angiography platform is virtually mandatory for the accurate and comprehensive evaluation of distal segments of coronary arteries and the left circumflex coronary artery in children with KD. This work is likely to impact the imaging paradigm of coronary arteries for children with KD.

SPEAKER PROFILE

Dr Pilania has received super-specialty training in Pediatric Clinical Immunology and Rheumatology. He has worked and published extensively on Kawasaki disease (where he has developed novel CT algorithms and investigated genetic pathways and immunomodulatory mechanisms), pediatric lupus, and inborn errors of immunity. Dr. Pilania has been the awardee of several national and international research fellowships and travel awards. He has guided several MD and DM student's research and has been the principal and co-investigator in many national and internationally funded research projects.

Affiliation:

- *Dr. Rakesh Kumar Pilania; MD (Pediatrics), DM (Pediatric Clinical Immunology and Rheumatology), MAMS, Assoc-FAMS*
- *Assistant Professor Pediatrics*
- *Allergy Immunology Unit, Department of Pediatrics, Advanced Pediatrics Centre, Post Graduate Institute of Medical Education and Research, Chandigarh (India)*
- *World Health Organization Collaborating Centre for Education, Research and Training in Pediatric Immunology (2022-2026)*
- *Indian Council of Medical Research Collaborating Centre of Excellence (2023-2028)*
- *Centre of Excellence in Rheumatology, Asia Pacific League of Associations for Rheumatology (CoE, APLAR, 2020-2023 and 2023-2028)*
- *Asia Pacific Society for Immunodeficiencies (APSID) Centre of Excellence (2023-2026)*
- *Centre of Excellence Asia Pacific Association of Allergy, Asthma and*
- *Clinical Immunology (2023-2026)*
- *Nodal Centre for Primary Immunodeficiency Diseases (PIDs) for the National Registry for Rare and other inherited disorder (NRROID)*
- *Joint Treasurer, Indian Society of Kawasaki Disease (2023-2024)*

DR. TARUN KUMAR SHARMA

Associate Professor & head

Department of Medical Biotechnology, Gujarat Biotechnology University, GIFT City, Gandhinagar, Gujarat, India.

Tarun K. Sharma, tarun.sharma@gbu.edu.in

ABSTRACT

Harnessing functional nucleic acids for the diagnosis of snake envenomation

We have successfully performed SELEX on *Bungarus caeruleus* (common Krait) venom to develop a panel of functional nucleic acids (aptamers) that specifically recognizes the common krait venom and was able to discriminate the Krait venom from Cobra, Russell's, and Saw-scaled viper's venom. The aptamers generated against the crude venom also led to the identification of the specific component of the venom, which is β-Bungarotoxin, a toxin uniquely present in the *B. caeruleus* venom. The best performing aptamer candidates were used as a molecular recognition element in a paper-based device. The developed aptamer-based paper device can be used for potential point-of-care venom detection applications.

SPEAKERS PROFILE

Dr. Tarun Sharma is an Associate Professor and currently heading Medical Biotechnology Department at GBU. His laboratory is primarily focusing on developing in vitro diagnostics assays for various clinical problems of national and global importance. He is the recipient of INSA young scientist Medal, DBT IYBA Award, IGNITE Fellowship, BIRAC-Cambridge University UK, Future Science Leader Award by STS-Japan and Australian Endeavour Research Award.

Chair: **Professor RV Sonti, FNA**

Sectional Committee X

INSA Distinguished Lecture

PROFESSOR TAPAN K. ADHYA

Professor

School of Biotechnology, Kalinga Institute of Industrial Technology (KIIT) (Deemed University), Bhubaneswar

adhyas@yahoo.com

ABSTRACT

Reactive-N in India – Policy Analysis to tackle pollution and Reducing Waste

Nitrogen (N) is essential for life, but in its reactive form (N_r), in excess, can cause severe harm to the people and the environment. Five principal threats of N pollution are to wáter quality, air quality, greenhouse gas balance, soil quality, ecosystem and biodiversity. South Asia is a critical region for the anthropogenic effects of the global N cycle and deteriorating impacts on ecosystem services. Nitrogenous fertilizer is a major agricultural input into the cereal-based cropping systems across most of the region. India is the second largest fertilizer consuming country in the World (FAO, 2016) with consequent pollution especially related to fertilizer overuse. Although use of N fertilizer has resulted in a steady increase in crop yields in the country, indiscriminate use has brought extensive negative impacts on ecosystems and environment. In India, recovery efficiency of N applied through fertilizer and manure has declined from ~90% in 1960 to ~37% in 2017. The scenario has prompted overzealous farmers applying in excess of N fertilizers, leading to economic loss as well as leakage of reactive-N to the environment. Government and non-Government measures can support and encourage efficient N management and hence minimize the negative impacts. A total of 306 N-related policies for India have been listed and analyzed. Nearly 70% of the policies were identified as having a potentially positive impact on N_r management. Despite a large number of policies with a potentially positive impact direction, India is a major contributor to all the N_r compounds (ammonia, nitrous oxide and nitrogen oxides). India, which has introduced the UNEA-5 resolution envisages to introduce administrative actions and policies to manage the wastage of fertilizer-N and follow up with the UNEA-5 resolution to reduce N-fertilizer wastage by 50% before 2030. Attention is paid on the following key areas for reducing leakage of reactive N-wastes including (a) Improving the performance of N-fertilizers, (b) Improved management of biological N fixation (c) Improving performance of livestock production, (d) Improved use and proper cycling of organic-N resources, (e) Reduce food wastage and, (f) Introduce measures to improve landscape resilience to N pollution. However, several barriers are required to be removed for effective minimization of

N-wastage by introducing new policy initiatives. Halving N waste may reduce gaseous-N emission by 19% by 2030 & 30% by 2050. Science-based decision making is crucial to move towards N_r sustainability and cleaner environment.

Reference:

1. [FAO] Food and Agriculture Organization of the United Nations 2016, FAOSTAT Database, FAO. (1 December 2016; www.fao.org/faostat)

Acknowledgements

The speaker is grateful to UKRI-GCRF-SANH Project for funding.

SPEAKER PROFILE

Professor Adhya's research has been on paddy with pioneering contribution on greenhouse gas emission including methane and nitrous oxide. He has done outstanding work on sustainable management of tropical soils through use of ecofriendly technologies for maintaining higher levels of productivity with minimal environmental impacts. His current research focus is on valorization of plant biomass and food waste and the circular bioeconomy for carbon and nitrogen as well as policy research on reactive-N in South Asian countries.

Professor Adhya is a fellow of National Academy of Sciences (India), Allahabad and National Academy of Agricultural Sciences. He is also a recipient of Professor Krishna Sahai Bilgrami Memorial Medal of INSA (2012). Professor TK Adhya was elected to the Fellowship of the Indian National Science Academy in 2008.

Chair: **Professor RV Sonti, FNA**

Sectional Committee X

Lecture INSA Associate Fellow

DR. SUBHASH BABU

Senior Scientist

Division of Agronomy, ICAR-IARI, New Delhi

ABSTRACT

Sustainable Intensification for Enhancing Energy Use Efficiency and Reducing Carbon Footprint of Smallholder Farms

Sustainable intensification approaches comprising conservation agriculture (CA), location-specific integrated farming systems (IFS), and agroforestry models were developed. CA practices like no-till direct-seeded rice curtailed energy use by 48.5%, and carbon footprint by 16.5% over conventional system. The induction of pulse crops reduced greenhouse gas intensity substantially over cereal-based monoculture. Similarly, the circular economy-led IFS model enhanced food production, energy use efficiency besides substantially reducing greenhouse gas intensity over crop alone. The Agroforestry systems like Sissoo + pineapple and Alder + large cardamom stored more carbon over crop cultivation, hence identified as carbon efficient systems in northeast India.

SPEAKER PROFILE

Born in a farmer's family in Amlonipur, Bareilly, U.P. He has completed his graduation from CSAUA&T Kanpur (2004), Post-Graduation from BHU Varanasi (2007) and Ph.D. from IARI New Delhi (2012). Currently working as a Senior Scientist at the Division of Agronomy, ICAR-IARI, New Delhi. Research area: Crop diversification, Carbon Management in Agroecosystem and Integrated Farming Systems.

DR. M MUTHAMILARASAN

Assistant Professor

Department of Plant Sciences, School of Life Sciences, University of Hyderabad, Hyderabad 500046, Telangana

Email: muthu@uohyd.ac.in

ABSTRACT

Foxtail millet (Setaria italica): Journey from an orphan crop to a crop with rich genetic and genomic resources

Foxtail millet (*Setaria italica*) is one of the indigenous crops of India; however, little research was performed on this crop to understand the genetics and genomics of agronomic, climate-resilience, and nutritional traits. Also, no genomic resources were available for deploying breeding approaches to develop cultivars with improved traits. In this direction, we have developed several large-scale, genome-wide molecular markers to understand their associations with important traits. Also, we have identified and characterized several stress-responsive gene families to delineate their precise roles in abiotic stress response. The research has promoted this neglected and underutilized crop to a well-studied crop with rich genetic and genomic resources.

SPEAKER PROFILE

Dr. M. Muthamilarasan is an Assistant Professor at the Department of Plant Sciences, School of Life Sciences, University of Hyderabad. He has received his graduate and postgraduate degrees from Madurai Kamaraj University and done his PhD from the National Institute of Plant Genome Research, New Delhi. Given his scientific contributions, he has received several awards, including Fulbright-Nehru Doctoral Research Fellowship, SERB Early Career Research Award, INSA and NASI Young Scientist Medals, and DBT-Innovative Young Biotechnologist Fellowship.

Chair: **Professor RV Sonti, FNA**

Sectional Committee X

Lecture INSA Associate Fellow

DR. ASHUTOSH PANDEY

Scientist

National Institute of Plant Genome Research, New Delhi.

ABSTRACT

Pathway engineering in food crops for enhancing nutritional value and stress response

Flavonoids play crucial roles in various physiological and biochemical processes within plants. These compounds have also been linked to numerous health benefits in humans. In this presentation, I will attempt to provide an insight of transcriptional regulators, specifically those belonging to the MYB and bHLH family of transcription factors. I will elucidate their interplay and how they finely tune flavonoid biosynthesis, enabling genetic manipulation to enhance the nutritional value of crops like banana, tomato, and chickpea. By harnessing these insights, we can pave the way for crops that are not only more resilient but also inherently richer in health-promoting flavonoids, contributing to improved human nutrition and well-being.

SPEAKER PROFILE

Dr. Ashutosh Pandey is a Scientist at the National Institute of Plant Genome Research, New Delhi. With over a decade of experience in plant metabolomics and metabolic engineering he's received the prestigious awards like the INSA Medal for Young Scientist a member of INYAS and a fellow of the Alexander von Humboldt Foundation. He has authored 60+ research publications.

DR. AMIT KUMAR RAI

Scientist D

National Agri-Food Biotechnological Institute (NABI), SAS Nagar, Mohali, Punjab, India

Email: amit.rai@nabi.res.in; amitraikvs@gmail.com

ABSTRACT

Translation of Traditional fermented foods to functional foods enriched with bioactive peptides using foodomics approaches

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 and peptidome of fermented soybean and milk products. 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.

DR. SANTOSH KUMAR UPADHYAY

Assistant Professor

Dept. of Botany, Panjab University, Chandigarh

ABSTRACT

Bioprospecting and characterization of defence-related genes from plant biodiversity

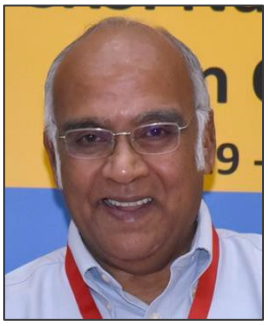
We performed isolation and characterization of a whitefly toxic protein (TMA12) and developed whitefly-resistant transgenic cotton. A few Allium lectins (viz. ASAL, AAA, AFAL) and Bt-Cry1Ac have also been characterized for insecticidal properties along with their compatibility for gene pyramiding. Further, we validated several genes as potential RNAi target for whitefly control. In addition, our group identified and characterized various defense and development-related genes including receptor-like kinases, calcium and other important cation transporters, and enzymatic antioxidants of bread wheat.

SPEAKER PROFILE

Dr. Santosh Kumar Upadhyay is currently working as an Assistant Professor of Botany at Panjab University, Chandigarh. His research group works for the characterization of defence-related genes of wheat. He has been recipient of Young Scientist Awards from three National Science Academies, INSA, NASI and NAAS, along with NAAS-associate.

Session XI

New Category



Chair:

Professor Swaminathan Sivaram, FNA

Dr. Swaminathan Sivaram is a polymer chemist by profession and a mentor as well as a science administrator of distinction. He is a former Director of the CSIR – National Chemical Laboratory, Pune (2002-10), Shanti Swarup Bhatnagar Fellow of CSIR (2010-2015) and J. C. Bose Fellow of the Department of Science and Technology (2006-2014). Currently, he is a Professor Emeritus and INSA Emeritus Scientist at the Indian Institute of Science Education and Research (IISER), Pune, Honorary Professor at IISER-Kolkata and a Professor of Eminence in Polymer Science at Somaiya Vidya Vihar University, Mumbai. From 1973 to 1988, Dr. Sivaram was associated with the Indian Petrochemicals Corporation Limited and helped build the first petrochemicals and polymer industrial R&D Centre in India. He moved to CSIR-NCL in 1988 as the Head of the Polymer Chemistry Division.

Dr. Sivaram is a highly decorated scientist with numerous awards and honours to his credit. He was conferred Padma Shri by the President of India in 2006. He is a recipient of the Gold Medal of the Chemical Research Society of India for his life-time achievements in chemistry (2019) and the International Award for distinguished contributions to polymer science, awarded by the Society of Polymer Science, Japan (2017). Dr. Sivaram earned his B. Sc. degree in Chemistry from Madras Christian College (1965) and is a distinguished alumnus of IIT-Kanpur (M.Sc. 1967). He earned a Ph.D. in Chemistry (mentored by Nobel Laureate Professor H. C. Brown) and D.Sc. (h.c) from Purdue University, W. Lafayette, Indiana, USA. Subsequent to his Ph.D. he was a Research Associate at the Institute of Polymer Science, The University of Akron, Ohio, USA (Professor J.P. Kennedy). He is an elected Fellow of all the learned academies of science and engineering in India as well as The World Academy of Sciences, Trieste, Italy. He is a technical consultant to several reputed Indian companies and serves or has served on the Board of Directors of many leading Indian companies dealing with chemicals and materials. He was a founder Chairman and director of Venture Centre, A Section 8 company, Pune one of the first science driven technology business incubators established in India in 2004. He is also a founder Director of AIC-Society for Entrepreneurial Education and Development and I-HUB Quantum Technology Foundation, both located within IISER, Pune.

Dr. Sivaram 's research interest concerns polymer synthesis, surface chemistry of polymers, porous polymers for energy related applications, biodegradable polymers, organic-inorganic hybrids, nanocomposites and structure-property relationship in polymers. This apart, he is deeply interested in subjects such as

sustainability issues, sustainable energy technology and policies, history of science as well as understanding the inter-play of science, technology and public policies.

He has authored close to two hundred and fifty papers in peer-reviewed journals, edited two books and authored one book. He is cited as an inventor in fifty-one issued US and European patents as well as fifty-two Indian patents. He has supervised the doctoral thesis of about forty students and mentored over fifteen post-doctoral fellows in a research career spanning fifty years.

New Category

Lecture New Fellow

DR. PRAMOD SHANKAR KUMBHAR

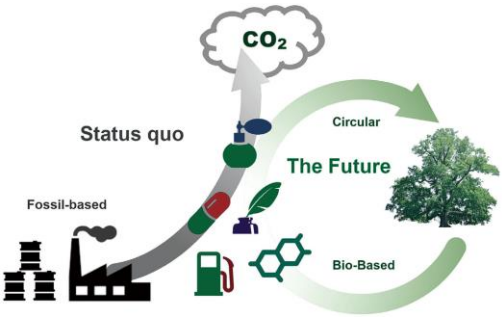
President and Chief Technology. Officer

Praj Matrix - R&D Center, Praj Industries Ltd, Pune

ABSTRACT

Lignocellulosic (LC) Biorefineries: Making Every Carbon Count

A promising alternative to current value chains for producing fuels and chemicals, heavily dependent on petroleum, lies in the so-called biorefinery, which uses renewable biomass and waste streams as the source to produce fuels, valuable chemicals and materials. An ideal biorefinery converts abundant, renewable, and nonedible biomass into products that are currently obtained from fossil fuels as depicted in figure below:



The ability of biorefineries to mitigate greenhouse gas emissions and supply a renewable stream of products and polymers has been heavily discussed especially within more global concepts of circular economy and bioeconomy. Nonetheless, the main challenge of a biorefinery is to valorize all the different components present in biomass in a simple, viable, and energy-efficient process. This talk will highlight the efforts done at Praj industries, after extensive R&D to develop and deploy proprietary Cellulosic Ethanol technology, "enfinity™" at commercial scale. The talk will also touch upon use of the lignin component of biomass to value added products to reach 100% utilisation of carbon in biomass to improve technology viability. The talk will bring out importance of cross-sectoral, multidisciplinary partnerships to speed up and de-risk the industrialization of such technologies, and an integrated view is necessary to achieve process feasibility.

SPEAKER PROFILE

- *Ph.D. in Chemical Engineering from Institute of Chemical Technology (formerly UDCT), Mumbai*
- *Working with Praj Industries, as President and Chief Technology Officer for last 10 years at Praj Matrix – R&D center leading 90+ scientists and engineers*
- *Focused on driving innovations in biotechnology to make biofuels and bio chemicals*
- *Part of elite club of top 500 leaders globally in Bioeconomy in 2022 by Biofuel Digest*
- *UAA-ICT Distinguished alumnus award (Research) for 2020 from UDCT Alumni Association and Institute of Chemical Technology, Mumbai*
- *VASVIK Award for 2020 in chemical Science and Technology*
- *Received the Green Chemistry award from IGCW 2019*
- *Fellow of Maharashtra academy of sciences*
- *Received the ICI process development award from Indian Institute of Chemical Engineers*
- *30+ International patents and publications in scientific journals*
- *Received Bronze and silver medals from GE for patent filings*
- *Recipient of two times President's award in SI group*

.

Annexure-IV

INYAS Lectures 1 & 2

Chair:

Professor Harsh K. Gupta, FNA

Full Name: **Harsh K. Gupta**

Current Affiliations: NASI Platinum Jubilee Fellow
President, Geological Society of India
Member, Atomic Energy Regulatory Board, India
Past President, International Union of Geodesy and Geophysics (IUGG)

Work Address: National Geophysical Research Institute,
Hyderabad- 500007, India

Contact Information: Email: harshg123@gmail.com
W: +91-40-27012600
H: +91-40-27155971
M: +91-9848133350

Important positions held by Dr. Gupta include

Member of the National Disaster Management Authority of India (Status: Minister of State, Government of India, 2011-2014); 2) Secretary to Government of India, Department of Ocean Development (2001- 2005); Director, National Geophysical Research Institute, Hyderabad (1992- 2001); Advisor, Department of Science and Technology, Government of India (1990-1992); Vice Chancellor, Cochin University of Science and Technology (1987- 1990); Director, Centre of Earth Science Studies, Trivandrum (1982- 1987); Adjunct Professor, University of Texas at Dallas (1978- 2001); Research Scientist, University of Texas at Dallas (1972-1977).

Major Scientific Contributions:

Prof. Gupta's work is globally recognized for 1) Developing criteria to discriminate artificial water reservoir triggered earthquakes from normal earthquakes, which are globally applied and finding safe sites for construction of reservoirs, 2) Making a medium term forecast of an M~8 earthquake in north-east India region in 1986 which came true on August 6,1988, 3) Chairing the Steering Committee of the Global Seismic Hazard Assessment Program (G-SHAP) where some 500 scientists worked from 1992 to 1999 and produced the Global Seismic Hazard map, 4) Pioneering the Gas Hydrate program and delimiting the zones for stability of gas hydrates within the exclusive economy zone of India, 6) Taking up detailed studies of genesis of triggered earthquakes in the Koyna region and making successful short term earthquake forecasts.

Indian Tsunami Warning System:

After the occurrence of the devastating 26 December 2004 Mw 9.3 Sumatra earthquake and the resultant tsunami that claimed over 250,000 human lives in south and south east Asia, Prof. Gupta spear headed setting up India's tsunami warning system, which was completed in just 30 months' time. This is now assessed to be among the best tsunami warning systems globally.

Publications:

Dr. Gupta has published over 200 scientific papers in internationally reputed journals, has authored 5 books, published by Elsevier and Springer, and edited 21 volumes. One of his papers was adopted as a chapter in the Open University (U.K.) text- book on Geophysics. His first book, "Dams and Earthquakes", published in 1976 was translated into Russian and Chinese languages. Prof Gupta compiled and edited "Encyclopedia of Solid Earth Geophysics". This monumental 1500+ pages two volume treatise, published by Springer is globally a landmark (website: www.springer.com). The second edition of this Encyclopedia (2050 pages, two volumes) has been published by Springer in 2021.

IUGG/ICSU/AGU/AOGS Etc.

Long time involvement with IUGG (President 2011-2015, Vice President 2007-2011, Bureau Member for two terms, 1999- 2003 and 2003- 2007); IASPEI (Vice President, 1995- 1999, Executive Committee Member 1991- 1995); Chair, Steering Committee of Global Seismic Hazard Program (GSHAP), 1992- 1999; ICSU (Member CSPR, two terms, 2005-2008 and 2008- 2011); Chair, Hazards Group, ICSU Regional Office for Asia and Pacific; ILP (Bureau Member, 1986- 1989; and was made a Bureau Member of ILP for life in 1996); Founder President of the Asian Seismological Commission (1996- 2000); IUGS (Councilor, 2000-2004); Vice President and President AOGS (2010-2013); Member Scientific and Technical Committee of ISDR (2009-15); Member AGU Committee on Public Affairs, The New AGU and a member of AGU Committee on International Participation, etc.

Awards: Many, including:

1983	Shanti Swarup Bhatnagar Prize for Science & Technology in Earth Sciences
1985	USSR Academy of Sciences "100 Years of International Geophysics" Memorial Medal
1991	National Mineral Award, Government of India
1995	CSIR Technology Prize for Business Development and Technology Marketing
1998	Second Outstanding performance Award by the 11th International Kharazmi Festival of Iranian Research Organization for Science and Technology, Teheran, Iran

1999	Federation of Indian Chambers of Commerce and Industry, New Delhi, Award for Physical Sciences,1998-99
2003	Jawaharlal Nehru Visiting Fellowship 2003, Indian National Science Academy
2003	The 4th Prof. C. Karunakaran Endowment Lecture
2003	Bruun Memorial Lecture, 22nd session of the Assembly of International Oceanographic Commission, Paris.
2003	National Mineral Award for Excellence-2002
2006	Padma Shri 2006
2008	Prof. Y. Nayudamma Memorial Gold Medal Award for 2008 from APAS
2008*	Waldo E. Smith Medal Award for 2008 from AGU
2016	Axford Gold Medal of the Asia Oceania Geosciences Society (2016)
2019	IUGG Honorary Fellowship
2021	Prof. W.D. West “Life Time Achievement Award”
2022	Elected Foreign Member of the Russian Academy of Sciences
2022	Elected Fellow of the International Science Council
2022	National Lifetime Excellence Award by the Ministry of Earth Sciences, India.
2023**	International Association of Seismology and Physics of Earth’s Interior (IASPEI) Medal.

*Prof Gupta is the first so far and the only scientist from the developing world to be awarded Waldo E. Smith Medal by the American Geophysical Union. He is also the second from Asia, the only other awardee being from Japan.

**Prof Gupta is the first one to receive this medal outside USA, Europeand Australia.

INYAS Lecture 1

DR. RAJENDRA SINGH DHAKA

Chairperson

Indian National Young Academy of Science (INYAS), INSA, New Delhi

And Department of Physics, Indian Institute Technology Delhi, Hauz Khas, New Delhi-110016, India

rsdhaka@physics.iitd.ac.in

ABSTRACT:

Connecting Science and Society through INYAS

INYAS was founded by INSA in 2015 and currently the only recognized academy for young scientists and by young scientists in India. Our vision is to promote science education and outreach, networking, and support for young scientists, as well as building scientific temperament across the country. We organize many science outreach activities like science camps at school level, awareness workshops, skill development and competition events for various levels covering college students, Ph.D. as well as postdocs. Many of these events, we conduct in local languages to better connect with society. We also conduct survey on different scientific issues faced by young researchers and publish them as whitepapers as well as communicate to different policy makers for a positive change. INYAS organize technical conferences to have more networking among early career researchers, aiming to have more interdisciplinary research collaboration. We also collaborate with other academies as well as organizations for various outreach events. In a nutshell, INYAS provides a great platform for young scientists to learn from each other, and more importantly to work together and contribute back to society in different ways. In this talk, I will highlight some of initiatives and events towards connecting science and society. Towards the end, I will also highlight some of the research projects we are working at IIT Delhi.

SPEAKER PROFILE

Biodata: Rajendra S. Dhaka is currently working as an Associate Professor at the physics department of Indian Institute of Technology Delhi, and Chairperson of the Indian National Young Academy of Science (INYAS). He has received M.Sc. and Ph. D. degrees in Physics from University of Rajasthan Jaipur, and UGC-DAE CSR Indore, respectively. He worked as postdoctoral research fellow at Max Planck Institute for Microstructure Physics, Halle, Germany and at the Ames Laboratory, US DOE, Iowa State University, Ames, USA. He then spent more than a year at Paul Scherrer Institut-Swiss Light Source, Villigen, Switzerland as scientific collaborator. In early 2014, he joined at the physics department of IIT Delhi and involved in teaching, research, and administrative duties. His research interests are in magnetic materials, complex oxides, quantum materials and sodium-ion batteries. He authored around 110 refereed journal papers having >3050 citations and 30 h-index.

Dr. Dhaka is recipient of various awards and fellowships: INSA Medal for Young Scientists-2015 in Physics, DAE Young Achiever Award (YAA)-2018, Satya Murthy Memorial Award in Physics for young scientists-2020 by Indian Physics Association, "Veena Arora early career Faculty research award-2020" at IIT Delhi, SERB Early Career Research Award-2016, DAE Young Scientist Research Award (YSRA)-2015, Young Faculty Incentive Fellowship, at IIT Delhi (2014), Indo-Australia Early and Mid-career Researchers (EMCR) Fellowship-2017, INSA-DFG Fellowship-2019, under International Exchange of Scientists Programme. He is life member of the National Academy of Sciences India (NASI), Materials Research Society of India (MRSI), Neutron Scattering Society of India (NSSI), and Indian Physics Association.

More details can be found at: http://web.iitd.ac.in/~rsdhaka/

INYAS Lecture 2

DR. VEDA KRISHNAN, SECRETARY INYAS

Secretary INYAS and Sr. Scientist

Division of Biochemistry, ICAR-Indian Agricultural Research Institute, New Delhi

ABSTRACT

INYAS: Driving Success through Collaboration

The Indian National Young Academy of Science (INYAS) stands as a beacon of success through its unwavering commitment to fostering collaborations among young scientists across the nation. By providing a platform for these budding intellectuals to connect, share ideas, and pool their diverse expertise, the INYAS catalyzes innovation and propels scientific progress. Through vibrant networks and interdisciplinary collaborations, these young scientists have embarked on transformative research endeavors, leading to remarkable discoveries and ground-breaking solutions. The success stories of these talented individuals, hailing from various corners of India, serve as a powerful testament to the impact of collaborative efforts. Thus, INYASians have not only elevated their own careers but have also contributed significantly to the nation's scientific landscape. INYAS continues to inspire, nurture, and empower the next generation of scientific leaders, showcasing how collaboration and collective intellect are the driving forces behind their remarkable achievements. This talk aims to brief such INYAS success stories, international collaborative assignments, and the way forward.

SPEAKER PROFILE

Veda Krishnan *is an expert in nutritional biochemistry boasting an impressive twelve years of experience at ICAR-Indian Agricultural Research Institute (IARI), New Delhi, India. As the dynamic leader of the Food Matrix Lab, Veda combines her extensive knowledge and innovative thinking to reshape the landscape of global human health with various research initiatives. Recognizing the importance of science communication in fostering public understanding and appreciation of scientific advancements, Veda has actively engaged in science communication initiatives. Her dedication to promoting scientific literacy led her to collaborate with like-minded professionals, culminating in her role as the Secretary of the Indian National Young Academy of Science (INYAS). In this capacity, she continues to advocate for the dissemination of scientific knowledge, bridging the gap between the scientific community and the wider public.*

Annexure-V

New Fellows elected w.e.f.01.01.2024)
(Scrolls and Angavastram)

1. **Professor Priya Abraham**
   Christian Medical College, Vellore
2. **Professor Ruchi Anand**
   Indian Institute of Technology Bombay, Mumbai
3. **Professor Bushra Ateeq**
   Indian Institute of Technology Kanpur, Kanpur
4. **Professor Chandrasekhar Bal**
   All India Institute of Medical Sciences, New Delhi
5. **Professor Bijnan Bandyopadhyay**
   Indian Institute of Technology-Jodhpur, Jodhpur
6. **Dr Sabhyata Bhatia**
   National Institute of Plant Genome Research, New Delhi
7. **Professor SK Bhowmik**
   Indian Institute of Technology Kharagpur, Kharagpur
8. **Professor SD Biju**
   University of Delhi, Delhi
9. **Dr NC Bisht**
   National Institute of Plant Genome Research, New Delhi
10. **Professor JR David**
    Indian Institute of Science, Bengaluru
11. **Professor BS Daya Sagar**
    Indian Statistical Institute- Bengaluru Centre, Bengaluru
12. **Professor Swades De**
    Indian Institute of Technology-Delhi, New Delhi
13. **Professor AP Dimri**
    Indian Institute of Geomagnetism, Navi Mumbai
14. **Professor AK Ganguli**
    Indian Institute of Science Education & Research (IISER), Berhampur
15. **Professor Debasish Ghose**
    Indian Institute of Science, Bengaluru
16. **Dr PK Ghosh**
    ICAR-National Institute of Biotic Stress Management, Raipur

17. **Professor Prasenjit Guchhait**
    Regional Centre for Biotechnology, Faridabad
18. **Professor Neena Gupta**
    Indian Statistical Institute, Kolkata
19. **Professor Sandeep Krishna**
    NCBS-TIFR, Bengaluru
20. **Dr Arvind Kumar**
    International Crops Research Institute for Semi-Arid Tropics (ICRISAT), Patancheru
21. **Dr PS Kumbhar**
    Praj Industries Limited, Pune
22. **Professor AV Kurpad**
    St John's Medical College, Bengaluru
23. **Professor Arul Lakshminarayan**
    Indian Institute of Technology-Madras, Chennai
24. **Professor Kalpana Luthra**
    All India Institute of Medical Sciences, New Delhi
25. **Professor NR Mahapatra**
    Indian Institute of Technology Madras
26. **Professor Lolitika Mandal**
    Indian Institute of Science Education and Research (IISER) Manauli, Mohali
27. **Professor Prantik Mandal**
    CSIR-National Geophysical Research Institute, Hyderabad
28. **Professor SK Mandal**
    Indian Institute of Science Education and Research Kolkata, Nadia
29. **Dr Sharmila S Mande**
    Former Distinguished Chief Scientist, TCS Research, Delhi
30. **Professor NK Mukhopadhyay**
    Indian Institute of Technology (BHU), Varanasi
31. **Professor Samrat Mukhopadhyay**
    Indian Institute of Science Education and Research (IISER) Mohali, Mohali
32. **Dr SVS Mylavarapu**
    Regional Centre for Biotechnology, NCR Biotech Science Cluster, Faridabad
33. **Professor SC Raghavan**
    Indian Institute of Science, Bengaluru
34. **Professor Pratap Raychaudhuri**
    Tata Institute of Fundamental Research, Mumbai

35. **Dr DS Reddy**

    CSIR-Indian Institute of Chemical Technology, Hyderabad

36. **Dr MS Reddy**

    Centre for DNA Fingerprinting and Diagnostics, Hyderabad

37. **Dr Dibyendu Sarkar**

    CSIR-Institute of Microbial Technology, Chandigarh

38. **Professor Nitin Saxena**

    Indian Institute of Technology-Kanpur, Kanpur

39. **Dr PV Shivaprasad**

    Tata Institute of Fundamental Research, Bengaluru

40. **Professor AK Tyagi**

    Bhabha Atomic Research Centre, Mumbai

41. **Dr Sheeba Vasu**

    Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru

Fellows elected in previous years

42. **Professor Sushmita Mitra**

    Indian Statistical Institute, Kolkata

43. **Professor Jyotsna Dhawan**

    CSIR- Centre for Cellular and Molecular Biology, Hyderabad

44. **Dr Manjula N Reddy**

    CSIR- Centre for Cellular and Molecular Biology, Hyderabad

45. **Dr TN Rao**

    National Atmospheric Research Laboratory, Gadanki

46. **Professor Md Zahid Ashraf**

    Jamia Millia Islamia University, Delhi

47. **Professor DS Pandey**

    Institute of Science, Banaras Hindu University, Varanasi

48. **Professor Vijaylaxmi G Trivedi**

    Tata Institute of Fundamental Research, Mumbai

Annexure-VI

INSA Associate Fellows
(recipient of certificate and Angavastram)

1. **Dr Subhash Babu**
   ICAR- Indian Agricultural Research Institute, New Delhi
2. **Dr Dhanya Chandrika Thulaseedharan**
   Institute of Technology (IIT) Delhi, New Delhi
3. **Dr Kaustav Chatterjee**
   Indian Institute of Technology Roorkee, Roorkee
4. **Dr Anindita Das**
   Indian Association for the Cultivation of Science (IACS), Kolkata
5. **Dr Ramendra Sundar Dey**
   Institute of Nano Science and Technology (INST), Mohali
6. **Dr Achintya Kumar Dutta**
   Indian Institute of Technology Bombay, Mumbai
7. **Dr Ved Prakash Dwivedi**
   International Centre for Genetic Engineering and Biotechnology, New Delhi
8. **Dr Diptimoy Ghosh**
   IISER Pune, Pune
9. **Dr Mayanak Kumar Gupta**
   Bhabha Atomic Research Centre, Mumbai
10. **Dr Shubhasis Haldar**
    S. N. Bose National Centre for Basic Sciences, Kolkata
11. **Dr Bhaskar Kanseri**
    Indian Institute of Technology Delhi, New Delhi
12. **Dr Mudrika Khandelwal**
    Indian Institute of Technology Hyderabad, Sangareddy
13. **Dr Subrata Kundu**
    IISER Thiruvananthapuram, Thiruvananthapuram
14. **Dr Rahul Mangal**
    Indian Institute of Technology Kanpur, Kanpur

15. **Dr M Muthamilarasan**
    University of Hyderabad, Hyderabad
16. **Dr Pavan Kumar N.**
    ICMR-National Institute for Research in Tuberculosis, Chennai
17. **Dr Ashutosh Pandey**
    National Institute of Plant Genome Research (NIPGR), New Delhi
18. **Dr Sajeev Philip**
    Indian Institute of Technology Delhi, New Delhi
19. **Dr Rakesh Kumar Pilania**
    Postgraduate Institute of Medical Education and Research Centre, Chandigarh
20. **Dr Amit Kumar Rai**
    National Agri-Food Biotechnology Institute, Mohali
21. **Dr Sayan Ranu**
    Indian Institute of Technology Delhi, New Delhi
22. **Dr Tarun Kumar Sharma**
    Gujarat Biotechnology University, Gandhinagar
23. **Dr Amarjeet Singh**
    Jawaharlal Nehru University(JNU), New Delhi
24. **Dr Arvind Singh**
    Physical Research Laboratory (PRL), Ahmedabad
25. **Dr Prabhat Kumar Singh**
    Bhabha Atomic Research Centre, Mumbai
26. **Dr M Tanveer**
    Indian Institute of Technology Indore, Indore
27. **Dr Shashank Tripathi**
    Indian Institute of Science, Bengaluru
28. **Dr Santosh Kumar Upadhyay**
    Panjab University, Chandigarh

INSA Distinguished Lecture Fellows
(recipient of Citations and Angavastram)

1. **Dr Manjunath Krishnapur**
   Indian Institute of Science, Bengaluru
2. **Professor Aswini Ghosh, FNA**
3. **Professor Asit Kumar Chakraborti, FNA**
4. **Professor Anil Bhardwaj, FNA**
5. **Professor PP Majumder, FNA (**received the citation on 6.12.2023)
6. **Professor Appa Rao Podile, FNA**
7. **Professor Amitabha Chattopadhyay, FNA**
8. **Professor Subrata Sinha, FNA**
9. **Professor TK Adhya, FNA**

Annexure-VII

Special Session on Science, Industry & Society

Chair & Panelist:

PROF. ASHUTOSH SHARMA, FNA

President of the Indian National Science Academy (2023-25), Co-chair of S20/G20 and a former Secretary to the Government of India, Institute Chair & Professor at IIT Kanpur

Ashutosh Sharma is 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.

Chair: **Prof. Ashutosh Sharma, President INSA**

Special Session on Science, Industry & Society

DR. RAKESH MISHRA

Director, Tata Institute for Genetics and Society (TIGS), Bangalore

(Former Director, Centre for Cellular and Molecular Biology (CCMB), Hyderabad), J.C. Bose National Fellow and Distinguished Emeritus Professor, Academy of Scientific and Innovative Research (AcSIR) at CCMB, Hyderabad

Dr. Rakesh Mishra did his university education from the University of Allahabad and received his Ph.D. (Organic Chemistry) degrees in 1986. Subsequently, he started his carrier in biology at the Indian Institute of Science, Bangalore. He has several years of research experience at the University of Bordeaux (France), Saint Louise University (USA) and University of Geneva (Switzerland). He then joined the Centre for Cellular and Molecular Biology (CCMB), Hyderabad, India, and became Director in 2016.

His research interests are comparative genomics of non-coding DNA in the context of evolution of complexity, and role of epigenetic regulation in development. His lab is also interested in how genome interacts with environmental factors. He has published about 195 scientific articles. He is also deeply involved in several verticals of the infectious diseases, rare genetic disorders, and crop improvement programs of TIGS that are currently ongoing.

Under his leadership, the Atal Incubation Centre was established at CCMB, which provides life science entrepreneurs the infrastructure and mentorship needed to encourage innovation. CCMB has also played a key role in genomic surveillance of the SARS-CoV-2 virus in India during the COVID-19 pandemic and made major contributions in diagnostics, drug screening, and capacity building in various efforts against the pandemic.

Dr. Mishra is elected fellow of the Indian National Science Academy, Indian Academy of Science and National Academy of Science, India.

Chair: **Prof. Ashutosh Sharma, President INSA**

Special Session on Science, Industry & Society

PROF. SANGHAMITRA BANDOPADHYAY

Professor (HAG), Machine Intelligence Unit, Director, Indian Statistical Institute, Kolkata

Sanghamitra Bandyopadhyay joined the Machine Intelligence Unit of the Indian Statistical Institute as a faculty member in 1999, after completing her PhD from the same Institute. She was the Director of the Institute from August 2015 to July 2020, and is currently on her second tenure as Director from September 2020 onwards. Sanghamitra has worked in various Universities and Institutes world-wide including in USA, Australia, Germany, France, Italy, China, Slovenia and Mexico, and delivered invited lectures in many more countries. She has received several awards and fellowships including the Bhatnagar Prize, Infosys award, TWAS Prize, DBT National Women Bioscientist Award (Young), INAE Silver Jubilee Prize, Young scientist/engineer medals of INSA, INAE and Science Congress, JC Bose Fellowship, Swarnajayanti Fellowship and Humboldt Fellowship. She is a Senior Associate of ICTP and Fellow of INSA, INAE, NASI and IEEE. She is currently a member of the Science, Technology and Innovation Advisory Council of the Prime Minister of India (PM-STIAC). The current research interests of Prof. Sanghamitra Bandyopadhyay include artificial intelligence, machine learning, soft and evolutionary computation, pattern recognition, data mining and various other applications. She has authored/co-authored more than 300 research article in international journals, conferences and book chapters, and published six authored and edited books from publishers like Springer, World Scientific and Wiley. She has also edited journals special issues in the area of soft computing, data mining, and bioinformatics.

Chair: **Prof. Ashutosh Sharma, President INSA**

Special Session on Science, Industry & Society

DR. PRAMOD SHANKAR KUMBHAR

President and Chief Technology. Officer Praj Matrix - R&D Center, Praj Industries Ltd, Pune

- *Ph.D. in Chemical Engineering from Institute of Chemical Technology (formerly UDCT), Mumbai*
- *Working with Praj Industries, as President and Chief Technology Officer for last 10 years at Praj Matrix – R&D center leading 90+ scientists and engineers*
- *Focused on driving innovations in biotechnology to make biofuels and bio chemicals*
- *Part of elite club of top 500 leaders globally in Bioeconomy in 2022 by Biofuel Digest*
- *UAA-ICT Distinguished alumnus award (Research) for 2020 from UDCT Alumni Association and Institute of Chemical Technology, Mumbai*
- *VASVIK Award for 2020 in chemical Science and Technology*
- *Received the Green Chemistry award from IGCW 2019*
- *Fellow of Maharashtra academy of sciences*
- *Received the ICI process development award from Indian Institute of Chemical Engineers*
- 30+ International patents and publications in scientific journals
- Received Bronze and silver medals from GE for patent filings
- Recipient of two times President's award in SI group

Chair: **Prof. Ashutosh Sharma, President INSA**

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DR. DEEPAK PENTAL

Ex Vice Chancellor, University of Delhi

Deepak Pental has been a Professor of Genetics at the University of Delhi South Campus till 2016. From 2005-10 he served as the Vice-chancellor of University of Delhi. His research interests are in breeding of oilseed mustard and cotton using both conventional and genetic engineering technologies. His group has published around hundred research papers in peer reviewed journals and received a number of national and international patents. He is an elected member of the National Academy of Agricultural Sciences, the National Academy of Sciences, the Indian Academy of Sciences and the Indian National Science Academy and recipient of many awards which include – Om Prakash Bhasin Award in 2008, FICCI award in 2010, D.Sc (hc) from the University of Nottingham in 2012, J. C. Bose Fellowship of DST in 2009 and 'Life Time Achievement Award in Agriculture' by Mahindra and Mahindra foundation in 2018. From 2017-2020 he was a CSIR-Distinguished Scientist. Currently, he is serving as SERB-National Science Chair

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Chair: **Prof. Ashutosh Sharma, President INSA**

Special Session on Science, Industry & Society

DR. DEEPANWITA CHATTOPADHYAY

Chairman & CEO, IKP Knowledge Park

Dr. Deepanwita Chattopadhyay, Chairman & CEO, IKP Knowledge Park, developed the first Life Science Research Park in India, in Hyderabad. She pioneered a Hardware Product Incubator and Makerspace, IKP EDEN, in Bangalore and works with Indian and global partners to support over 1400 innovation projects and early startups. Deepanwita is the recipient of the Golden Jubilee Biotech Park Lifetime Achievement Award 2023. She was recognized as one of the top 10 Enablers and Champions of the Incubation Ecosystem in India by the Department of Science & Technology, GoI in 2022. She received the FICCI FLO Influential Women Award, 2021 for Outstanding Contribution to the Innovation Ecosystem. In 2018 she was awarded the "Top Women Achievers of the Year 2017 in Asia" by AsiaOne Business Magazine and "Women of the Decade in Life Sciences & Innovation" by the Women Economic Forum. She authored the India Chapter for the Global Innovation Index Report GII 2020. After brief stints as an engineering faculty at BITS, Pilani, India and as freelance science writer for children, Deepanwita joined the ICICI Bank, the 3rd largest Bank in India, in 1994 in the telecom practice of ICICI Advisory Services Division. She worked in telecom regulation and policy and advised the government and the private sector on telecom regulation, market forecasts and market entry strategies. She was deputed to IKP Knowledge Park as its CEO in August 2001.Deepanwita took over as the Chairman of IKP in November 2015. She is a Director on the Boards of IKP, IKP Trust, IKP Ventures, Research & Innovation Circle of Hyderabad (RICH) and AIC-CCMB, and the President of IKP EDEN. She is also the Chairman and Co-Founder of a startup, Support Elders Pvt. Ltd.

Deepanwita is a member of the Global Advisory Council and the immediate past Treasurer of the International Association of Science Parks (IASP) with its global headquarters in Malaga, Spain. She is on the Research Council of the Centre for Cellular & Molecular Biology (CSIR-CCMB) - a National R&D Laboratory, on the Executive Council of AGNIi (Accelerating Growth of New India's Innovations), Board of Governors of the Society for Technology Management (STEM) and on the Governing Council of several Incubators in India. She is a member of several National level committees of the Government including the S&T Cluster Apex Committee under the Office of the Principal Scientific Advisor to the Govt. of India, Committee of the Prime Minister's Fellowship for Doctoral Research, DST, GoI, Consultative Committee of S&T and Innovation in NITI Aayog and the Department of Biotechnology Committee on Biotech Parks.
