

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

Minutes of the 88th Anniversary General Meeting of the Indian National Science Academy held on 14-16 December, 2022 at Andhra University and IPE, Visakhapatnam.

The following Fellows were present:

Professor Chandrima Shaha, President, INSA
Professor Gaiti Hasan, Vice-President (Fellowship Affairs)
Professor VG Achanta
Dr Arun Bandyopadhyay
Professor DM Banerjee
Dr SS Banga
Dr Anirban Basu
Professor Santanu Bhattacharya
Professor AJ Bhattacharyya
Dr SN Bhattacharyya
Dr Archana Bhattacharyya
Professor Pinakpani Chakrabarti
Professor Niranjana Chakraborty
Dr SL Chaplot
Dr Subhadeep Chatterjee
Professor SK Das
Professor S Dattagupta
Professor Debashish Chowdhury
Dr Madhu Dikshit
Dr VK Gahalaut
Professor V Ganesan
Professor S Ganesh
Professor SR Ghorpade
Professor Debashish Goswami
Professor MSM Gromiha
Professor Debatosh Guha
Professor Syed Aftab Haider
Professor YV Jhala
Professor YM Joshi
Dr Rupinder Kaur
Professor DV Khakhar
Dr Sanjay Kumar
Professor Vinod Kumar
Professor Palakurissi Balagopal Sunil Kumar
Dr GC Kundu
Professor Sunil Chandran Leela
Dr Subeer S Majumdar
Professor JHN Malik
Professor Mahitosh Mandal
Professor Narinder K Mehra
Dr Hari Mishra
Professor PK Mukherjee

Professor ML Munjal
Professor DT Nair
Professor SK Pal
Professor Ashwani Pareek
Professor G Parthasarathy
Professor Sanjay Puri
Professor VA Raghunathan
Professor S Rajagopal
Professor SS Ramasesha
Professor Udaykumar Ranga
Dr CS Rao
Dr V Bhujanga Rao
Professor Ashoke Sen
Professor Maithili Sharan
Professor Amit Sharma
Professor Anurag Sharma
Professor Arun Kumar Shukla
Professor Sunil Kumar Singh
Dr NK Singh
Professor Mewa Singh
Dr GP Singh
Professor RN Singh
Dr Kulinder Pal Singh
Professor MD Srinivas
Professor MS Sriram
Professor Pradeep Srivastava
Professor JP Tamang
Professor P Tharmalingam
Dr VM Tiwari
Professor AK Verma
Dr Paluru Vijayachari
Professor SP Yendluri
Dr SM Yusuf

In 88th Anniversary General Meeting (14-16 December 2022) the following activities: Presidential address, one public lecture, two award lectures and INSA Anniversary lectures were organized :

14 December, 2022

The inaugural session :

Professor Sunil K Singh, FNA, Director, CSIR-NIO, Goa welcomed the participants and expressed his gratitude for holding this important event in his institution. He informed that for consecutive two times CSIR-NIO is organizing this Anniversary General Meeting of INSA. Address was delivered by Professor Chandrima Shaha, President, INSA followed by remarks delivered by Professor DV Khakhar, FNA, Vice-President, INSA.

The inauguration was followed by the Presidential address on ***Pandemics: the battles reshaping the future*** delivered by Prof. Chandrima Shaha, President, INSA. Summary of the lecture and brief profile is attached at ***Annexure-I, p/ 9-10.***

Anniversary Lectures (14-16 December, 2022)

SESSION 1

CHAIR: Prof. Ritabrata Munshi, FNA, ISI, Kolkata

Sectional Committee I:

- (i) *Galois Representations* by Prof. E.P. Ghate, FNA, TIFR, Mumbai
- (ii) *Graphon-valued Stochastic Processes* by Prof. SR Athreya FNA, ISI, Bengaluru

SESSION 2

CHAIR: Dr. Subeer S. Majumdar FNA, Gujarat Biotechnology University, Gandhinagar

Sectional Committee VI:

- (i) *Emergence of Novel Foraging Skills in Monkeys Inhabiting Human Dominated Landscapes* by Prof. Mewa Singh FNA, University of Mysore, Mysore
- (ii) Sectional Committee VI: *It's a Nematode World* by Prof. Qudisia Tahseen FNA, AMU, Aligarh

SESSION 3

CHAIR: Prof. Anurag Sharma FNA, IIT, Delhi

Sectional Committee II:

- (i) *Geometrical Singularities in the Model of Hard Rigid Rotors on a Lattice* by Prof. Deepak Dhar FNA, IISER, Pune
- (ii) *Thermonuclear Supernovae as Cosmological Probes* by Prof. G.C. Anupama FNA, IIA, Bengaluru

SESSION 4

CHAIR: Prof. AS Raghavendra FNA, University of Hyderabad, Hyderabad

Sectional Committee VII:

- (i) *Biotechnology Based Interventions Involving Animals for Enhancing Quality of Animal and Human Lives* by Dr. Subeer S Majumdar FNA, Gujarat Biotechnology University, Gandhinagar
- (ii) *Understanding the Social Language of Bacteria: Speak or not to Speak?* by Dr. Subhadeep Chatterjee FNA, CDFD, Hyderabad

SESSION 5

CHAIR: Prof. Sourav Pal FNA, Ashoka University, Sonapat

Sectional Committee III:

- (i) *Design and Development of Heterogeneous Catalysts for Sustainable Chemical Industry* by Prof. M Lakshmi Kantam, FNA, ICT, Mumbai
- (ii) *Molecules to Materials by De Novo Design* by Prof. JN Moorthy FNA, IISER, Thiruvananthapuram

SESSION 6

CHAIR: Prof. NR Jagannathan FNA, Sri Ramachandra Inst. of Higher Education and Research, Chennai

Sectional Committee IX:

- (i) *Preclinical Studies with Ayurvedic Drugs to Predict their Efficacy Against COVID-19 Pathologies* by Dr. Madhu Dikshit FNA, CDRI, Lucknow
- (ii) *Multi-disciplinary Approach to Understand Complex Diseases with Public Health Significance* by Dr. Shinjini Bhatnagar FNA, THSTI, Faridabad

SESSION 7

Chair: Prof. DM Banerjee FNA, University of Delhi

Sectional Committee IV:

- (i) *Advent of Plate Tectonics and the Supercontinent Cycle-selected Indian Examples* by Prof. Somnath Dasgupta FNA, ISI, Kolkata
- (ii) *A Narrative of Mathematization of Earth System Science* by Prof. RN Singh FNA, IIT, Gandhinagar

SESSION 8

Chair: Prof. Pinakpani Chakrabarti FNA, Bose Institute, Kolkata

Sectional Committee VIII:

- (i) *Gut Instincts and Gut Reactions: Molecular Mechanisms Underlying the Biology* by Prof. Sandhya S. Visweswariah, FNA IISc, Bengaluru
- (ii) *Of Genomes, Methylomes & Acetylomes* by Prof. DN Rao FNA, IISc, Bengaluru

SESSION 9

CHAIR: Prof. Gautam Biswas FNA, IIT, Kanpur

Sectional Committee V:

- (i) *Towards Quieter Technologies* by Prof. ML Munjal FNA, IISc, Bengaluru
- (ii) *Pattern Recognition, Machine Intelligence to Data Science: Evolution, Challenges and Concerns* by Prof. Sankar K Pal FNA, ISI, Kolkata

SESSION 10

CHAIR: Prof. Mewa Singh FNA, University of Mysore, Mysore

Sectional Committee X:

(i) *Genomics-assisted Breeding of Climate-resilient Crop Varieties* by Dr. NK Singh FNA, IARI, New Delhi
Summary of the lectures and brief profile of the speakers are attached at **Annexure-II, p/ 11-41.**

Award Lectures

(i) Chairperson: Prof. Chandrima Shaha, President, INSA

Professor Vishwa Nath Memorial Lecture (2018) on *World's Most Radiation-resistant Bacterium: Deinococcus radiodurans and What Can You Do With It?* by Prof. SK Apte, FNA, UM-DAE-CEBS, Mumbai.

(ii) Chairperson: Prof. Debashish Chowdhury, FNA, IIT Kanpur

Homi Jehangir Bhabha Medal Lecture (2020) on *The Fascinating Physics of Strongly Correlated Quantum Impurities* by Prof. HR Krishnamurthy, FNA, IISc, Bengaluru
Summary of the lectures and brief profile of the speakers are attached at **Annexure-III, p/ 42-44.**

INSA Website

A new format of the INSA Website has been launched by Professor Chandrima Shaha, President, INSA during the Anniversary General Meeting on 15 December, 2022.

Book Release Ceremony

Chairperson: Prof. Chandrima Shaha, President, INSA

A recorded address by Dr. (Mrs) N Kalaiselvi, DG CSIR (at **Annexure-IV, p/ 45-46**) was played just before the book release ceremony.

“Jiddi - The Zealous Ones” authored by Prof. Sulabha K Kulkarni, FNA, CMET, Pune was released by Dr Madhu Dikshit, FNA

Public Lecture

Chairperson: Prof. DV Khakhar, Vice-President, INSA

Lecture on *The Future of Our Universe* by Prof. Ashoke Sen, FNA, ICTS, Bengaluru

Summary of the lecture and brief profile of the speaker is attached at **Annexure-V, p/ 47.**

Anniversary General Meeting

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

The sad demise of Professors Krishna Manda Venkata Apparao, Kankan Bhattacharyya, Sukumar Shyamlal Merh, Ashoke Nath Mitra, Salem Ramachandrarao Venkatasubba Rao 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.

2. Confirmation of minutes of the Annual General Meeting held on 17 October, 2022.

The minutes of the Annual General Meeting held on 17 October, 2022 were presented by Professor Gaiti Hasan, Vice-President, INSA. These minutes were already uploaded on INSA website. No comments were received. Thereafter, the minutes were confirmed.

3. To read as required under Rule 40(c) the name of nominees for election as INSA Fellow from 1 October, 2022 to 7 December, 2022.

Professor Gaiti Hasan, Vice-President announced that there were no nomination received during 1st October, 2022 to 7th December, 2022.

4. To report Retirement / Resignation / Appointment of staff of the Academy during the year 2022.

Professor Gaiti Hasan, Vice-President announced the names of staff members who were appointed and retired during the year 2022.

During the Anniversary General Meeting, President, INSA presented scroll/ lapel pin / stole to the 52 Fellows (those who were inducted virtually in the previous meeting) w.e.f. 1.1.2023 and inducted to the Fellowship. In addition, Professor SR Athreya and Professor EP Ghate handed over the scroll, lapel pin and tie.

Admission of Fellows under Rule 11

Professor Chandrima Shaha, President INSA presented scroll/ lapel pin / stole to the 52 Fellows (those who were inducted virtually in the previous meeting) w.e.f. 1.1.2023 and inducted to the Fellowship took the oath, signed the Fellowship register. The list is given at **Annexure-V, 48-50**. In addition, Professor SR Athreya and Professor EP Ghate handed over the scroll, lapel pin and tie.

Presentation of awards: a) INSA Medal for Young Scientists
b) INSA Teachers Award

35 Young Scientists (14 from 2021 and 21 from 2020) received the INSA Medal for Young Scientist Award from President, INSA. In addition, 25 Teachers Awardees (12 from 2021 and 13 from 2020) received the INSA Teachers Award from President, INSA. The list is given at **Annexure-VI, p/ 51-52**.

Modification in Rule 21

President, INSA informed the Fellows present about the changes in Rule for Cessation of Fellowship.

After detailed discussion in the Council, it was decided that the proposed Rule will be modified as follows:

CESSATION OF FELLOWSHIP

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21. If any Fellow of the Academy shall willfully disobey Rules or Orders of the Academy or Council, or shall commit a willful breach of order at any of the General Meetings, or having unwittingly committed, shall persist in any disobedience or breach of order, after being admonished by the President, or if for any other reasons **e.g. violation of academic ethics such as data falsification, plagiarism, financial irregularities and proven cases of harassment**, it shall appear to the Council that the name of a Fellow should not remain on the rolls, he/she shall be liable to be removed from the Academy. Whenever there shall appear cause as aforesaid, for the removal of a Fellow from the Academy, if a majority of the Council shall, after due deliberation determine by ballot, to propose to the Academy the removal of the said Fellow, the President shall, at any General Meeting of the Academy, announce from the Chair such determination of the Council, and at the next meeting after that at which the said announcement has been made, the proposition shall be submitted to ballot. If three-fourth of the Fellows present and voting at such General Meeting vote for the removal of such Fellow, he/she shall be removed from the Academy.

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The above modified Rule will be sent for voting to all Fellows.

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

The outgoing member of the Council, Professor Gaiti Hasan, Vice-President and Professor Debashish Chowdhury, Member were felicitated. President, INSA presented them a shawl as a token of respect. (Other members: Professor Subrata Sinha, Professor Amitabha Chattopadhyay, Professor Tarun Kant, Professor M Lakshmi Kantam, Dr SWA Naqvi, Professor EV Sampathkumaran, Members and Professor Paramjit Khurana, Additional Member (Representative The National Academy of Sciences (India), Dr Ashish Kishore Lele, Additional Member (Representative Govt. of India, DST Nominee) were not present during this function). President profusely thanked the members of the Council for their continued support to him in carrying out the programmes during his tenure as a President of the Academy.

5 b. Presentation of memento to outgoing President, Professor Chandrima Shaha.

At this stage Professor DV Khakhar, Vice-President was invited to the dias. He presented the shawl and an album containing representative photographs highlighting the major activities of INSA during the tenure of the President-ship of Professor Chandrima Shaha.

Professor Ashutosh Sharma, President-Elect joined the Anniversary General Meeting online and delivered the address to General Body. Professor Sharma thanked Professor Chandrima Shaha for guiding the Academy and initiating many new programmes under her leadership. He further thanked all Fellows for attending the INSA Anniversary General Meeting in person. He informed due to certain health issue he could not attend the meeting. Professor Sharma mentioned that INSA can play big role to provide useful direction to science and policy makers of the country. INSA could continue to contribute in various ways to science and scientist as it holds flagship of Indian science. He requested all the members, fellows and awardees to think about various ways so that footprints of the academy could be enlarged. Also to find ways and means where the connects of Academies and different stakeholders can be enlarged. He emphasized INSA is a great platform and will be able to connect from school level to policy level, government to industries and academia at a large extent. He profusely thanked INSA Council, both outgoing and incoming members for their enormous support.

The meeting ended with a vote of thanks to the Chair.

**CHANDRIMA SHAHA***President, Indian National Science Academy*

Bahadur Shah Zafar Marg, New Delhi

Email: cshaha04@gmail.com**Pandemics: the Battles Reshaping the Future**

Human health has confronted numerous challenges across centuries, among them infectious diseases were the primary scourge that took many lives and decimated societies. Although communicable diseases have taught us a tremendous amount about science and biology, the viral nature of pandemics has also opened our eyes to how other phenomena important for societal evolution changed with incredible outcomes. In the course of human history, the pandemics that plundered the world have influenced the outcomes of wars, destinies of nations, progress of science, creative expressions of artists and literary endeavours. The pandemics of smallpox, plague, the Spanish flu, the human immunodeficiency virus and the corona virus have imprinted their presence in our genomes, generating variants of certain genes under natural selection that have made us either susceptible or resistant to diseases.

The history of the fight against infectious diseases is remarkable with scientists meaningfully contributing to treatment and survival. Fundamental contributions by Jenner and Pasteur led to the formulation of vaccines that helped blunt the effects of many diseases. The most successfully eliminated contagion is the smallpox eradicated primarily through vaccination. The knowledge of viruses and other infectious pathogens should not blind a medical researcher to ecological and immunological insights that influences the biology of a pathogen and collective knowledge will help in effectively dealing with a pandemic. While it is not possible to predict if the next pandemic will be caused by something similar to the corona virus or something else, better surveillance systems are the ways to detect to build improved medical interventions before an outbreak goes out of control. As evident from the recent pandemic, even after such huge advances in science and technologies, we shall always face contagions and will have to be prepared. The structure of the systems and linkages in which we live will control how well we shall fare in future.



Speaker Profile

Prof. Chandrima Shaha is a biologist, President of the Indian National Science Academy and JC Bose Chair Distinguished Professor of the National Academy of Sciences at the Indian Institute of Chemical Biology at Kolkata. She is also the Former Director of the National Institute of Immunology, New Delhi. Her research interests center around elucidating the processes that influence cell death programs under varying physiological conditions in diverse organisms. She is an elected fellow of the World Academy of Sciences and fellow of all three Science Academies of India. She served as Vice-President of International Affairs of the Indian National Science Academy and as a member in the Councils of all three National Academies. Notable awards include the Ranbaxy Science Foundation Award for basic sciences; the J.C. Bose Fellowship; Shanti Swarup Bhatnagar Medal of INSA; Om Prakash Bhasin Award; Archana Sharma Memorial Award; Darshan Ranganathan Memorial Award; Chandrakala Hora Memorial Medal and the Shakuntala Amir Chand Prize.

**EKNATH P. GHATE***Professor of Mathematics*

TIFR, Mumbai

Email: eghate@math.tifr.res.in**Galois Representations**

Galois representations have become fundamental tools with which to study problems in Number Theory. We shall give an overview of our work on the explicit shape of the reductions of local Galois representations.

Speaker Profile

Eknath Ghate is a Professor of Mathematics specializing in Number Theory. He is mainly interested in studying various number theoretic objects such as modular forms, Galois representations and L-functions from a p -adic perspective. He received the Bhatnagar Award in 2013. He was elected as a Fellow of the Indian Academy of Sciences in 2014 and the Indian National Science Academy in 2021.



SIVA R. ATHREYA

Professor
ISI, Bengaluru

Email: athreya@isibang.ac.in

Graphon-valued Stochastic Processes

We will present our attempts thus far to develop a theory of graphon-valued stochastic processes. We will present a brief review of theory Graphons and dynamics constructed on the space of graphons. We shall construct and analyse a natural class of such processes arising from population genetics. In conclusion we shall present the challenges in our ongoing work on constructing dynamics where the edges and vertices interact with each other. This is joint work with Frank den Hollander and Adrian Roellin.

Speaker Profile

Siva Athreya is a Professor at the Indian Statistical Institute and International Centre for Theoretical Sciences, TIFR. His primary field of interest is probability theory. He has worked on models arising from statistical physics and population biology, particularly Stochastic partial differential equations, Diffusions on tree like networks, Random Graphs and related topics. He got his PhD in Mathematics from the University of Washington, Seattle, in 1998 and has been at the Indian Statistical Institute since 2001. He was awarded the Shanti Swarup Bhatnagar Prize for Science and Technology in 2012. He is the chief editor of the Electronic Communications in Probability. He has coauthored a recent book "Measure and Probability" and is the coauthor of a forthcoming book "Probability and Statistics with Examples using R".



MEWA SINGH

SERB Distinguished Fellow and Distinguished Professor

University of Mysore, Mysore

Email: mewasinghltm@gmail.com

Emergence of Novel Foraging Skills in Monkeys Inhabiting Human Dominated Landscapes

I will describe, from field studies and field experiments on bonnet monkeys of south India and long-tailed monkeys of the Nicobar Islands, how living in urban landscapes, where monkeys usually come across encased and concealed food items, leads to the emergence of novel behaviours and skills related to food extraction and food processing which are not observed in monkeys in forest and rural regions. There will also be a special message for researchers from developing countries where they often have limited research funds available that high standard, even experimental, research can also be carried out with low cost, using local resources.

Speaker Profile

Mewa Singh obtained his Master's degree at Panjab University, Chandigarh, Ph.D. at University of Mysore, and training in Wildlife Management at Smithsonian Institution Washington DC. His research on ecology and behavior of wild mammals, especially of non-human primates, is field based. He has worked in the forests of Himalayas, Western Ghats, Eastern Ghats, and Nicobar Islands. He is an elected Fellow of the three science academies of India, and winner of Sundar Lal Hora Medal of INSA. He is a former Ramanna and J.C. Bose Fellow of DST/SERB, and presently, he is SERB Distinguished fellow at University of Mysore. In his honor for research in biological sciences, a recently discovered new species of a frog from the Western Ghats of India has been named as "Nyctibatrachus mewasinghii" or Mewa Singh's Night Frog. In recognition of his contributions, the University of Mysore has appointed him Distinguished Professor (for life).



QUDSIA TAHSEEN

Professor of Zoology

Department of Zoology, Aligarh Muslim University
Aligarh

Email: qtahseen@gmail.com

It's a Nematode World

Nematodes, with an estimated existence of over 400 million years, are one of the most abundant, ubiquitous, and immensely diverse metazoans inhabiting all types of marine, freshwater, and terrestrial habitats. They are expected to have a high species richness *ca* 50,000 to >100,000 species with only a tiny proportion of species (10-15%) discovered and documented. As their small size, soft bodies and concealed habits contributed to making the fossil record too limited except for those preserved in amber, identifying and understanding the biodiversity patterns of this dominant phylum along with associated evolutionary processes, would be a critical and challenging task. The impact of nematodes on humans is significant and double-edged. As plant parasites, they are one of the major uncontrollable biotic causes of plant stress and crop losses. As animal parasites, they cause the death or debilitation of humans and livestock. They also play a vital role in the trophic food web being part of the food chain at different trophic levels and are involved in nutrient release and cycling. Nematodes serve as indicators of habitat heterogeneity, contamination, or toxicity in the environment since they are common, numerous, and speciose, and live inside or in close contact with interstices of sediments. The manifestation of diverse traits can be due to inhabiting different environments with a good degree of adaptive radiation. Also, the variations could be the result of a few large-scale habitat transitions followed by extensive diversification, or numerous habitat transitions followed by reasonable diversification. One of the reasons for the success of nematodes is, their ability to survive adverse conditions by entering a resistant, dormant metabolic state, sometimes by completely turning off their metabolism (cryptobiosis) for as long as a quarter of a century and finally resurrecting themselves when favorable conditions return. The dispersion to different habitats is also due to phoresy, entoecy, entomopathogeny, and necromeny. The ability to survive, establish and propagate in a particular environment also depends on their resource-finding, -acquiring, and resource-utilizing abilities. Nematodes with a malleable body, exhibit phenoplasticity and character displacement, the remarkable strategies to coexist by minimizing competition.



Speaker Profile

Research Specialization

Nematology, Taxonomy, biodiversity, developmental biology, ecology of soil and freshwater nematodes.

Research work and contribution

The work area includes the **taxonomy and biology of the free-living soil and aquatic nematodes**. Thrust has been given to the **taxonomy of less explored and ignored groups** that have helped building a coherent and sound classification. The innovations in the field of taxonomy have been accredited and recognized in the international community of scientists in the form of the ONTA (Organization of Nematologists of Tropical America) Special Award **for worldwide expertise in nematode taxonomy and sustained excellence in Nematology**.

Other International recognitions

Rothamsted International Fellow (2003); INSA visiting Scientist (2001); INSA-Royal Society bilateral exchange scientist; DBT Overseas Fellow (2006); **Visiting Scholar**, TWAS-CAS (2007-08); **Erasmus Mundus Scholar** (2010-11); **EUMAINE** (European Union Masters in Nematology) Expert; **Indo-Australian Senior Scientist** (2013-14); **Max Planck visiting scientist** (May-Aug, 2018).; National representative of the **International Union of Biological Science (IUBS)** (2019-)

National Honours

Fellow of the three National Science Academies. INSA Young Scientist Medal (1995),

Expert lectures delivered at reputed Institutes Abroad

Rothamsted Research, Harpenden, England; Department of Nematology, University of California, Riverside; Institute of Zoology, Chinese Academy of Sciences, Beijing; Department of Biological Sciences, Ghent University, Ghent, Belgium; Department of Animal Ecology, Bielefeld University, Bielefeld Germany; Ecosystem Sciences, CSIRO, Black Mountain laboratories, Canberra, Australia; Max-Planck Institute of Developmental Biology, Tübingen.

Seven Projects undertaken funded by

Rothamsted International-Royal Society, UK; Indian National Academy of Sciences, Department of Science and Technology, Ministry of Environment and Forests, Scientific and Engineering Research Board, New Delhi.

Reputed labs of Europe (England, Scotland, Belgium, Germany, Netherlands, France etc.), Chinese Academy of Sciences and the University of California, Ohio State University, and New York University visited for collaborative research.

Total publications in international reputed journals = 95

**DEEPAK DHAR***Distinguished Emeritus Professor*

IISER, Pune

Email: deepak@iiserpune.ac.in; deepakdhar1951@gmail.com

Geometrical Singularities in the Model of Hard Rigid Rotors on a Lattice

Molecular solids like nitrogen or cyclopentane, on heating from the low temperature crystalline solid phase, show multiple mesophases where there is a lattice, but there the orientation of the molecules in different unit cells are not the same. These are called plastic solids, or orientational disordered solid phases.

I will consider a simple model of these materials, where rigid nonspherical molecules are pivoted to the sites of a regular lattice, but can take arbitrary orientations, subject to the hard core constraint. I will show that this model shows multiple geometrical phase transitions, where the entropy per molecule is a singular function of the ratio of size of the molecules to the spacing between sites. In many cases, the position and nature of singularities in distribution of orientations can be determined exactly.

Speaker Profile

Deepak Dhar (b. 1951) obtained his M.Sc. Degree in Physics from I.I.T. Kanpur (1972), and Ph.D. from Caltech (1978). He was at the T.I.F.R., Mumbai (1978-2016), and is currently Distinguished Emeritus Professor and NASI Senior Scientist at IISER, Pune. He is known for his work in statistical physics on models of percolation, self-organized criticality, and slow relaxation. He has been awarded the S.S.B. Prize in Physics (1996), S.N. Bose medal of INSA, TWAS prize and the Boltzmann medal (2022).

**G.C. ANUPAMA***Visiting Professor*

IIA, Bengaluru

Email: gca@iiap.res.in**Thermonuclear Supernovae as Cosmological Probes**

Thermonuclear, or Type Ia supernovae are the result of the explosion of a white dwarf that undergoes thermonuclear burning on increasing its mass beyond the Chandrasekhar mass of 1.44 Solar mass due to accretion. Since these supernovae occur in all types of galaxies and at great distances, they are found to be good standardizable and candles and probes of cosmology. In the recent decades, with the onset of several large scale surveys, a significant amount of diversity in the observational properties have been noticed. It is important to understand the nature of this diversity in order to use the type Ia supernovae as effective probes of cosmology. The importance of detailed, long term studies of several type Ia supernovae in the low redshift regions to understand the nature and cause of the diversity will be highlighted in the lecture.

Speaker Profile

G.C. Anupama is an observational astronomer with expertise in the area of time domain astronomy. Currently a Visiting Professor at the Indian Institute of Astrophysics, she retired as a Senior Professor at IIA in 2021. She was the former Dean and also Professor in-Charge of the Indian Astronomical Observatory at IIA. She also held the office of the President of Astronomical Society of India during 2019-2022, with the distinction of being the first woman president of the ASI. She is a Fellow of the NASI and IAS, and also a recipient of the Govt. of Karnataka's Sir C.V. Raman Young Scientist Award in Space Sciences for the Year 2001.



SUBEER S. MAJUMDAR

Director General

Gujarat Biotechnology University, Gandhinagar

Email: subeer@niab.org.in

Biotechnology Based Interventions Involving Animals for Enhancing Quality of Animal and Human Lives

Subeer S. Majumdar, Suveera Dhup, Nirmalya Ganguli, Kamal Mandal, Sarwar Azam and Ravi Gandham

Domesticated and wild animals have evolved along with human and deserve to be respected equally well. Since livelihood of many depend on animals, it is necessary to address issues related to animal health as eagerly as we do for human. With this philosophy, scientific investigations based on modern tools can be undertaken to benefit animals and human both. We have developed few techniques and tools in line with this principal. With the advent of high throughput tools of next generation sequencing (NGS), we are rapidly discovering many new genes based on their sequences, however pace with which their roles in disease biology or productivity is established is less. To study initiation and progression of a disease, involving a gene, now we can make transgenic animals. We have generated a new deathless method for generating transgenic animals using short cut testicular route, which avoids a cumbersome procedure based on embryo manipulation and assisted reproductive techniques. This not only saves animal lives but also opens a scope to generate strong herds of livestock with disease resistance and heat tolerance. Exogenous supplementation of proteins in ailing persons (diseases like cancer, arthritis, osteoporosis etc.) is routinely practiced in clinical set up. However, their exorbitant cost associated with in vitro production and required industrial setup, reduce their access to the masses. Creation of transgenic farm animals which can be used to generate human proteins in their milk (udder gland only) by using genetic engineering is the only alternative to reduce the cost and increase the affordability. Unfortunately, issues related to Genetically modified organisms (GMOs) restrict such avenues. To this end, we have developed a technique where the udder glands of animals are directly transfected with the construct containing genes for expressing human or animal proteins for their therapeutic use, avoiding creation of GMO. We have recently developed the first SNP chip for Indian cows named 'IndiGau' with an intent to identify and conserve native breeds



of cows which have many important traits and which are threatened due to interbreed inbreeding. The same chip may be used for enhancing the milk yield in future.

Speaker Profile

Dr. Subeer S. Majumdar was the Director of National Institute of Animal Biotechnology, until recently and now is the Director General, Gujarat Biotechnology University, Gandhinagar. He has generated a new technique of transgenesis, called as testicular transgenesis which can quickly generate humanized models of diseases, for testing vaccines and therapeutics and opens up avenues for easy, large animal (livestock) transgenesis.

Indian variety of cows have great qualities of heat resistance, disease resistance, draught resistance, stabilized during million years in India is getting lost due to random artificial insemination using imported semen. A high density SNP chip is developed using Next generation sequencing (NGS) of 43 Indian breeds of cows at NIAB. The chip is currently under validation for conservation of indigenous breeds of cow which have many good qualities including, resistance to certain diseases.

He is fellow of all three science academies and recipient of TATA innovation and J.C. Bose fellowships.



SUBHADEEP CHATTERJEE

Staff Scientist-VI (Group Leader)

CDFD, Hyderabad

Email: subhadeep@cdfd.org.in; xoohyd@gmail.com

Understanding the Social Language of Bacteria: Speak or Not to Speak?

Bacteria coordinate their social behavior in a density dependent manner by production of diffusible signal molecules by a process known as quorum sensing (QS). Sensing and adaptation to changing environmental conditions were traditionally attributed to two-component sensors and response regulators. Increasing volume of work now suggests that coordination of responses to fluctuating environments is very complex, as many of the microbial species live in communities under natural conditions. We are using *Xanthomonas* and *Pseudomonas* group of plant pathogens which make diverse quorum sensing signaling molecules to address the mechanism of integration and adaptation to changing environmental conditions. Our work has shown that fine tuning of QS regulatory circuits in closely related members of the *Xanthomonas* group of phytopathogens contribute to their lifestyle change inside the host. We are also trying to understand how the QS-mediated social structure and individuality in the bacteria coexists to improve their fitness in fluctuating environments.

Speaker Profile

Dr. Subhadeep Chatterjee's laboratory at Centre for DNA Fingerprinting and Diagnostics has discovered reversible non-genetic heterogeneity in bacterial social communication systems that coordinate virulence and lifestyle transitions during plant disease. The fundamental findings have implications for bacterial disease management, including those of medical importance, and they give key insights on microbial evolution.

Award and Honors

Shanti Swarup Bhatnagar Prize (SSB) prize--2020 for Science and Technology in Biological Sciences; Elected fellow of the Indian National Science Academy, India (INSA)-2020; Elected fellow of the National Academy of Sciences, India (NASI), 2019; National Bioscience Award for career development (NBACD), DBT (Department of Biotechnology), Government of India, 2017-2018; Member Guha Research conference (GRC), 2017; IYBA-2009 (Innovative Young Biotechnologist Award), DBT (Department of Biotechnology), Government of India.



M. LAKSHMI KANTAM

Dr. B.P. Godrej Distinguished Professor in Green Chemistry and Sustainable Engineering

Department of Chemical Engineering
Institute of Chemical Technology
Matunga, Mumbai

Email: lk.mannepalli@ictmumbai.edu.in; lkmannepli3@gmail.com

Design and Development of Heterogeneous Catalysts for Sustainable Chemical Industry

Catalysis is a highly demanded technology for sustainable society and drives innovation in many other fields. The impact of catalysis and catalysts is substantial. Today over 90 % of all industrial chemicals are produced with the aid of catalysts. World catalyst demand is forecast to grow to \$34.1 billion in 2025 and earlier global sales of catalysts is around 20.6 billion dollars.

Bio-compatible materials as supports and catalysts: Hydroxyapatite (HA) is a hydrated calcium phosphate material, which is an important biomaterial because of its similarity to the mineral component of mammalian bone. We have utilized these materials and their metal exchanged materials as catalysts for C-C and C-N coupling reactions. Similarly, hydrotalcites, anionic clays and the metal exchanged hydrotalcites have successfully applied in any organic transformations. We have developed highly efficient catalytic materials for biomass valorization. Several highly efficient and recyclable Cu-based catalysts were developed for the liquid phase selective hydrogenation of levulinic acid (LA) into γ -valerolactone (GVL) and direct synthesis of furan-2,5-dimethylcarboxylate (FDMC) from oxidative esterification of hydroxymethyl furfural (HMF). Overview of our work on the design and development of catalysts for green, and economical processes & technologies for chemical industry will be presented.

Speaker Profile

Professor Lakshmi Kantam was born in 1955 in Tenali, Andhra Pradesh, India. She received M.Sc. and Ph.D. degrees from Kurukshetra University, Haryana, India. After completing her Ph.D. at Kurukshetra, she worked as a lecturer for one year at JMJ College, Tenali, where she did her graduate studies. In 1984, she joined as a Scientist in Regional Research Laboratory, Hyderabad, now CSIR-Indian Institute of Chemical Technology (CSIR-IICT), and later became the Director of CSIR-IICT in April 2013. In 2015, she served as Professor at Tezpur University, Assam, and at present,



she is Dr. B.P. Godrej Distinguished Professor in Green Chemistry and Sustainable Engineering, at Department of Chemical Engineering, Institute of Chemical Technology, Mumbai. She has 38 years of experience designing and developing catalysts for the chemical industry's innovative green and economic processes. She has authored more than 350+ publications, 42 patents, and six book chapters. She is an Adjunct Professor at Tezpur Central University, Tezpur, Assam, and a Conjoint Professor at The University of Newcastle, Australia. She is a fellow of the Royal Society of Chemistry (FRSC), The World Academy of Sciences (FTWAS), Indian National Science Academy (FNA), and National Academy of Sciences (FNASc). She is in the Board of many companies, Vinati Organics Limited, Godavari Biorefineries Limited, Prasol Chemicals Limited, and Indo Amines Limited.



JARUGU NARASIMHA MOORTHY

Director

IISER Thiruvananthapuram, Vithura, Thiruvananthapuram

Emails: moorthy@iisertvm.ac.in; moorthy@iitk.ac.in

Molecules to Materials by De Novo Design

We consider molecular structure as an embodiment of organic reactivity as well as macroscopic bulk property. By dealing with design at the molecular level, it is possible to control organic reactivity as well as properties of macroscopic solids.

I will present some results of our research in the last few years on how one may control molecular reactivity and develop functional materials in a bottom-up fashion. I will exemplify rational molecular design for the development of organic functional materials, namely, photochromic materials,¹ organic light-emitting diodes,² and porous materials (metal-organic frameworks (MOFs) and porous organic polymers (POPs)).³

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Speaker Profile

Dr. J. N. Moorthy obtained Ph.D degree from the Organic Chemistry Department of Indian Institute of Science, Bangalore in 1994. He pursued postdoctoral research in University of Houston, USA, University of Wuerzburg, Germany and University of Victoria, Canada prior to joining the



Chemistry Department, IIT Kharagpur in 1998. After a 5-month stint, he moved to IIT Kanpur. He has been a full professor at IITK since 2008. He moved to IISER Thiruvananthapuram as the Director in April 2019.

He is a recipient of A ϕ H postdoctoral research fellowship, Germany (1995-96), young chemist award, and bronze and silver medals of Chemical Research Society of India (CRSI), India. He received Shanti Swarup Bhatnagar Prize in Chemical Sciences, India (2008), and Sastra-CNR Rao award in Chemical Sciences (2020). He is a Fellow of Indian Academy of Sciences Bangalore (2010), Fellow of Royal Society of Chemistry (2014) and Fellow of Indian National Science Academy (2018). He has also been a J. C. Bose National Fellow since 2015. He has been on the editorial boards of *New J. Chemistry*, *J. Chem. Sci.* and *Int. J. Photoenergy*. He is presently an associate editor of *J. Chem. Sci.*

His interests are in the areas of supramolecular chemistry, organic materials, mechanistic organic chemistry and organic photochemistry.



MADHU DIKSHIT

JC Bose National Fellow

CSIR Central Drug Research Institute, Lucknow

Email: drmadhudikshit@gmail.com; madhu.dikshit@cdri.res.in

Preclinical Studies with Ayurvedic Drugs to Predict their Efficacy Against COVID-19 Pathologies

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. In most cases, the infection is resolved by the immune cells. Local immune response following infection leads to the recruitment of macrophages and monocytes that release cytokines and prime adaptive T and B cell immune responses. However, in some cases, a dysfunctional immune response triggers a cytokine storm that mediates widespread lung inflammation. During the pandemic several interventions were tried to combat the infection and among the few available therapeutic options, Ayurvedic drugs were also tried for the moderate to severe disease patients. The preclinical studies were undertaken at THSTI to assess the anti-viral and immunomodulatory effect of select AYUSH herbal extracts/formulations (*Withania somnifera* - WS, *Tinospora cordifolia* - TC, *Glycyrrhiza glabra* - GG, AYUSH-64 – A-64 and its ingredients (*Alstonia scholaris* - AS, *Swertia chirayita* - SC, *Picrorhiza kurroa* - PK, *Caesalpinia cristata* - CC) using appropriate experimental models of SARS-CoV2 and associated pathologies. Among all the tested formulations, only *Withania Somnifera* *In-vitro* and *in-vivo* studies exhibited reasonable antiviral efficacy. However the *in-vitro* studies to assess the immunomodulatory potential of the test extracts indicated that most of these herbal extracts have interesting immunomodulatory potential. Highlights of the results obtained will be presented during the meeting.

Speaker Profile

Dr. Madhu Dikshit, a leading scientist of the country, has made significant contributions to the general area of Molecular Pharmacology with special emphasis to redox/NO biology and metabolism. Dr. Dikshit has impacted the area of neutrophil biology by enhancing our understanding that how nitric oxide modulates neutrophil differentiation, survival, free radical generation, NETosis, chemotaxis, and microbicidal activity. She has systematically investigated the role of iNOS in metabolic regulations and insulin sensitivity. She also initiated and led the team for anti-thrombotic drug discovery at CDRI from which one of the NCE has received DCGI permission for Phase I



clinical trial. At THSTI, she initiated a program on drug and biomarker discovery in the area of fatty liver disease and has made significant contributions. During the Covid-19 pandemic under a DBT-AYUSH project, she undertook the preclinical and pharmacokinetic evaluations of select AYUSH herbal extracts / formulations for mitigating SARS- CoV2 and associated pathologies.

Dr. Dikshit has published more than 180 well cited papers, 22 reviews in peer reviewed journals, edited three books, has eight patents and has supervised 37 Ph.D., 10 MD theses, and a good number of graduate students.

Former Director, CSIR Central Drug Research Institute, Lucknow; Former Visiting Professor & Head, Department of Bioscience & Bioengineering, Indian Institute of Technology, Jodhpur-342037; Former THSTI National Chair, Translational Health Science and Technology Institute, Faridabad-Gurgaon Expressway, Faridabad, Haryana-121001.



SHINJINI BHATNAGAR

Professor of Eminence

Translational Health Science and Technology Institute (THSTI)
Department of Biotechnology, Government of India.

Email: shinjini.bhatnagar@thsti.res.in; shinjini.bhatnagar@gmail.com

Multi-disciplinary Approach to Understand Complex Diseases with Public Health Significance

(behalf of the GARBH-Ini Study Group)

Complex diseases that have public health significance in our country need unique large multi-disciplinary research programs that bridge classical epidemiology with modern science to find solutions. Despite several efforts to prevent preterm birth, in India among 27 million born annually, 3.6 million are preterm, and over 300,000 die each year contributing to 25% of the overall global preterm related deaths. In our GARBH-Ini (interdisciplinary Group for Advanced Research on adverse Birth outcomes – DBT INdia Initiative) program, we hypothesized that interdisciplinary insights in a time-series study will stratify women into defined risk groups for preterm birth. Our primary objective is to use multi-disciplinary approach that will facilitate early identification of those “at risk”, enabling implementation of sustainable health and medical management tools in clinical practice and in the community. The study is hosted in a large prospectively followed GARBH-Ini cohort of more than 12,000 pregnant women enrolled early in pregnancy in a district hospital in Haryana. We have identified novel clinical and epidemiological risk factors that are now being integrated into dynamic prediction models. The crosstalk between clinical epidemiology, imaging and data science has facilitated Indian population-specific pregnancy dating models with higher precision than the existing models. Further, we have used AI to automate fetal biometric measurements as an important public health tool. In the discovery phase we have identified novel molecular biological markers based on omics technology that will be validated further as diagnostic panels to predict preterm birth.

This platform will continue to serve as an important national resource for answering additional research questions around child health.



Speaker Profile

Dr. Shinjini Bhatnagar is a paediatrician by training and is currently Professor of Eminence at the Translational Health Science and Technology Institute (THSTI), an autonomous institute of the Department of Biotechnology, Government of India. She was the Dean Clinical Research till 2020 and has been heading the Programme on Maternal and Child Health Research at THSTI since 2010.

Dr. Bhatnagar was earlier at the All India Institute of Medical Sciences, New Delhi for 25 years as a pediatric gastroenterologist and senior research scientist. Her group provided evidence-based recommendations in child health for global and national policy, notably a dietary algorithm for treatment of persistent diarrhea and the introduction of low osmolarity oral rehydration salts solution and zinc in treatment of childhood diarrhea. She coordinated the development of a rapid point of care test for diagnosis of celiac disease.

In recent years, Dr. Bhatnagar has established large multidisciplinary research programs that bridge classical epidemiology with modern science to find solutions for diseases that have major public health significance. The current focus is pre-term birth and fetal growth restriction.

Dr. Bhatnagar is a Fellow of the Indian National Science Academy, the National Academy of Medical Sciences, and the National Academy of Sciences. She has received numerous honours and awards over the course of her career, including recognition for research in Pediatrics and Pediatric Gastroenterology.



SOMNATH DASGUPTA

INSA Senior Scientist

Indian Statistical Institute, Kolkata

Email: somnathdasgupta@gmail.com

Advent of Plate Tectonics and the Supercontinent Cycle-selected Indian Examples

One of the most hotly debated topic in Earth Sciences is related to the time of onset of modern day Plate Tectonics and its relationship with Supercontinent Cycle (amalgamation of continental blocks and their dispersal). Other related major scientific questions are: What was the precursor of Plate Tectonics?, Was the change abrupt or gradual? While a final answer is awaited on all these issues, the relationships of Plate Tectonics and Supercontinent Cycle with the evolution of the components of Earth System Science (hydrosphere, lithosphere, biosphere and atmosphere) have been emphasized. We briefly review different hypotheses, discuss some of the criteria used towards attempting a solution to the puzzling questions, and outline some future directions of research. Selected examples showing the involvement of India in the Supercontinent Cycle are provided.

Speaker Profile

Somnath Dasgupta, currently INSA Senior Scientist at ISI, Kolkata, served as Geologist in Geological Survey of India, as Professor in Jadavpur University, as Professor at IISER-Kolkata, as Vice Chancellor, Assam University and as Ford Foundation Chair Professor at Jamia Milia Islamia. He obtained his Ph.D degree from Jadavpur University in 1979. He is a Fellow of all the three National Science Academies of India, and of World Academy of Sciences, Trieste. He is a recipient of National Mineral Award from the Ministry of Mines, Krishnan Medal from the Indian Geophysical Union, INSA Teachers Award, D.N. Wadia Medal from INSA and J.C. Bose National Fellowship from DST. He is a Fellow of the Alexander von Humboldt Foundation, and served as Mercator Guest Professor (DFG) at Ruhr University, Germany, as JSPS Visiting Professor Hokkaido University, Japan and as Visiting Scientist at the University of Arizona.



RISHI NARAIN SINGH

Visiting Professor

IIT Gandhinagar, Palaj
Gandhinagar, Gujarat

Email: rishiprema@gmail.com; rnsingh@iitgn.ac.in

A Narrative of Mathematization of Earth System Science

The concept of Earth-as-system can be traced over in growth of geophysical knowledge for long. However, a great filip to this concept was provided by the development of two techniques viz., a) synoptic observations of earth and its processes through satellites and b) computer simulation. I propose to examine the growth of quantitative understanding of Earth-as-system through the applications of mathematics in developments of both the satellite observational systems and computational simulation of earth system processes. Two clearly discernible trends are the use of nonlinear optimization techniques of control theory in satellite data acquisition and second is use of numerical linear algebra methods in computer simulation. An aspect pioneered by Poincare' and common to both trends is the use of qualitative methods in reducing dimensions of both the observational and the simulated data through the use of nonlinear dynamics. The talk will narrate landmark examples of these developments in mathematization of earth system science, such as organizing motions on/in earth's interior governing plate tectonics, global biogeochemical cycles critical to origin and evolution of life and global climate changes due anthropogenic impacts. It will also discussed how now coding is becoming a central activity of mathematizing earth system science.

Speaker Profile

Dr. RN Singh obtained his B Sc, MSc (Geophysics) and Ph D degrees from Banaras Hindu University in 1962, 1964 and 1969 respectively. He joined National Geophysical research Institute (NGRI), Hyderabad in 1964 and made significant contribution in modeling of geophysical and environmental processes. He constructed models of thermal and rheological structure of Indian continental lithosphere, of processes underlying formation of Cuddapah basin and charnockites of southern Indian shield and isostatic flexural compensation mechanisms of Afanasi Nikitin seamount, slow spreading Carlsberg and Chagos Laccadive oceanic ridge and fracture zones of Indian oceanic lithosphere. He contributed to modeling of groundwater dynamics, and fate and transport of contaminants in environment. He participated in institution building in formation of CSIR Centre for Mathematical Modeling and Computer Simulation Bengaluru which he later headed during



1996-99 and as Director of National Environmental Engineering Research Institute (NEERI), Nagpur where he initiated frontier researches in integrated quantitative physical, chemical and biological aspects of environmental processes, during 1999-2003. He was CSIR Emeritus Scientist during 2005-10 and INSA Senior Scientist during 2010-15, both at NGRI, Hyderabad. Since 2015, he is a visiting professor at IIT Gandhinagar where his teaching/research focus is in modeling of earth surface system. For his research work, he has been awarded with Shanti Swarup Bhatnagar prize of Council of Scientific and Industrial Research, National Award in Geoscience and Technology of Ministry of Earth Sciences and elected to the fellowships of Indian Academy of Sciences in 1988 and India National Science Academy in 1991.



SANDHYA S. VISWESWARIAH

Honorary Professor

Department of Molecular Reproduction, Development and Genetics,
Indian Institute of Sciences, Bengaluru

Email: sandhya@iisc.ac.in; s.sandhya@gmail.com

Gut Instincts and Gut Reactions: Molecular Mechanisms Underlying the Biology

The correct functioning of the gut is integral to the well-being of an organism, as perceptively noted by Hippocrates 2000 years ago when he stated that 'All disease begins in the gut.' I will speak on our research in understanding the role of a receptor guanylyl cyclase, GC-C, in modulating mammalian gut function. I will describe our efforts to understand the molecular basis of regulation of this receptor and the characterization of human mutations in the receptor that cause severe familial and congenital diarrhea. Finally, I will describe our recent observations on novel transgenic mice that we have generated to understand the physiology of human disease at the molecular level.

Speaker Profile

Sandhya S Visweswariah obtained her PhD in 1987 from the Department of Biochemistry, Indian Institute of Science, Bengaluru. She is currently an Honorary Professor at the Department of Molecular Reproduction, Development, and Genetics at the Indian Institute of Science, and an Adjunct Professor at the Faculty of Medicine and Dentistry University of Bergen, Norway. She is a Fellow of The World Academy of Sciences (TWAS), the Indian National Science Academy (INSA) and the Indian Academy of Science (FASc). She has received a Gold Medal in Botany, the YT Thathachari Award and the CDRI Award for Excellence in Drug Research. She has been a recipient of a HFSP Short-Term Fellowship, and the Fulbright-Nehru Senior Research Fellowship. She is a JC Bose Fellow; currently a holder of a Royal Society Collaborative Grant for Research Professors; and is a Margdarshi Fellow supported by the Wellcome Trust-DBT India Alliance.



DESIRAZU N. RAO

Honorary Professor

Department of Biochemistry,
Indian Institute of Science, Bangalore

Email: dnrao@iisc.ac.in

Of Genomes, Methylomes & Acetylomes

DNA methylation is an important mechanism involved in bacteria limiting foreign DNA acquisition, maintenance of mobile genetic elements, DNA mismatch repair, and gene expression. Changes in DNA methylation pattern are observed in bacteria under stress conditions and these can result in transient and fast-appearing adaptive antibiotic resistance phenotypes.

Methylation constitutes an important epigenetic layer that contributes to the definition of transcriptional and regulatory potential of genomic DNA. DNA methyltransferases are enzymes that specifically methylate cytosines or adenines in DNA. Most bacterial DNA methyltransferases belong to restriction-modification systems; in addition, “solitary” or “orphan” DNA methyltransferases are frequently found in the genomes of bacteria and phages. Base methylation can affect the interaction of DNA-binding proteins with their cognate sites, either by a direct effect (e.g., steric hindrance) or by changes in DNA topology. The roles of DNA base methylation are especially well known for N6-methyladenine, including control of chromosome replication, nucleoid segregation, post-replicative correction of DNA mismatches, cell cycle-coupled transcription, formation of bacterial cell lineages, and regulation of bacterial virulence. Recently, methods have been developed for the genome-wide detection of methylated cytosines or adenines which enable capture of genome-wide profiling of DNA methylation. SMRT sequencing (Single molecule real time) can be used for the detection of all the main epigenetic features of bacterial DNA, including the identification of methylated bases and modification of the DNA backbone.

Acetylation of biomolecules (e.g., proteins and small molecules) is a process that occurs in cells of all domains of life and has emerged as a critical mechanism for the control of many aspects of cellular physiology, including chromatin maintenance, transcriptional regulation, primary metabolism, cell structure, and likely other cellular processes. Recent proteomic studies reveal that 5–10% of mammalian and bacterial proteins undergo lysine



acetylation, a post-translational modification that adds an acetyl group to the ϵ -amino group of lysine residues. $N\epsilon$ -acetylation is emerging as an abundant post-translational modification of bacterial proteins. Global surveys have revealed acetylation in diverse bacterial phyla. It will be important to elucidate how the acetylomes are maintained, i.e. which enzymes are responsible. Protein acetyltransferases and deacetylases tend to physically associate with substrates, thus providing a key manner in which substrates can be identified. The newly realized spectrum of acetylated proteins constitutes an important framework for understanding the fundamental roles of acetylation in different biological and pathological processes.

I will discuss our work on DNA methyltransferases and protein acetyltransferases in *Helicobacter pylori*.

Speaker Profile

Dr. Desirazu N Rao joined the Department of Biochemistry, Indian Institute of Science (IISc), Bangalore in June 1989 as an assistant Professor and retired as a Professor in July 2020. During 2005-2015 he was the Chairman of the Division of Biological sciences, IISc. Prof Rao is an Honorary Professor in the Institute and an Advisor, Challakere campus of IISc. In addition, he is the Convenor of the Talent Development Center at the Challakere campus, which conducts Teachers Training Programs throughout the year. Dr. DN Rao is currently the President of the Society of Biological Chemists (India).



M.L. MUNJAL

AICTE Distinguished Chair Professor and INSA Honorary Scientist
Indian Institute of Science, Bengaluru

Email: munjal@iisc.ac.in

Towards Quieter Technologies

Noise can be controlled at the source, in the path and/or at the receiver end. However, it is most economical to control the noise at the source or by adopting a quieter technology. This can be done by selecting a quieter machine and lossy materials, using quieter processes or tools, designing radiating surfaces for lower radiation efficiency, etc. A quieter machine is most cost-effective in the long run. It is particularly necessary to design flow machinery for quietness. However, noise control of an existing facility would call for use of silencers or mufflers, acoustic barriers or enclosures, etc. For designing a quieter factory or industrial plant, we must carry out proper Environmental Impact Assessment (EIA) well in advance from the point of view of environmental noise as well as air pollution, water pollution and ecology. In fact, EIA has now been made mandatory by the ministry of Environment, Forests and Ecology.

Speaker Profile

Dr. ML Munjal has been on the Faculty of the Indian Institute of Science since 1968. He has published over 200 papers in professional journals. He has authored a monograph 'Acoustics of Ducts and Mufflers' (Wiley, Original edition, 1987; Second edition, February 2014, UK), a textbook on 'Noise and Vibration Control' (World Scientific Publishers, Singapore, June 2013) and contributed chapters in a couple of international handbooks. He has guided 18 PhD students and executed over 125 industrial consultancy projects in different aspects of noise control and quieter designs, with particular application to automobiles. Since its inception in 1998, Prof. Munjal has been Convener of the Facility for Research in Technical Acoustics. Since 1988, he has been a Distinguished International Member of the Institute of Noise Control Engineering of USA. Recently, Prof. Munjal has been elected as Honorary Fellow of the International Institute of Acoustics and Vibration. He was Chairman of the National Committee for Noise Pollution Control from 1997 to 2015. He was President of the Acoustical Society of India during the years 1999 and 2000. He has been Member of the Editorial Board of the International Journal of Acoustics and Vibration since 1996. He is Fellow of the Indian National Science Academy as well as Indian National Academy of Engineering, and Member of the European Academy of Sciences. He was



honored by the then PM with the Shanti Swarup Bhatnagar Prize in Engineering Sciences for the year 1986 and the DRDO Academic Excellence Award for the Year 2009. After his superannuation in 2010, he served as Honorary Professor for five years, INAE Distinguished Professor for three years and INSA Senior Scientist for five years. Currently, Dr. Munjal is AICTE Distinguished Chair Professor and INSA Honorary Scientist at IISc.



SANKAR K. PAL

National Science Chair

Center for Soft Computing Research
Indian Statistical Institute, Kolkata

Email: sankar@isical.ac.in; sankarpal@yahoo.com

Pattern Recognition, Machine Intelligence to Data Science: Evolution, Challenges and Concerns

The talk describes the experience of a researcher, including the challenges and criticism faced, over 47 years in developing the discipline starting from pattern recognition and fuzzy sets in 1975 to image processing, expert system and AI, knowledge-based system, neural networks, soft computing, rough technology, machine intelligence, granular data mining, Big data, and deep learning with applications. New technologies and terms evolved during the process and their necessity are explained. Characteristic features of some of the machine learning tools developed accordingly, are stated. Modeling uncertainty and rough granular computing concerning data analytics are emphasized.

The second part deals with some granular mining applications such as, video tracking in ambiguous situations in the context of both shallow and deep learning. Roles of different kinds of granules and rough lower-upper approximations in unsupervised object tracking are demonstrated. It is shown how these approximations in temporal domain provide an estimate of object model in unsupervised tracking, even under complete occlusion. This is followed by a new concept of granulated deep learning (GDL) and description of a recently developed G-RCNN model for enhancing the detection accuracy.

The talk concludes mentioning some challenging issues and future directions of research concerning data science including some cautions for researchers in DL.

Speaker Profile

Sankar K. Pal (<https://www.isical.ac.in/~sankar>) received two PhD degrees, one from the University of Calcutta, Kolkata, India and the other from Imperial College, London, UK. He joined the Indian Statistical Institute (ISI), Kolkata in 1975 as a CSIR-Senior Research Fellow where he became a full professor in 1987, a distinguished scientist in 1998, the Director in 2005, and the President in 2022. Currently, he is a National Science Chair, and ISI-Emeritus Professor. He founded the Machine Intelligence Unit and the Center for Soft Computing Research at his Institute in Kolkata. He is



a former Distinguished Professor of Indian National Science Academy (INSA), Chair Professor of Indian National Academy of Engineering (INAE), Jawaharlal Nehru Fellow, and J.C. Bose National Fellow.

He worked at the University of California, Berkeley, CA, USA; University of Maryland, College Park, MD, USA; NASA Johnson Space Center, Houston, TX, USA; and US Naval Research Laboratory, Washington, DC, USA. He held several visiting positions in Italy, Poland, Hong Kong, and Australia. He has coauthored 21 books and about 500 research publications in the areas of pattern recognition, machine learning, image/video processing, data mining, web intelligence, soft computing, bioinformatics, social-network analysis, and cognitive machines. His Google scholar h-index is 80 with about 35000 citations.

Prof. Pal received several national/ international awards including the Padma Shri, S.S. Bhatnagar Prize, G.D Birla Award, Om Bhasin award, Khwarizmi International Award (Iran), NASA Tech Brief (USA), and IEEE Fellow Class Golden Jubilee Medal (USA). He has been an IEEE Computer Science Distinguished Visitor since 1987. He is/was on the editorial boards of 25 prestigious international journals including several IEEE Transactions. He has visited 44 countries as a keynote/ invited speaker and academic visitor. He is a Fellow of IEEE, TWAS (The World Academy of Sciences), IAPR (International Association for Pattern Recognition), IFSA (International Fuzzy Systems Association), and all the four National Academies for Science and Engineering in India. He is also a member of the European Academy of Sciences and Arts.



NAGENDRA K. SINGH

National Professor

National Institute for Plant Biotechnology
Pusa Campus, New Delhi

Email: nksingh@nrpcb.org; nksingh4gmail.com

Genomics-assisted Breeding of Climate-resilient Crop Varieties

One of the biggest challenges for 21st century Agriculture is to produce enough food for growing human population from diminishing acreage, deteriorating soil health and environmental stresses induced by global climate change. Therefore, it is imperative to develop high-yielding rice varieties with tolerance to different environmental stresses. Rice became the first crop plant with high quality reference genome available in the public domain. Rice breeders at International Rice Research Institute, Philippines and national agricultural research system institutions in the rice growing countries have developed thousands of rice varieties over the years, few of these e.g. 'IR64' are highly popular among the farmers even after decades of their release. These are cultivated in millions of hectares for their superior quality and yield stability. These are called mega varieties (MVs) that represent the best available assortments of superior alleles of agronomically important genes through recombination breeding. The MVs provide an ideal base for further improvement by infusion of validated genes for climate resilience by marker-assisted accelerated breeding. Green revolution (GR) high-yielding varieties (HYV) carrying a gene for semi-dwarf plant height have rapidly replaced the traditional climate-resilient but low yielding tall rice varieties in most part of the world. The GR-HIV were selected primarily for yield under high input conditions and therefore are sensitive to climatic adversities. Knowledge of rice genome and causal genes for tolerance to different abiotic stresses like heat, drought, flood and soil salinity has provided opportunity to transfer the favourable alleles of these genes into MVs by marker-assisted backcross breeding (MABB) through a multi-institutional network. We have transferred six genes/QTLs for grain yield under drought; viz. *qDTY1.1*, *qDTY2.1*, *qDTY2.2*, *qDTY3.1*, *qDTY3.2* and *qDTY12.1* into flood-tolerant versions of Swarna, Samba Mahsuri and IR 64 to develop two-in-one drought-flood tolerant HYV of rice. To address the problem of flash flooding, *SUB1* gene for submergence tolerance has been transferred into nine regional MVs of rice, viz. ADT 46, Bahadur, HUR 105, MTU 1075, Pooja, Pratikshya, Ranjit, Rajendra Mahsuri and Sarjoo 52. Further, *qSALTOL1* gene for seedling stage salt tolerance and *qSSISFH8.1*



genes for reproductive stage salt tolerance have been transferred into five MVs, viz. ADT 45, Gayatri, MTU 1010, Pusa 44 and Sarjoo 52.

We used foreground selection markers for the presence of desired gene, recombinant selection markers to reduce the linkage drag around the target gene and high-density background selection using a 50K SNP chip. Finally, MV-NILs with more than 95% similarity to the recipient parent genome have been released for commercial cultivation. These climate-smart rice varieties are gaining popularity and will provide yield stability in the adverse climatic conditions. So far more than 20 such varieties of rice developed through marker-assisted breeding have been released for commercial cultivation by farmers in India e.g. Pusa Basmati 1, Improved Samba Mahsuri, Pusa 1637, Ranjit-Sub1, DRR Dhan 50, Pusa 1847. MABB is the most promising and technically feasible option for introgression of useful genes in the background of MVs cultivated in millions of hectares but are sensitive to one or more of the climate-change induced stresses. Correction of these susceptibilities by introgression of small genomic segments promises high impact on rice production stability. A major limitation of molecular breeding is the availability of validated markers. Availability of affordable genotyping services within reach is another limitation that requires establishment of genotyping service centres.

Further, we are using wild rice germplasm collected from different parts of India to identify novel genes for climate resilience. Crop wild relatives are adapted to wide geographical and climatic conditions and hence are a rich source of genes that can be harnessed for developing climate-resilient varieties. Therefore exploration, conservation, evaluation and utilization of fast depleting crop wild relatives gene pool is the need of the day. Efforts are also underway to combine genes for disease and pest resistance in these MVs without losing their yield and quality attributes crucial for consumer acceptance. In the near future, genome editing tools for allele replacement (SDN-2) are likely to substitute the present backcross breeding approach for high speed precision breeding of climate-resilient varieties of rice and other crops.

Speaker Profile

Prof. Nagendra Kumar Singh is well-known agricultural scientist in the area of genomics and molecular plant breeding. He is a distinguished alumnus of BHU Varanasi, who after 10 years of Ph. D. and postdoctoral studies in University of Adelaide and CSRIO in Australia returned to India in 1991. He has served in CSIR-CFTRI, Mysore for 3 years; GB Pant University for Agriculture and Technology, Pantnagar for 6 years and for the last 22 years at ICAR-NIPB, New Delhi. Apart from leading several multi-institutional research projects, Prof. Singh has guided more than 50 students for their M.Sc. and Ph.D. degrees. He has more than 400 research publications with 26,500 citations and an H-index of 73.



Prof. Singh is the lead Indian scientist responsible for decoding the genomes of rice, tomato, wheat, pigeonpea, jute and mango in India after establishing world-class genomics laboratories at ICAR-NIPB. He led a team of Indian scientists to decode the Arhar genome, world's first pulse genome and the first plant genome sequenced entirely in India. Prof. Singh has developed high-density SNP chip arrays of rice, pigeonpea and mango and identified a number of genes and DNA markers for rice, wheat, pigeonpea, jute and mango breeding. In an important conservation effort, Prof. Singh has collected >1000 different wild rice accessions by travelling thousands of kilometers in the remote villages in 16 states of India and identified accessions resistant to drought, flooding and salinity, which are important genetic resource for development of climate-resilient rice varieties. Earlier, Prof. Singh has invented new methods for analysis of wheat seed proteins and discovered a new class of wheat seed storage protein named 'Triticin' responsible for excellent chapati and bread making quality.

Prof. Singh is an elected Fellow of major science academies of India including INSA, NAAS and NASI, and is recipient of several honors and awards, including the highest individual award of ICAR, Norman Borlaug Award 2015, and the JC Bose National Fellowship in 2022.



SHREE KUMAR APTE

Distinguished Professor

School of Biological Sciences, UM-DAE Centre for Excellence in Basic Sciences, Vidyanaigari, Mumbai

Email: aptesk@cbs.ac.in; shree.apte@gmail.com

PROFESSR VISHWANATH MEMORIAL LECTURE (2018)

World's Most Radiation-resistant Bacterium: *Deinococcus radiodurans* and What can you do with it?

The Guinness Book records the Gram-positive, red/orange pigmented, non-pathogenic bacterium *Deinococcus radiodurans* as the world's most radiation-resistant bacterium. Indeed, it can survive 10000-fold higher doses of ionizing radiations (X-rays or γ -rays), without even being mutated, than what humans can withstand. It also survives extremes of other genotoxic environmental stresses, such as UV radiation, prolonged nutrient starvation and desiccation. Post-stress, the superbug successfully re-assembles its completely shattered genome and highly damaged proteome, thanks to its highly proficient DNA repair and very robust oxidative stress tolerance systems. *The question is what can one do with such a unique organism?*

Sequencing of its genome, sponsored by the U.S. Department of Energy in 1999, immensely accelerated both basic and applied research on this bacterium, and has revealed some fascinating aspects of its biology. Prominent among these are (i) unexpected facets of its genome organization (ii) novel mechanisms underlying DNA repair and ROS scavenging, leading to phenomenal radioresistance, and (iii) unique DNA damage-responsive gene expression and its regulation. Extensive genetic engineering of this microbe has been carried out to develop bioremediation technologies for highly radioactive nuclear waste as well as for other polluted environments. Impressive applications developed using this microbe or its metabolites range from nanotechnologies to radioprotectors and cancer treatment to vaccine development. The presentation will highlight some of these discoveries and discuss future prospects.

Speaker Profile

- *M.Sc. (Botany): Science Faculty Gold Medal, Jiwaji University, Gwalior (1972).*
- *Ph.D. (Botany): Gujarat University, Ahmedabad (1985).*
- *Graduate (Biology and Radiobiology): 16th batch of BARC Training School (1972-73).*



- *Joined the Bio-Medical Group, BARC in 1973 and served in different capacities for 42 years.*
- *Superannuated as Distinguished Scientist, Director, Bio-Science Group, & Head, Molecular Biology Division, BARC in 2014.*
- *Emeritus Professor-HBNI (2014-2019), DST-J C Bose National Fellow (2009-2020), Raja Ramanna Fellow-DAE (2015-2018).*
- *Distinguished Professor, UM-DAE-Centre for Excellence in Basic Sciences (2018-continuing)*
- *Fellow, Indian National Science Academy, New Delhi; Indian Academy of Sciences, Bengaluru; National Academy of Science, Allahabad; National Academy of Agricultural Sciences, India; Maharashtra Academy of Sciences.*
- *Recipient Prof. J.V. Bhat-Eureka Forbes Award - Excellence in Microbiology (1990); Young Scientist Award - Cyanobacterial Biotechnology (1996); Prof. K.S. Bilgrami Memorial Award - INSA (2006), Indian Nuclear Society Award (2006).*
- *Recipient IAEA Fellowship (1976-77); Nuffield Foundation Fellowship, U.K (1984); USAID Fellowship, USA (1988-89).*
- *India's Representative at United Nation's Scientific Committee on Effects of Atomic Radiations (UNSCEAR) (2014).*
- *Coordinated a DAE-sponsored multi-institutional project entitled "Thermal Ecological Studies" which assessed impact of thermal effluents from operating nuclear power plants on aquatic ecosystems (2000-2006).*
- *Member Selection and Evaluation Committees of INSA, DST, DBT, CSIR, ICAR and DAE and 6 research institutes in India.*
- *Research interests : Response of organisms to ionizing radiations and other environmental stressors and development of eco-friendly biotechnologies for agricultural applications and for environmental clean-up.*
- *Currently engaged in teaching integrated 5-year M.Sc. programme, popularization of science and enhancing public awareness of science in India.*



H.R. KRISHNAMURTHY

Honorary (Emeritus) Professor

Department of Physics, Indian Institute of Science, Bengaluru

Email: hrkrish@iisc.ac.in

HOMI JEHANGIR BHABHA MEDAL LECTURE (2020)

The Fascinating Physics of Strongly Correlated Quantum Impurities

My fascination with strongly correlated quantum impurities started with my doctoral research during the early 1970s and has stayed with me ever since. My aim in this talk will be to provide a historical perspective on the evolution of this subject and the important role it has played from the 1950s to the present, at a level accessible to a non-specialist audience. I will begin by tracing the early puzzles posed by systems of magnetic impurities in metals, the development of quantum impurity models to understand these systems, and the advances that eventually led to the solutions of these models. I will then discuss the development of the dynamical mean field theory and of its cluster extensions, which resurrected this subject in a whole new context by mapping lattice models of strongly correlated quantum materials, such as high T_c superconductors, to systems of one or more strongly correlated quantum impurities embedded self-consistently in an effective medium. I will end by discussing why the importance and fascination of this subject continues at present, and will do so well into the future. My narrative will be intertwined with snippets of some of the research contributions by me (and collaborators) in this area.

Speaker Profile

Prof. HR Krishnamurthy obtained his B.Sc.(Hons) in Physics from Central College, Bangalore University, M.Sc. in Physics from IIT Kanpur, did his doctoral research from 1972-76 at Cornell University with Kenneth G Wilson (NL 1982), and postdoctoral work at the University of Illinois at Urbana-Champaign. He joined the Department of Physics at the Indian Institute of Science, Bangalore in 1978, and holds the position of Honorary (Emeritus) Professor there after retiring in 2017. His research interests are in theoretical condensed Matter Physics, with a focus on strongly interacting quantum and classical many-body systems, especially quantum impurity physics, and theories of strong correlation phenomena in solids and in systems of cold atoms in optical lattices. Prof. Krishnamurthy is a recipient of the INSA medal for young scientists in 1983, a Fellow of all three Science Academies of India and of the World Academy of Science (TWAS), a fellow of the American Physical Society, and a recipient of the J.C. Bose National Fellowship and the SERB Distinguished Fellowship.



N. KALAISELVI
Secretary, DSIR and Director General, CSIR
 New Delhi

Email: dgcsir@csir.res.in

Speaker Profile

Dr. (Mrs) N Kalaiselvi assumed charge as Secretary, DSIR and Director General, CSIR, New Delhi on August 8, 2022. Dr. N Kalaiselvi is the first women Director General of CSIR. Prior to taking over as Secretary, DSIR and DG, CSIR, she was working as Director, CSIR-Central Electrochemical Research Institute, Karaikudi.

Dr. N Kalaiselvi (born: February 5, 1967) obtained her Bachelor's degree in Chemistry from Government Arts College, Tirunelveli affiliated to Madurai Kamaraj University, Madurai. She obtained her Post Graduate Degree in Chemistry from Government Arts College Coimbatore and did her PhD at Annamalai University, Chidambaram.

Dr. Kalaiselvi's research work of more than 25 years is primarily focused on electrochemical power systems and in particular, development of electrode materials, custom designed synthesis methods, optimization of reaction parameters and electrochemical evaluation of in-house prepared electrode materials for their suitability in energy storage device assembly. Her research interests include lithium and beyond lithium batteries, supercapacitors and waste-to-wealth driven electrodes and electrolytes for energy storage and electrocatalytic applications.

A glimpse of her R&D activities includes:

- *Modified electrode materials for high energy and high power lithium battery applications*
- *Novel/tailor-made electrodes for aqueous and non-aqueous lithium battery*
- *Development of polymer based electrolytes, characterization and deployment of polymer films as electrolytes*
- *Ionic liquid based electrodes and electrolytes*
- *Exploration of bio ionic liquids crystalline electrolytes for extended electrochemical potential windows.*

Apart from executing numerous extramural research, collaborative and sponsored projects funded by DST, MNRE and CSIR, Dr. Kalaiselvi has served as a Nodal Scientist for MULTIFUN [Multifunctional Electrodes and Electrolytes for Futuristic Technologies – a Twelfth five-year plan



project, sponsored by CSIR to the tune of Rs. 68.54 Crore] with CSIR-CECRI as the Nodal lab and 6 CSIR Institutes as participating labs during 2012-2017. The sectoral monitoring committee Chaired by Prof. Baldevraj graded this project as EXCELLENT.

She was involved in the development of practically viable Sodium-ion/Lithium-sulfur batteries and supercapacitors and continues her research in these fields. As a nominee of CSIR-CECRI, she has participated in the meetings conducted at various levels by MNRE and TIFAC (2015 onwards) for the implementation of e-mobility in India with indigenous technological support from CSIR and in particular from CSIR-CECRI in a major way. She was instrumental and coordinated the preparation of the Technical Report on NMEM (National Mission for Electric Mobility) in collaboration with TIFAC identified academic, research and industrial partners. She was a part of MNRE initiated Mobility Mission Concept Note too. Dr. Kalaiselvi was the Theme Director of Energy and Energy Devices (E2D) of CSIR, wherein CSIR-CECRI is the Nodal laboratory.

Dr. Kalaiselvi has more than 135 research papers and 6 patents to her credit. Under her guidance, 12 research scholars have received Ph.D. Degrees and 2 researchers are currently pursuing their Ph.D. She is a recipient of many prestigious awards including MRSI medal, CSIR Raman Research Fellowship, INSA-NRF Exchange award, Brain Pool Fellowship of Korea, the Most Inspiring Women Scientist Award and C.V RAMAN MAHILA VIJNANA PURASKARA at 12th National Women's Science Congress held at Mysore.

**ASHOKE SEN***Professor*International Centre for Theoretical Sciences,
Bengaluru

Email: ashokesen1999@gmail.com

The Future of Our Universe

Discovery of dark energy has changed our understanding of how our universe will look in the distant future. In this lecture I shall review these developments.

Speaker Profile*Research Interest: String Theory**Year of Birth: 1956**School (1962 - 1972): Shailendra Sircar Vidyalyaya, Calcutta, India**College (1972 - 1975): Presidency College, Calcutta, India**University (1976 - 1978): Indian Institute of Technology, Kanpur, India**Graduate Study (1978 - 1982): State university of New York at Stonybrook, USA**Post-doctoral Experience:**1982 - 1985: Fermilab, Batavia, USA**1985 - 1988: SLAC, Stanford, USA**Permanent positions held**1988 - 1995: Tata Institute of Fundamental Research, Mumbai, India**1995 - 2021: Harish-Chandra Research Institute, Allahabad, India**2021 - present: International Centre for Theoretical Sciences, Bengaluru, India**<https://home.icts.res.in/~sen/biodata.html>*

ELECTED FELLOWS INDUCTED (w.e.f. 01.01.2023)

1. VENU GOPAL ACHANTA
Tata Institute of Fundamental Research, Mumbai
2. ARUN BANDYOPADHYAY
CSIR- Indian Institute of Chemical Biology, Kolkata
3. SURINDER SINGH BANGA
Punjab Agricultural University, Ludhiana
4. VEPAKOMMA BHUJANGA RAO
National Institute of Advanced Studies (NIAS), Bengaluru
5. SAMAR KUMAR DAS
University of Hyderabad, Hyderabad
6. NAGESH KUMAR DASIKA
Indian Institute of Science, Bengaluru
7. ANUPAMA GADIYARA CHAKRAPANI
Indian Institute of Astrophysics, Bengaluru
8. VENKATASUBRAMANIAN GANESAN
National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru
9. SUBRAMANIAM GANESH
Indian Institute of Technology, Kanpur
10. SUDHIR RAMAKANT GHORPADE
Indian Institute of Technology, Bombay, Mumbai
11. DEBASHISH GOSWAMI
Indian Statistical Institute, Kolkata
12. M MICHAEL GROMIHA
Indian Institute of Technology Madras, Chennai
13. DEBATOSH GUHA
University of Calcutta, Kolkata
14. YADVENDRADEV VIKRAMSINH JHALA
Wildlife Institute of India, Dehradun
15. YOGESH MORESHWAR JOSHI
Indian Institute of Technology Kanpur, Kanpur
16. RUPINDER KAUR
Centre for DNA Fingerprinting and Diagnostics, Hyderabad
17. SANJAY KUMAR
CSIR-Institute of Himalayan Bioresource Technology, Palampur
18. GOPAL CHANDRA KUNDU
KIIT University, Bhubaneswar
19. JAVED HUSAIN NURMOHMED MALIK
Indian Institute of Technology Kanpur, Kanpur
20. HARI SHARAN MISRA
Bhabha Atomic Research Centre, Mumbai
21. DEEPAK THANKAPPAN NAIR
Regional Centre for Biotechnology, Faridabad
22. SUNIL KUMAR PALAKURISSI BALAGOPAL
Indian Institute of Technology Madras, Chennai
23. ASHWANI PAREEK
Jawaharlal Nehru University, New Delhi

24. ALOKE PAUL
Indian Institute of Science, Bengaluru
25. NARAYAN PRADHAN
Indian Association for the Cultivation of Science, Kolkata
26. SUBRAMANYAM RAJAGOPAL
University of Hyderabad, Hyderabad
27. UDAYKUMAR RANGA
Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru
28. CHERUKUMALLI SRINIVASA RAO
ICAR-National Academy of Agricultural Research Management (NAARM),
Hyderabad
29. ARUN KUMAR SHUKLA
Indian Institute of Technology Kanpur, Kanpur
30. GYANENDRA PRATAP SINGH
ICAR- Indian Institute of Wheat & Barley Research, Karnal
31. MANDYAM DODDAMANE SRINIVAS
Centre for Policy Studies, Chennai
32. PRADEEP SRIVASTAVA
Indian Institute of Technology-Roorkee, Roorkee
33. RAJESH K SRIVASTAVA
Banaras Hindu University, Varanasi
34. JYOTI PRAKASH TAMANG
Sikkim University (Central University), Gangtok, Sikkim
35. PUNNIYAMURTHY THARMALINGAM
Indian Institute of Technology Guwahati, Guwahati
36. SHANTHI PAVAN YENDLURI
Indian Institute of Technology Madras, Chennai
37. SEIKH MOHAMMAD YUSUF
Bhabha Atomic Research Centre, Mumbai

FELLOWS ELECTED IN PREVIOUS YEARS

1. ASHOKE SEN
International Centre for Theoretical Sciences (ICTS)- TIFR, Bengaluru
2. SURYANARAYANA SASTRY RAMASESHA
Indian Institute of Science, Bengaluru
3. VELAYUDHAN ANANDAVALLY RAGHUNATHAN
Raman Research Institute, Bengaluru
4. AMIT PRAKASH SHARMA (PRAVASI FELLOW)
International Centre for Genetic Engineering and Biotechnology, New Delhi
5. SUVENDRA NATH BHATTACHARYYA
CSIR-Indian Institute of Chemical Biology, Kolkata
6. SUBHADEEP CHATTERJEE
Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad
7. ANINDA JIBAN BHATTACHARYYA
Indian Institute of Science, Bengaluru
8. SUNIL CHANDRAN LEELA
Indian Institute of Science, Bengaluru

9. VINEET KUMAR GAHALAUT
CSIR- National Geophysical Research Institute, Hyderabad
10. VINOD KUMAR
University of Delhi, Delhi
11. PRASUN KUMAR MUKHERJEE
Bhabha Atomic Research Centre, Mumbai
12. MAYASANDRA SUBRAHMANYA SRIRAM
KV Sarma Research Foundation, Chennai
13. VIRENDRA MANI TIWARI
CSIR- National Geophysical Research Institute, Hyderabad
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University of Delhi, Delhi
15. PALURU VIJAYACHARI
Ministry of Health & FW, Port Blair

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1. Mohd Asgher
2. Haritha Bollinedi
3. Dhiman Chakravarty
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6. Biplab Maji
7. Tridib Kumar Mondal
8. MD Nasim
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10. Kabir Ramola
11. Akanksha Singh
12. Abhishek Sinha
13. Hrishikesh A Tavanandi
14. Sudipta Tung

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2. Wareed Ahmed
3. Mithu Baidya
4. Aditya Bandopadhyay
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7. Debasish Borah
8. Snehasis Daschakraborty
9. Sreejith Ganesh Jaya
10. Shyam Sundar Ghoshal
11. Imran Asatar Girach
12. Shraddha Madhav Karve
13. Kutubuddin Ali Molla
14. Kamalika Mukherjee
15. Prabhakar Naraga
16. Anubhab Roy
17. Sutanu Roy
18. Nisha Singh
19. Suraj Soman
20. Kartik Sunagar
21. Himanshu Tyagi
22. Hareesh VS
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5. Pankajkumar Natawarlal Gajjar
Gujarat University, Ahmedabad, Gujarat
6. Naseer Iqbal
University of Kashmir, Srinagar
7. Upendranath Nandi
Scottish Church College, Kolkata
8. Charu Dogra Rawat
Ramjas College, University of Delhi, Delhi
9. Pranab Sarkar
Visva-Bharati (Central University), Santiniketan, West Bengal
10. Shalivahan
Indian Institute of Technology (ISM), Dhanbad, Jharkhand
11. Uma Shankar
North-Eastern Hill University, Shillong, Meghalaya
12. Paul Agastian Theoder
Loyola College, Chennai

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Acharya Narendra Dev College, University of Delhi, Delhi
4. Chockalingam Jeganathan
Birla Institute of Technology, Mesra, Ranchi
5. Nataraj Karaba
University of Agricultural Sciences, Bengaluru
6. P Dilip Kumar
Indian Institute of Technology Kharagpur, Kharagpur
7. Avinash Shankar Kumbhar
Savitribai Phule Pune University, Pune
8. N Latha
Sri Venkateswara College, University of Delhi, Delhi
9. Shashi Kant Mishra
BHU, Varanasi
10. Parmjit S Panesar
Sant Longowal Institute of Engineering and Technology, Longowal, Punjab
11. Vimal Rarh
SGTB Khalsa College, University of Delhi, Delhi
12. Reghu Ravindran
Kerala Veterinary and Animal Sciences University, Wayanad
13. Sachi Srivastava
Delhi University, Delhi
