

भारतीय विज्ञान शिक्षा एवं  
अनुसंधान संस्थान पुणे  
वार्षिक प्रतिवेदन २०२३-२०२४

**INDIAN INSTITUTE OF SCIENCE  
EDUCATION AND RESEARCH PUNE**  
Annual Report 2023–2024

**On the Cover**

Shape Optimisation problems in mathematics deal with the task of finding a shape that works best, in terms of the cost-functional at hand, among all shapes satisfying given constraints. The image on the cover is an example of one such problem studied by Dr. Anisa Chorwadwala from the Mathematics Department at IISER Pune. Shown is a ball with a hole in the shape of a pentagon and the ten sectors of the ball that are formed through the axes of symmetry (dotted lines) of the pentagon. There is one sector on one side of the axis labelled " $\varphi=t$ " and another sector on the other side of this axis that remain unpaired. The team studied if the pairing of these two remaining sectors to each other would give the desired mathematical result related to the monotonicity of eigenvalue. The tool used here is called the rotating plane method, which is a variant, developed by Dr. Chorwadwala and collaborators, of the moving plane method.

**Image Credit**

Anisa Chorwadwala and Souvik Roy

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Dr. Homi J. Bhabha Road, Pune 411 008, India  
**T:** +91 20 2590 8001  
**W:** [www.iiserpune.ac.in](http://www.iiserpune.ac.in)

**Contributors**

Content was sourced from various departments and sections of the institute.

Editorial Contributors:

Dr. Shanti Kalipatnapu, Nikhil Kakade, Dr. V.S. Rao, and Prof. Bhas Bapat

Hindi Translation:

Nitin Kesharwani

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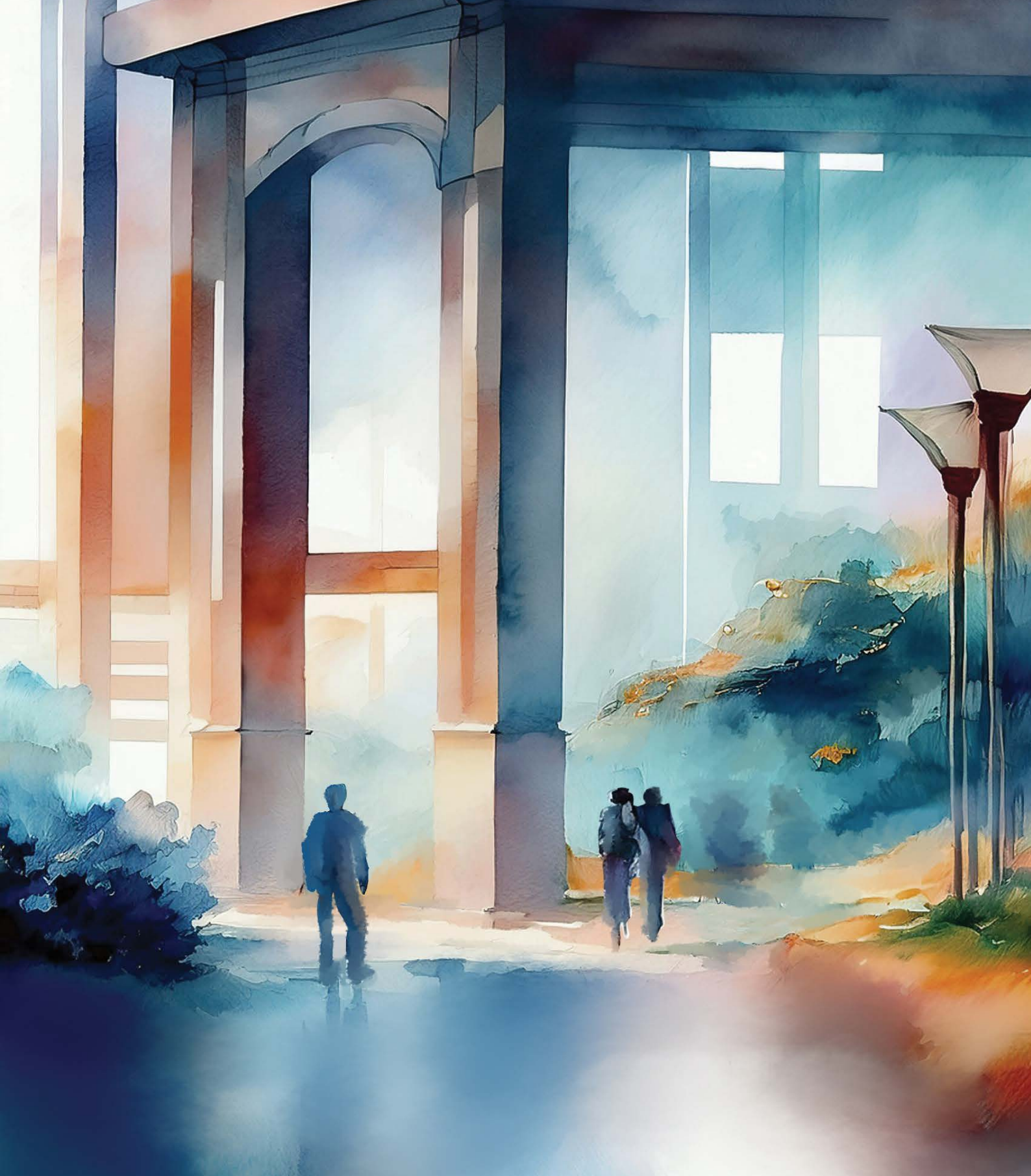
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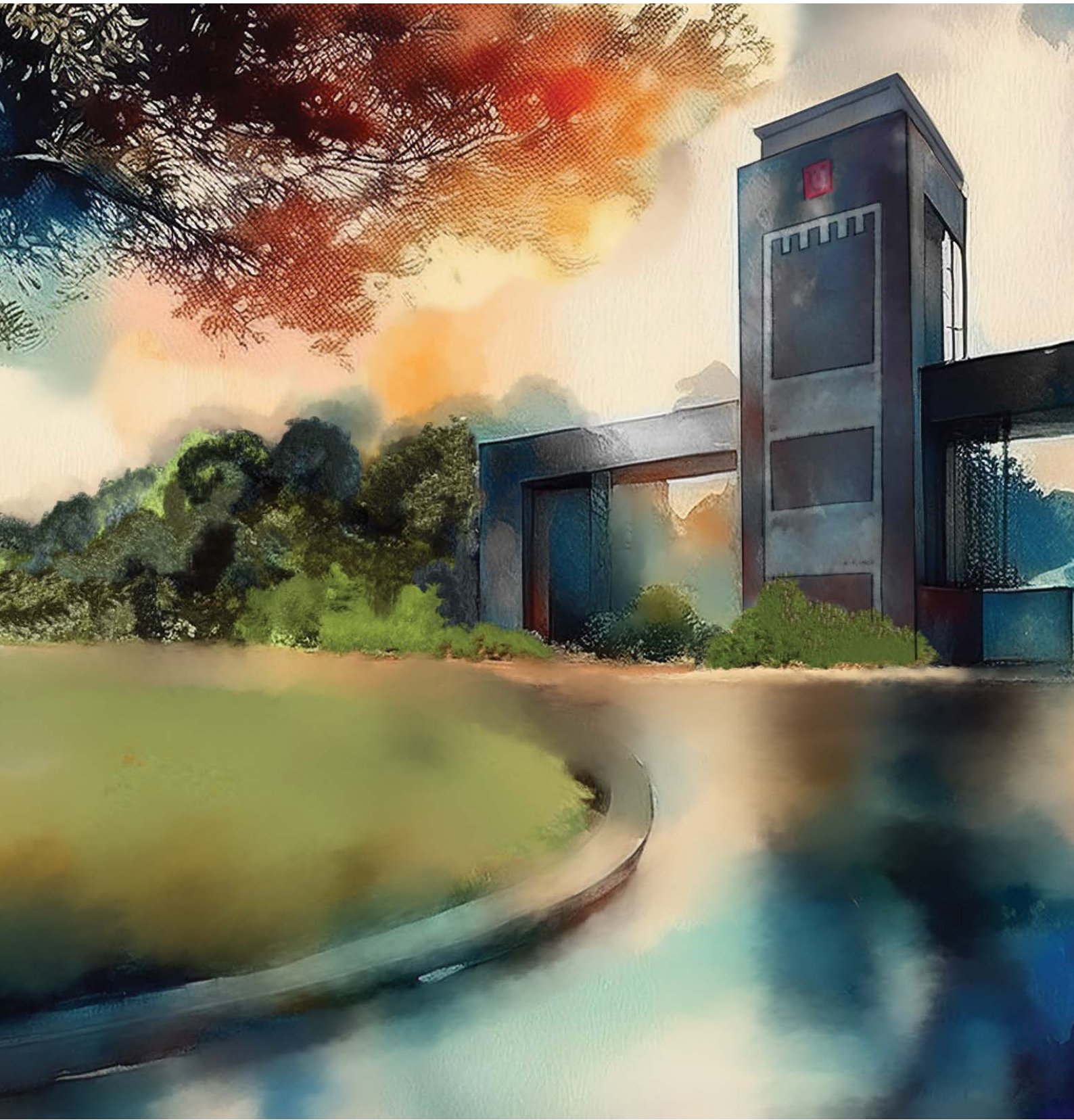
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**Fostering a culture of excellence and expanding the frontiers of knowledge, IISER Pune is at the forefront of training the next generation of scientists and informed citizens.**

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IISER Pune is an autonomous teaching and research organisation of the Ministry of Education, Government of India.

IISER Pune offers undergraduate and graduate programmes in Biology, Chemistry, Data Science, Earth and Climate Science, Humanities and Social Sciences, Mathematics, and Physics. A new department of Science Education has been initiated. Researchers at the Institute investigate a wide spectrum of topics in the basic sciences as well as in applied areas of research.

The Institute is ranked 34 in the Overall Category and 27 in the Research Category in the 2023 India Rankings of the National Institutional Ranking Framework (NIRF); 801-1000 in the 2024 Times Higher Education (THE) World University Rankings; and is listed 13th in India, 171st in Asia-Pacific and 492nd globally for research output by the 2023 Nature Index Tables.

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# HIGHLIGHTS

2023-24

138 ●

**Faculty Members**

23 ●

**Visiting, Emeritus, Guest,  
and Adjunct Faculty**

135 ●

**Non-Teaching Staff Members**

52 ●

**Fellows, Project Scientists, and  
Post-doctoral Research Associates**

1866 ●

**Students**

506 PhD, 166 Integrated PhD,  
45 MSc, and 1149 BS-MS

69 ●

**New Extramural Grants**

99 crores (in ₹) ●

**Extramural Funds received/assigned**

174 crores (in ₹) ●

**Funds Received from the  
Ministry of Education**

559 ●

**Publications in 2023**

**Patents in 2023** ●

13 filed

12 published

21 granted

41 ●

**MoU and Agreements** with industries  
and academic organisations

About **2.73** lakh teachers, students,  
and science enthusiasts reached out to  
by outreach teams on the campus

*Numbers are as of March 31, 2024*

*Financial data rounded off to  
the nearest whole number*

# Director's Report



I'm delighted to present the 2023-24 annual report for the institute. Over the last year, I have had the pleasure of being associated with a wide variety of activities at the institute along with interacting with visitors from across India and beyond. The institute had the opportunity to be part of the G20 series of events when we hosted a seminar on "Accessible Science: Fostering Collaboration" on our campus. This event was organised by the Department of Higher Education in partnership with Elsevier and IISER Pune. This brought to our campus several delegates from within and outside India to discuss matters pertaining to higher education and to interact with our students, staff, and faculty members.

In the 2023 India Rankings of the National Institutional Rankings Framework (NIRF), IISER Pune was ranked 34 in the Overall Category and 27 in the Research category. On the 2023 Nature Index Tables, IISER Pune is listed 13th in India, 171st at the Asia-Pacific level, and 492nd globally for research output.

As of March 31, 2024, IISER Pune has 138 faculty members across our eight departments. This includes Dr. Ajay Kumar and Dr. Mohammad Ismaiel who joined the Department of Earth and Climate Science during the year; Prof. Jayant Udgaonkar who completed his tenure as the Director and continues his association with the institute as a faculty member in the Department of Biology; and myself when I joined in April 2023 as the Director of the institute and faculty member in the Chemistry Department.

In addition to this, we have had the following faculty members join us in visiting, emeritus, and guest positions during the year: visiting faculty members Dr. Girish Deshpande (Biology) and Prof. Dhruv Raina (Humanities and Social Sciences); Emeritus faculty member Prof. Nishikant Subhedar (Biology); Guest faculty members Dr. Shrikant Botre and Dr. Hemant Apte (Humanities and Social Sciences); and Prof. Satishchandra Ogale (Physics) who continues his association with us in a new role as an Adjunct faculty member.



While engaging in active research with 672 PhD students including 166 Integrated PhD students, our faculty members also engage in teaching 45 MSc students, and 1149 BS-MS students with a strong focus on research. In the 10th convocation of IISER Pune held on May 31, 2023, a total of 308 students received their degrees. I'm happy to share that since early 2024, preparations were initiated to launch a new master's programme in Quantum Technology.

During the calendar year 2023, researchers from IISER Pune have published a total of 559 publications, which include journal articles, books, and book chapters. Our faculty members filed 13 new patent applications, published 12 patents, and were granted 21 patents during the 2023 calendar year.

The institute faculty members secured extramural funding for 69 new projects through which 99.02 crore rupees were received by / assigned to the institute, during the 2023-24 financial year.

Several of our faculty members have been recognised for their academic contributions during the 2023-24 reporting period: Prof. Pinaki Talukdar was named a Fellow of the Royal Society of Chemistry, UK, and a Fellow of the West Bengal Academy of Science and Technology; he also received the National Prize for Bio-physical Chemistry Research (2023) from C.N.R. Rao Education Foundation; Prof. Satishchandra Ogale received the India Energy Storage Alliance's Researcher of the Year Award; Dr. Sagar Pandit was named DAAD (German Academic Exchange Service) Research Ambassador; Dr. Moumita Majumdar won a Bronze Medal of Chemical Research Society of India (CRSI); Dr. Mridula Nambiar and Dr. Gayathri Pananghat were awarded DBT/Wellcome Trust India Alliance Intermediate and Senior Fellowships, respectively; three faculty members Prof. Partha Hazra, Prof. Pinaki Talukdar, and Dr. Prasenjit Ghosh received a JSPS Invitational Fellowship for Research in Japan; Prof. Sujit K. Ghosh received the Distinguished Lectureship Award of the Chemical Society of Japan; Dr. Moumanti Podder and Dr. Haripada Sau were selected as Associates of the Indian Academy of Sciences (IAS), Bengaluru; Dr. Gayathri Pananghat received S. Ramachandran National Bioscience Award for Career Development for the year 2021; Dr. Pooja Sancheti won the Rajendra Yadav Hans Anudit Katha Samman '23 for Best Translated Story; Prof. Sunil Bhagwat was named Fellow of the Indian National Academy of Engineers (INAE) and received ICC - K.V. Mariwala Award for Effective Chemical Industry-Academia Partnership with Balmer Lawrie & Co. Ltd. as the industry partner and ICT Mumbai as the academic partner; Dr. Diptimoy Ghosh and Dr. Haripada Sau were named Associate Fellows of the Indian National Science Academy (INSA), New Delhi; Dr. Ashish Arora received Young Achiever Award at the 67th DAE Solid State of Physics Symposium; and Dr. Srabanti Chaudhury received a DAAD Scholarship for Research Stays for University Academics and Scientists.

When the Indian Space Research Organisation (ISRO)'s Aditya-L1 spacecraft was launched on September 2, 2023, we had an additional reason to celebrate. Our faculty member Prof. Bhas Bapat has been involved with this work since his earlier tenure at Physical Research Laboratory, Ahmedabad and has continued to be part of the team since. Prof. Bapat contributed in a major way to the design and implementation of the Solar-Wind Ion Spectrometer (SWIS) sub-system of ASPEX, which is one of the seven payloads on this space mission.

I would like to mention two of our staff members who received laurels this year. Shri Ashok Rupner (Senior Technical Officer at IISER Pune's Smt. Indrani Balan Science Activity Centre) was honoured for his science outreach efforts and service to society through the Yashkalyani National Vidnyan Prasar Puraskar. Dr. N. Krishnaveni Jayakumar (Senior Technical Officer at the National Facility for Gene Function in Health and Disease of IISER Pune) received a Diplomat certification from the Indian College of Laboratory Animal Medicine (ICLAM), which involves rigorous training and assessment of skills in laboratory animal medicine and management.

A team of 14 undergraduate students from IISER Pune participated in the international iGEM competition in synthetic biology and won a gold medal. This was the only team from India in the Top 10 undergraduate teams at the competition. Ten of our research scholars (9 PhD students and 1 Integrated PhD student) received Prime Minister's Research Fellowship in the August 2023 award cycle.

The Institute hosts two section-8 companies on campus, the I-Hub Quantum Technology Foundation (QTF) and the AIC-IISER Pune SEED Foundation. During 2023-24, AIC-SEED Atal Incubation Centre incubated 32 startup companies in domains such as biotech, pharma, healthcare, agritech, AI/ML, clean energy, and environment sustainability. Among these, 10 startups have been initiated by faculty, students and alumni of IISER Pune. The I-Hub QTF is funded by the Department of Science and Technology, and has been contributing to building the quantum technology capacity in the country through supporting research projects and start-ups in the area.

The following scientific conferences and workshops were held at the institute during the year: Workshop on Geospatial Data Analysis (April 10-14, 2023); Celebrating Women in Mathematics (May 12, 2023); Quantum Technologies: Introduction, Materials and Devices (July 10-14, 2023); Computational Approaches to Memory and Plasticity (CAMP) 2023 (July 11-25, 2023); Emerging Materials 2023 (July 13-15, 2023); Macromolecular Assemblies: Structure, Function, and Evolution (August 2-4, 2023); Exoplanet Conference at IISER Pune (August 17-19, 2023); Low-dimensional Topology Conference (September 20-29, 2023); 4th Indian Cancer Genome Atlas (ICGA) Conference (October 6-8, 2023); Mini Symposium on Organometallic Chemistry and Catalysis (November 3, 2023); International Colloquium on Randomness, Geometry and Dynamics (January 1-12, 2024); 43rd Annual Conference of the Indian Association for Cancer Research (January 19-22, 2024); Upper Bhima Basin Stakeholder Workshop II (February 6-7, 2024); EMBO Satellite Meeting on DNA Damage and Repair (February 17, 2024); Workshop on Group Theory 2024 (February 23-24, 2024); and Data Dynamics Summit (March 15-16, 2024)

Along with research seminars by visitors round the year, the institute hosted five public lectures as part of the Institute Colloquia series. The institute hosted three named lectures during the year: the fifth Annual P.M. Mukhi Memorial Human Rights Lecture was delivered by Political Science scholar Dr. Suhas Palshikar (October 6, 2023); the tenth Annual Homi Bhabha Memorial Public Lecture was delivered by Prof. Sudeshna Sinha from IISER Mohali (November 16, 2023); and the 2024 K.S. Krishnan Memorial Lecture in Neuroscience was delivered by Prof. Oliver Hobert from Columbia University (February 26, 2024).

A large number of sports events were organised through the year covering a wide range of sports including badminton, table tennis, cricket, football, basketball, and volleyball. A Research Premiere League between research institutions of Pune (IISER Pune, CSIR-NCL, HEMRL, and ARAI) was held during May 2023 and the IISER Pune team secured the second position in this tournament. International Day of Yoga (June 21) was an occasion for us to embrace health and fitness through various yoga and fitness events. Several extra-curricular and cultural events ran through the year spearheaded by the student community livening up the entire campus community. Our students have organised and participated in a host of extra-curricular and cultural activities through the year making the campus vibrant and enriching their campus experience in turn.

During 2023-2024, the institute received Rs. 4.12 crores from corporates and individuals to support research and outreach activities of the institute and towards student development and welfare. A total of 217 students benefited through this support offered in the form of tuition fee assistance and travel support enabling students to participate in conferences.

The 2023 edition of IISER Pune-Industry Conclave held on August 5, 2023 saw participation of over 100 industry representatives. During 2023-24, the Institute signed 41 Memoranda of Understanding (MoU), Memoranda of Agreements (MoA), or Amendments with organisations from industry and academia towards building partnerships. Of these, 21 were towards building research collaborations and expertise, 19 were towards CSR and donations, and 1 towards strengthening our international relations. Some of the agreements pertaining to research and international cooperation are highlighted below.

The Institute signed a MoA with the Indian Meteorological Department, GoI, on August 4, 2023, with the aim of advancing our understanding of extreme events and improving human resources in the field of weather and climate, and to facilitate development of joint research projects and mentoring of students.

The Institute renewed an MoU with the University of Glasgow, U.K., aiming to strengthen academic and research collaborations. In February this year, we hosted a delegation led by the Lord Mayor of the City of London and discussed shared interests in science, education, and outreach. A significant announcement occurred on July 6, 2023, during the visit by the UK Minister of State for Science, Technology and Innovation along with delegation, wherein the UK government pledged its commitment to Phase 4 of UKIERI, aiming to bolster bilateral collaborations in education and research between the UK and India. On May 24, 2023, a consortium agreement for the Biosantexc project in life sciences was signed at IISER Pune, showcasing a partnership between ENS, IISER, and partners across France and India. These events mark significant strides in fostering international cooperation in academia and research across various domains.

Smt. Indrani Balan Science Activity Centre (SAC) on campus has emerged as a vibrant hub for educational outreach, with an impressive engagement of approximately 2.68 lakh students, teachers, and science enthusiasts through events such as workshops, visits by schools, colleges, and delegates, participation in exhibitions, online lecture-demo series events during the year. This year, team members from the SAC participated in national-level educational initiatives such as Akhil Bhartiya Shiksha Samagam 2023 and the NEP Exhibition in New Delhi. An important milestone this year has been the SAC's collaboration with the Pimpri Chinchwad Science Park, a science centre of the Pune region, by organising events and activities at the Science Park thus expanding our reach to larger audiences.

During the year, through short workshops, IISER Pune's Science Media Centre (SMC) offered opportunities to enrich media skills in visual design, 3D illustrations, and animations for effective science communication. The SMC conducted a collaborative project with the University of West England - Bristol, U.K., delving into the practice of science communication in India and the U.K. Two roundtable discussions brought together science communicators to reflect on their experiences, contributing valuable insights to the development of an upcoming course in science communication.

Led by the institute faculty members, the project-based outreach activities dedicated to capacity building in the education and research sectors are thriving and reaching scores of beneficiaries. Three such projects are highlighted here: iRISE project, MS-DEED project, and Molecular Biology workshops.

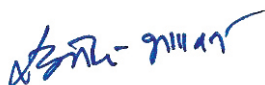
The Inspiring India in Research, Innovation, and STEM Education Programme (iRISE) is in collaboration between the Department of Science and Technology (DST) Government of India, IISER Pune, the British Council, Royal Society of Chemistry (RSC) U.K., Tata Technologies, and

Tata Trusts and is being implemented by IISER Pune. During the year, the iRISE team conducted 6 regional workshops for over 400 teachers, developed 136 master trainers (Innovation Champions) at IISER Pune campus and 44 district-level cascade workshops reaching over 2523 teachers directly. The team instituted iRISE Recognition Awards for teachers who demonstrate outstanding commitment to cultivating a culture of Innovation in their region. Through Capacity building programmes for Early Career Researchers, the team reached over 600 PhD scholars and post-doctoral researchers through 12 workshops.

Maharashtra State Development of Educators and Enhancement in Delivery (MS-DEED) Programme is a close collaboration between IISER Pune and the Maharashtra State Faculty Development Academy (MSFDA) - Centre for Multi-disciplinary Curriculum & Pedagogy under the Department of Higher and Technical Education, Government of Maharashtra. The MS-DEED team has been reaching out to higher education institutes and faculty members across Maharashtra with formal collaborations with universities, autonomous colleges, and educational organisations. During the year, the MS-DEED team conducted 13 Level-1 Introductory workshops and 2 Level-2 Master Trainer workshops with 964 and 96 undergraduate teachers, respectively. The team initiated student-teacher integrated workshops to promote experiential learning and reached 204 students and 36 teachers through these new set of workshops. A new Master Trainer Fellowship is being introduced by the team for reaching out to MS-DEED alumni who are taking the learnings from the programme to classrooms and peers.

Molecular Biology training programmes for school, undergraduate (Bachelors) and postgraduate (Masters) students are being organised with support from Praj Industries Ltd and KK Nag Pvt Ltd. During 2023-24, the team conducted 76 workshops and catered to 773 students.

I express gratitude to all our statutory committees, the Senate, the Building and Works Committee, the Finance Committee, and the Board of Governors. I express my sincere thanks to the Chairperson of our Board of Governors, Shri Sudhir Mehta, and to all members for their contributions towards the smooth functioning of the institute.



**Prof. Sunil S. Bhagwat**

Director, IISER Pune

September 24, 2024

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*List is as of March 31, 2024; changes during the year are not shown here*

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*Superintending Engineer, IISER Pune*



# Research Activities and Achievements



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# RESEARCH REPORT

Publications in 2023

TOTAL: 559



**87**

BIOLOGY



**139**

CHEMISTRY



**4**

DATA SCIENCE



**26**

EARTH AND  
CLIMATE SCIENCE



**11**

HUMANITIES AND  
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**69**

MATHEMATICS



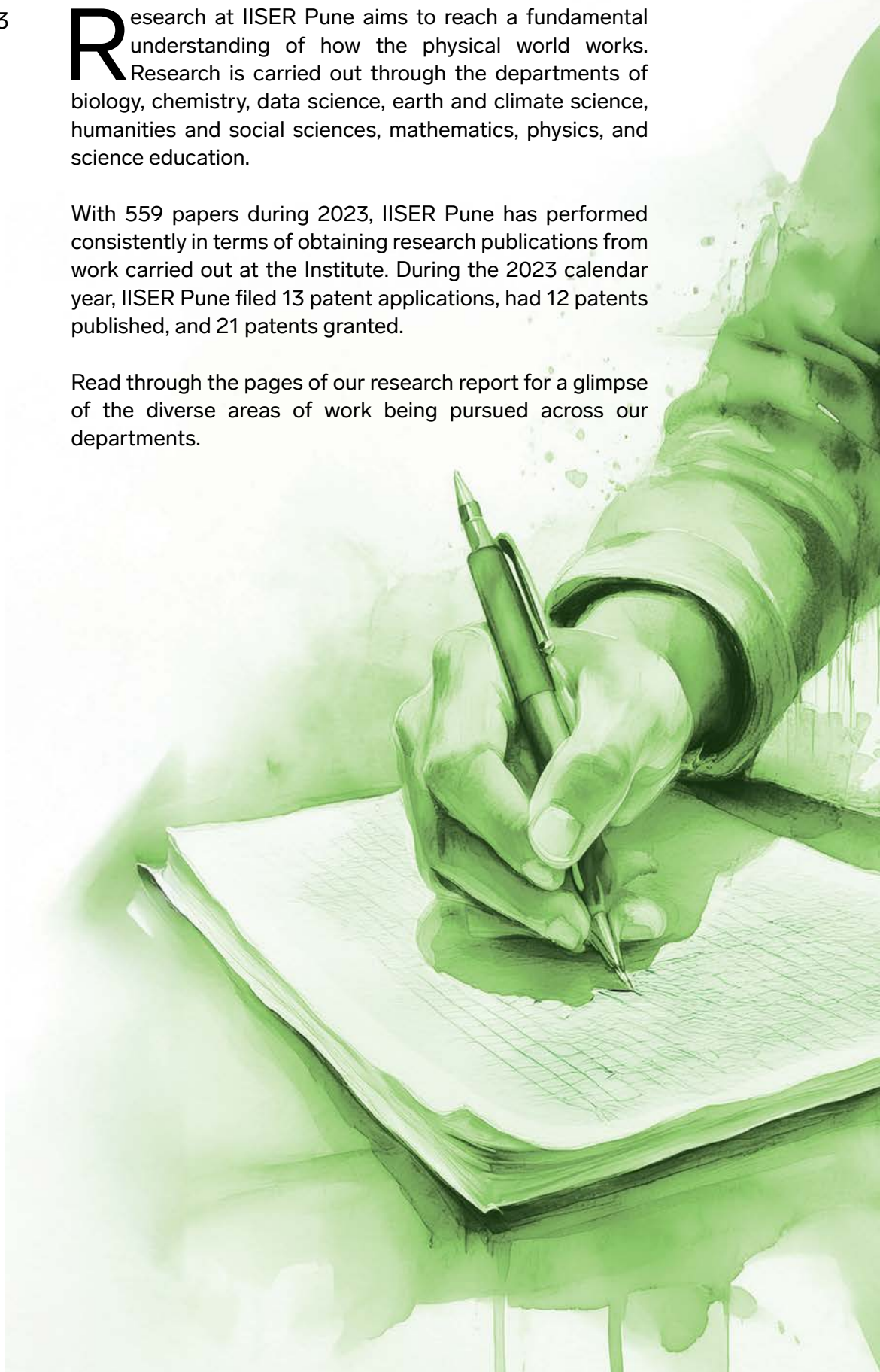
**223**

PHYSICS

Research at IISER Pune aims to reach a fundamental understanding of how the physical world works. Research is carried out through the departments of biology, chemistry, data science, earth and climate science, humanities and social sciences, mathematics, physics, and science education.

With 559 papers during 2023, IISER Pune has performed consistently in terms of obtaining research publications from work carried out at the Institute. During the 2023 calendar year, IISER Pune filed 13 patent applications, had 12 patents published, and 21 patents granted.

Read through the pages of our research report for a glimpse of the diverse areas of work being pursued across our departments.



# 1. BIOLOGY

## 1.1 BIOCHEMISTRY AND BIOPHYSICS

### Mechanisms of nucleotide-dependent multidomain proteins

The focus of Prof. Saikrishnan Kayarat's research is to understand how nucleotide-dependent multifunctional and multidomain proteins, often referred to as molecular machines, coordinate their activities to carry out nucleic acid transactions. Towards this end, the group studies the bacterial nucleoside triphosphate (NTP)-dependent restriction enzymes and the extended replication-transcription complex (RTC) of the SARS-CoV-2 virus as model systems using X-ray crystallography, electron cryo-microscopy, biochemical and biophysical tools. (i) The project on NTP-dependent restriction enzymes focuses on understanding how energy released upon nucleotide hydrolysis is converted into mechanical movement and regulates other enzymatic activities, such as DNA cleavage and methylation. (ii) The project on the extended RTC complex aims to understand the mechanism of processive and error-free replication of the SARS-CoV-2 genomic RNA, which is one of the largest viral genomes.

### Cell motility and bacterial cytoskeleton

Dr. Gayathri Pananghat's research focus is to understand the molecular mechanism of motility, cell shape determination and division based on the bacterial cytoskeleton using *Myxococcus xanthus* and *Spiroplasma* as model systems. A few highlights of this year's achievements are as follows:

- A model for *Myxococcus* FrzCD and FrzA and FrzB interaction has been experimentally validated.
- Characterisation of the interaction between RomRX, RomY and MglAB components of *Myxococcus* polarity determinants have been carried out (Chakraborty et al, BioRxiv, 2024).
- Ongoing work on the characterisation of FtsZ from the cell wall-less organism *Spiroplasma* is progressing and the group is currently characterising its filament dynamics, to answer questions regarding an extended conformation intermediate, and interaction with the adapter proteins FtsA and SepF.
- Further experiments with respect to visualisation of *Spiroplasma* MreB on the membrane, to understand the nucleotide dependence of membrane remodelling is in progress. Interaction studies between multiple MreBs are also ongoing.
- The group has initiated a modelling of the fission yeast cytokinetic ring based on AlphaFold models of pairwise interactors.

### Understanding protein machines that catalyse membrane fission

Membrane tubulation coupled with fission (MTCF) is a widespread phenomenon but mechanisms for their coordination remain unclear, partly because of the lack of assays to monitor dynamics of membrane tubulation and subsequent fission. Prof. Thomas Pucadyil's group has developed polymer-cushioned bilayer islands that allow the real-time monitoring of membrane tubulation. Using this assay system, they analysed the membrane tubulator Bridging Integrator 1 (BIN1) mixed with the fission catalyst dynamin2 (Dyn2). The results revealed this mixture to constitute a minimal two-component module that demonstrates membrane tubulation coupled with fission. MTCF is an emergent property and arises because BIN1 facilitates recruitment but inhibits membrane binding of Dyn2 in a dose-dependent manner. These results led the group to establish cushioned bilayer islands as a facile template for the analysis of membrane tubulation and inform on mechanisms that coordinate MTCF.



### Emergence of information-containing polymers in prebiotic Earth

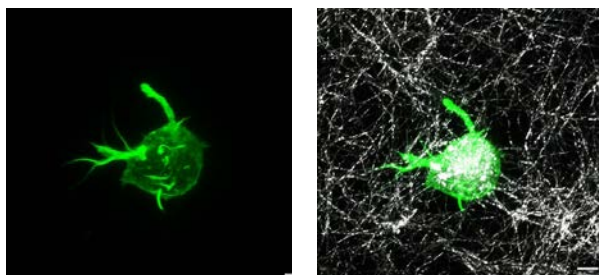
How did life come about on the early Earth and what are the geologically relevant niches that allowed for the transition from non-life to life? Prof. Sudha Rajamani's group is working on the geochemical, biochemical, and biophysical processes that pertain to the events and niches that are considered to have set the grand stage on the early Earth, which allowed for life's emergence around 4 billion years ago. Specifically, characterising these processes and their outcomes helps to better understand how the emergence of the earliest cells or protocells came about. Further, delineating the aforesaid also has implications for dissecting fundamental biochemical principles underpinning extant biological processes. More recently, results from Prof. Rajamani's group have started to have ramifications for understanding how similar events could advent on habitable solar-system bodies and other Earth-like exoplanets. During 2023-24, the group worked on characterising prebiotic amphiphile-related processes that are thought to result in the formation of cell-like entities. The group has begun to characterise how single-chain amphiphiles could be used to concoct phase-separated systems (eg., coacervates). This is important because phase-separated systems are thought to have played important roles in concentrating prebiotic reactants to result in molecular networks. The group has also delineated few phenomena related to the pre-RNA-World. Here, they demonstrated how a pre-RNA World heterocycle (barbituric acid) could be used by extant enzymes, in the context of early RNA World processes, to result in functional RNA aptamers.

## 1.2 CELL, ORGANISMAL, AND DEVELOPMENTAL BIOLOGY

### Adhesion-dependent regulation of cell function: Role and regulation in cancers

Integrin-mediated cell-matrix adhesion controls anchorage-dependent signalling and growth, which cancer cells overcome to become anchorage-independent. Integrins also regulate cellular mechanosensing and signalling that is altered in cancers. Dr. Nagaraj Balasubramanian's group focuses on understanding how these regulatory pathways work, are deregulated in cancers, and can be targeted to restore anchorage dependence. The group studies the role caveolar-endocytosis and Ral-exocyst-dependent exocytosis has in regulating adhesion-dependent membrane trafficking and signalling. They further test how adhesion-dependent Golgi organisation in normal cells is deregulated in cancers and how this can provide insights into the regulation of Golgi organisation and function.

The significant outcomes of this work in the last year include a novel understanding of how the kinetics of Arf1 inhibition (and not just active Arf1 levels) regulate Golgi organisation and function (Rajeshwari et al., 2023). This regulation can be used to study how cell-surface glycans can be a quantitative reporter of Golgi dysfunction in single cells (Prachi et al. 2024. bioRxiv). To extend our understanding of cellular mechanosensing, the group developed a simple reflectance microscopy protocol to evaluate 3D collagen organisation proximal to cells (Shaunak et al. 2024). This allows one to compare differentially mechanoresponsive wild-type vs Cav-1 null mouse fibroblasts in 3D hydrogels. The group extended this study to find 3D matrix organisation to be affected by dental abutments to regulate the recruitment of cells (Shaunak et al. 2024. In review).

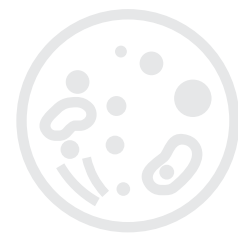


**Figure 1:**

*Fibroblast labelled for actin in 3D collagen hydrogel imaged by reflectance microscopy (Dr. Nagaraj Balasubramanian's Group)*

### **DNA damage and maintenance of genome integrity**

Dr. Mayurika Lahiri's group has been investigating the process by which genome instability can lead to the cellular transformation of breast epithelial cells using three-dimensional breast acini as a model system. Recent studies have shown deregulation of Api5 (anti-apoptotic protein) leads to cellular transformation in breast acini. The group is working on the molecular mechanism of such a transformation. Breast spheroids harbouring overexpression of Api5 show increased stemness properties and the current research in the group is to understand the signalling cascade between Api5 and the stemness markers. This will reveal a novel and yet undiscovered function of Api5. The other project is investigating the role of Api5 in the DNA damage response signalling cascade. This signalling cascade is critical to maintain genome stability. Recent studies from the group demonstrated Api5 to play a role in the ATR checkpoint signalling cascade following UV damage and replication stress. Therefore, it is important to study how and where Api5 functions in the DNA damage response to prevent genome instability. Another project is on studying the changes in microtubule dynamics following DNA damage.

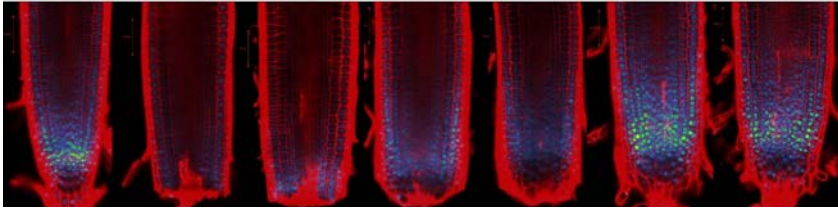


### **Chromosomal segregation during cell division**

Dr. Mridula Nambiar's group's research focuses on deciphering the roles of cohesins in maintaining genomic stability during cell division in the fission yeast *Schizosaccharomyces pombe*. The group studies the functional divergence of cohesin paralogs, regulation of their spatial separation on chromosomes as well as consequences of atypical cohesin complexes upon aberrant expression. The results show that the meiotic cohesin subunits have evolved specific functions that are not replaceable by their mitotic paralogs during meiosis including both genetic recombination and chromosomal segregation. They also observe differences in cohesin complex formation and genomic loading, especially at the centromeres, dependent on the type of cohesin paralog present, which affects growth and viability. This is also dependent on specific heterochromatin proteins that appear to have a bias for one cohesin paralog over the other. The group is currently identifying the molecular basis for this selective preference. Moreover, proliferating cells with ectopic expression of certain cohesin paralogs show dramatic sensitivities to DNA damaging agents, potentially due to altered gene expression profiles that fail to mount a DNA damage response or inability to recruit DNA repair factors at DNA damage sites - ideas that are being tested by Dr. Nambiar's research group.

### **Regulation of self-organised morphogenesis in plant regeneration**

During morphogenesis, mechanical forces induce cellular and tissue-wide deformations. These forces, in conjunction with cell geometry and biochemical properties, including hormones, drive the morphogenetic process. Dr. Kalika Prasad's group employs regeneration in *Arabidopsis thaliana* as a tool to investigate morphogenesis. The group's investigations, utilising tissue culture-mediated shoot regeneration, unveil the necessity of mechanical forces in orchestrating the self-organisation of shoot initials, known as progenitors, from undifferentiated callus into functional shoot meristems. To elucidate the process, they propose a stretch-compress model explaining how mechanical forces induce compression in progenitor cells and expansion in neighbouring cells. The resulting changes in cell geometry and mechanical conflicts are key to the making of a dome-shaped shoot meristem. Notably, this mechanistic module also operates in the restoration of an organ lost in injury. Using *Arabidopsis* root tip regeneration, the group identified a similarly operating push-pull mechanistic model that facilitates the U-shaped convergence of longitudinal cell files at the regenerating tip and the repositioning of the stem cell niche (SCN). This study underscores the significance of cell geometry and mechano-chemical feedback between adjacent cells as key drivers of tissue morphogenesis.



**Figure 2:**

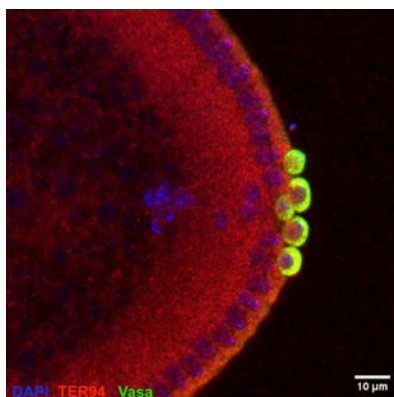
*Re-establishment of a transcription factor gradient in regenerating root tip. (Dr. Kalika Prasad's Group)*

### Regulatory processes that govern growth and development in bacteria

The ability to sense and respond to nutrient availability is an inherent and essential property of all living cells. Growth, proliferation, and dispersal of every cell need to be in tune with the availability of nutrients and their metabolism. The underlying mechanisms that help cells to integrate nutrient availability to the regulatory processes governing cell cycle, proliferation and dispersal is poorly understood. For example, during nutrient starvation cells robustly turn off chromosome replication, but the underlying mechanism that regulates this process has remained unclear. Work from Dr. Sunish Radhakrishnan's group, using bacteria as a model, has led to the discovery of an uncharacterised regulator that inhibits chromosome replication in nutrient-depleted conditions. Using an array of genetic and imaging approaches, the group has unearthed the underlying mechanism that this newly-discovered regulator utilises to silence replication elongation, specifically in low nutrient conditions. The group found that the regulator they have discovered is conserved from bacteria to humans, raising the possibility that such a nutrient-dependent replication regulatory mechanism may be fundamental to several domains of life.

### Molecular principles underlying animal development and disease

Molecular mechanisms underlying the development of organisms are remarkably conserved. Many developmental paradigms and their underlying genetic networks were first elucidated in *Drosophila melanogaster* and have provided insights into the development processes governing other organisms, including humans. Prof. Girish Ratnaparkhi's laboratory utilises *Drosophila* as a model organism to study the regulation of cellular signalling in the context of development and its misregulation in disease. Under this broad theme, the Ratnaparkhi laboratory found that SUMO conjugation modulates NF-kappa B signalling in both DV patterning (Hegde et al., 2022) as well as in host defence (Kumar et al., 2022; Soory & Ratnaparkhi, 2022; Hegde et al., 2022).



**Figure 3:**

*Primordial Germ cells (PGC), marked by Vasa (Green) are set aside at the posterior side of the *Drosophila* embryo. These cells determine the future stem cells in the testis/ovary of the adult. This work showed that maternal levels of Caspar/dFAF1 regulate the number of PGCs, a function executed with its partner TER94 (red). (Prof. Girish Ratnaparkhi's Group)*

The group also found that the interactions between VAPB, Caspar/FAF1 and VCP appear to be key for the modulation of proteostasis and inflammation in the context of the neurodegenerative disease Amyotrophic Lateral Sclerosis (Tendulkar et al., 2022; Thulasidharan et al., 2024).

Further, they are investigating functions for orphan metabolic serine hydrolases in *Drosophila* (Kumar et. al., 2021) using a combination of chemo-proteomics and CRISPR/Cas9 mediated genome editing.

### Cellular mechanisms underlying embryogenesis and stem cell differentiation

Prof. Richa Rikhy's research focuses on understanding the regulation of cellular remodelling events during embryogenesis and stem cell differentiation. Epithelial cell formation, remodelling and differentiation occurs routinely during metazoan embryogenesis. *Drosophila* embryogenesis begins as a syncytium and this is followed by formation of epithelial cells in a process called cellularisation. The group found that the lateral plasma membrane in between adjacent nuclei is important for partitioning adjacent nucleocytoplasmic domains. The plasma membrane is organised in a polygonal manner with hexagon dominance occurring in nuclear cycle 12. The adherens junction protein DE-cadherin, the polarity protein Bazooka, and cytoskeletal remodelling protein Peanut are important for stabilisation of the hexagonal array. The group also found that mitochondrial dynamics in the form of fission is needed for the onset of the apical domain during follicle cell differentiation in oogenesis. Increase in ROS alleviates the symptoms of loss of mitochondrial fission. This work has shown important pathways that regulate epithelial cell formation and remodelling.



**Figure 4:**

The *Drosophila* ovariole chamber has posterior follicle cell clones (bottom-right, CD8-GFP, green) mutant for mitochondrial fission protein Drp1 present in multiple layers (DNA, blue) and showing the presence of lateral polarity protein Dlg (gray) and a loss of apical polarity protein aPKC (red).

(Prof. Richa Rikhy's Group)

## 1.3 CHROMOSOME BIOLOGY AND EPIGENETIC REGULATION

### Epigenetics and transcriptional regulation in *Plasmodium falciparum*

*Plasmodium falciparum*, the deadly protozoan parasite responsible for malaria, has a tightly regulated gene expression profile closely linked to its intraerythrocytic development cycle. Epigenetic modifiers of the histone acetylation code have been identified as key regulators of the parasite's transcriptome, but require further investigation. In one study, Dr. Krishanpal Karmodiya's group mapped the genomic distribution of *Plasmodium falciparum* histone deacetylase 1 (PfHDAC1) across the erythrocytic asexual development cycle and find it has a dynamic occupancy over a wide array of developmentally relevant genes. The group found that overexpression of PfHDAC1 results in a progressive increment in parasite load over consecutive rounds of the asexual infection cycle and is associated with enhanced gene expression of multiple families of host cell invasion factors (merozoite surface proteins, rhoptry proteins, etc.) and with increased merozoite invasion efficiency. They also identified that artemisinin exposure can interfere with PfHDAC1 abundance and chromatin occupancy resulting in enrichment over genes implicated in response/resistance to artemisinin. Collectively, their results demonstrate PfHDAC1 to be a regulator of critical functions in asexual parasite development and host invasion, which is responsive to artemisinin exposure stress and deterministic of resistance to it.



## 1.4 ECOLOGY AND EVOLUTION

### Population dynamics

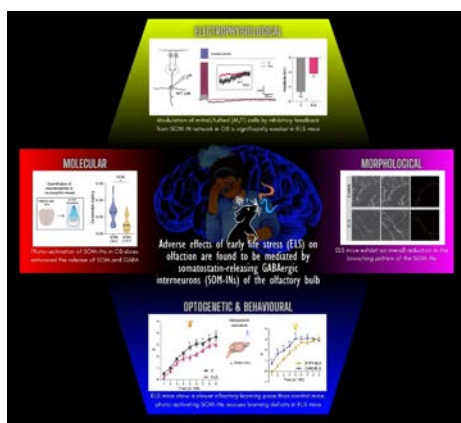
One of the topics that Prof. Sutirth Dey's group works on includes the study of dispersal evolution and the effects of population size on microbial evolution. How does niche expansion occur when the habitual (high-productivity) and marginal (low-productivity) niches are simultaneously available? Without spatial structuring, such conditions should impose fitness maintenance in the former while adapting to the latter. Hence, adaptation to a given marginal niche should be influenced by the identity of the simultaneously available habitual niche. This hypothesis remains untested. Similarly, it is unknown if larger populations, which can access greater variation and undergo more efficient selection, are generally better at niche expansion. The group tested these hypotheses using a large-scale evolution experiment with *Escherichia coli*. While they observed widespread niche expansion, larger populations consistently adapted to a greater extent to both marginal and habitual niches. Owing to diverse selection pressures in different habitual niches (constant vs. fluctuating environments; environmental fluctuations varying in both predictability and speed), fitness in habitual niches was significantly shaped by their identities. Surprisingly, despite this diversity in habitual selection pressures, adaptation to the marginal niche was unconstrained by the habitual niche's identity. The group showed that in terms of fitness, two negatively correlated habitual niches can still have positive correlations with the marginal niche. This allows the marginal niche to dilute fitness trade-offs across habitual niches, thereby allowing costless niche expansion. These results provide fundamental insights into the sympatric niche expansion.

## 1.5 NEUROBIOLOGY AND COMPUTATIONAL BIOLOGY

### Neural circuits

Unravelling neural circuits responsible for sensory and cognitive dysfunctions is one of the major challenges in Psychiatric Neuroscience. What happens to our perceptual abilities if we have experienced adverse events during our childhood? Dr. Abraham's group discovered the neural circuit whose functioning was compromised by early-life stress (ELS) conditions by using a mouse model of early maternal separation, and a combination of behavioural, electrophysiological and in vivo imaging techniques (Pardasani et al., 2023 *Molecular Psychiatry* 28:4693-4706). Their results demonstrate olfactory perceptual learning and memory deficits in ELS mice. Lowered neuronal activity and a reduction in the number of dendritic processes of specific inhibitory interneurons (SOM-INs) in the olfactory bulb of ELS mice led them to hypothesise the underlying neuronal circuit. Towards probing the circuit mechanisms, they observed lack of learning-dependent refinement of  $Ca^{2+}$  dynamics in SOM-INs during odour discrimination, and recorded reduced synaptic inhibitory feedback on the output neurons, mitral/tufted cells. Photo-activation of SOM-INs rescued the learning deficits in ELS mice. Conversely, optical inhibition of SOM-INs in control animals mimicked the ELS-induced learning deficiency, while it completely abolished the learning in ELS mice. These results confirmed the role of inhibitory circuits formed by SOM-INs in mediating the learning deficits the group observed in ELS mice. Thus, by using a multi-pronged approach comprising optogenetics, electrophysiology, and in vivo population imaging, the group revealed the responsible neural circuit and succeeded to rescue the learning dysfunctions, which may facilitate designing therapeutic approaches involving a stress-vulnerable interneuron population.



**Figure 5:**

*A multi-pronged experimental approach to probe olfactory perceptual deficits due to early-life adverse conditions (Dr. Nixon Abraham's Group, Illustration by Krish Pandey)*



### **Mathematical modelling to explore physiological systems**

Dr. Pranay Goel's group is presently working on three projects using mathematical modelling to explore physiological systems.

*Bone age assessment (BAA) from X-rays:* Determining age from the X-ray of a child is a mainstay of pediatric endocrinology. In a long-standing project with the lab of Dr. Khadiikar from Hirabai Cowasji Jehangir Medical Research Institute (HCJMRI), the group is involved in using Artificial Intelligence (AI) techniques to carry out BAA. In the past year, they have completed BAA analysis for the so-called RSNA dataset, which is largely for Caucasian children. Over the past year, with graduate student S. Chakladar, the group is focusing on using transfer learning to carry out BAA for Indian children as well. In this regard, collaborators at HCJMRI have painstakingly manually rated several hundreds of X-rays which Dr. Goel's group is now using as ground truth to train their neural networks to predict bone age through X-rays for Indian children.

*Synovitis detection in hand photographs:* Dr. Pranay Goel's group along with Dr. S. Phatak has been involved in developing a technology that uses AI to detect synovitis by examining hand photographs. The group has been developing this for some time and continue to refine the technique. As of the present time, they are able to detect synovitis in patients versus control subjects with good confidence, and are extending their methods to joint-specific predictions.

*Analysis of continuous glucose monitoring (CGM):* Dr. Pranay Goel's group has been working with Prof. S. Ghaskadbi to understand CGM traces in diabetes. Two of their contributions are described in the thesis work of PhD student, S. Majumdar, who has shown (i) improved relationships between CGM measurements and HbA1c in type 2 diabetes patients. This work has since been extended to type 1 patients in collaboration with HCJMRI; (ii) how to use trajectory optimisation techniques to compute blood glucose traces from the times series collected on interstitial fluid glucose (i.e. CGM).

### **Computational neurobiology**

*Sophisticated synapses: Quantitative insights into crucial components of brain function:* Synapses, crucial for learning and memory, are remarkably intricate structures, varying in morphology, receptors, ion channels, and second messengers. Direct measurements at synapses are challenging due to their minuscule scale and molecular complexity. Coarse approximations often obscure crucial experimental findings. Neurological disorders often involve synaptic dysfunction, highlighting the brain's interconnected organisational levels and that changes at the synaptic level can profoundly impact brain function. To tackle these challenges, Dr. Suhita Nadkarni's group developed detailed in silico models of synapses, enabling them to explore information processing and make precise predictions.

*Acetylcholine transforms synaptic dynamics for efficient learning during active exploration:* Acetylcholine alters synaptic activity at CA3-CA1 synapses, enhancing learning and memory. The model from the group showed M1 and M4 receptors' role in modulating this activity, influencing plasticity and ensuring maximum transfer of relevant information in an energy-efficient manner.

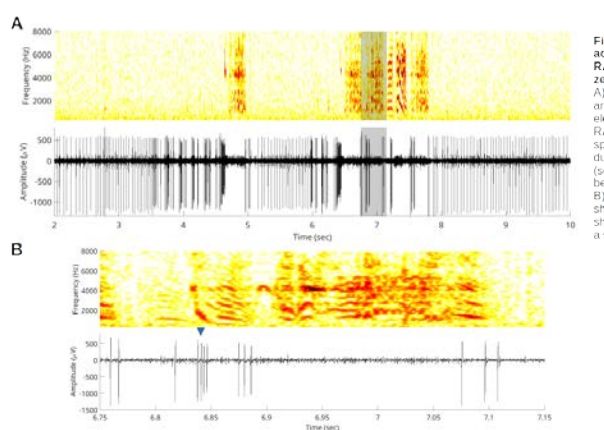
*Shaping of neural activity by homeostatic plasticity (In collaboration with Deepak Nair, IISc.):* Homeostatic plasticity, via adjustments to synaptic strengths and conductances, maintains neural stability. Model from Dr. Nadkarni's group is examining how these changes affect synaptic strength, plasticity, and information transmission, suggesting a dynamic role in neural activity regulation.

*Cross-talk among active zones is essential for short-term plasticity in hippocampal mossy fiber:* Granule cells' mossy fibers exhibit STP that is essential for hippocampal function. The group's spatial model of MF boutons shows that active zone crosstalk and VDCC coupling underpin this plasticity, crucial for synaptic transmission and pattern separation.

### Neural mechanisms underlying movement initiation in songbirds

A central role of the brain is to respond to stimuli with the appropriate movement. The same movement can be produced in response to an external stimulus or can be triggered by internal stimuli. For eg., you can reach out for a bar of chocolate because someone gave it to you or because you are hungry. Dr. Raghav Rajan's group uses the zebra finch, a songbird, as a model system to understand how the brain initiates movements. The song sequence of the adult male zebra finch consists of a stereotyped sequence of sounds interleaved by silent gaps and is about 0.5 to 1 second in duration. This song sequence begins with a variable number of short syllables called introductory notes.

During 2023-24, the group has examined neural activity and respiratory pressure changes related to introductory notes. The group observed changes in both as birds get closer to the start of the song sequence. Interestingly, they also see these changes in a rare subset of birds that do not produce introductory notes, suggesting the importance of these changes for song sequence initiation. The group is currently exploring the origin of these changes and their importance for song sequence initiation.



**Figure 6:**

*Singing related activity from motor nucleus RA in an awake, singing, zebra finch A) Microphone signal (top) and signal from tungsten electrode in motor nucleus RA. Characteristic regular spontaneous activity is seen during non-singing periods (see between 2s and 3s or between 8 and 10s) B) Detailed view of the shaded region from A showing individual spikes and a spike burst (arrow head) (Dr. Raghav Rajan's Group)*

## 2. CHEMISTRY

### 2.1 ORGANIC CHEMISTRY AND CHEMICAL BIOLOGY

#### Synthesis of biologically important heterocycles and macrocycles

The primary goal of Dr. Gnanaprakasam's research group is to develop sustainable synthetic approaches for the synthesis of biologically important heterocycles and macrocycles. In this direction, the ring-opening of macrolactones to amides by Ru catalyst and subsequently intramolecular N-alkylative ring closure of amides with alcohols by Ir catalyst provided a series of macrolactams with water as a byproduct. Furthermore, a direct intramolecular coupling of primary and secondary alcohols for the selective synthesis of macrocyclic olefins in the presence of Ni-zeolite catalyst under continuous flow was also developed by Gnanaprakasam's research group. A continuous-process for the direct cyclopropanation of various alkenes nonconjugated with carbonyl using trimethylsulfoxonium iodide as a methylene source via the Corey-Chaykovsky cyclopropanation reaction in the presence of Amberlyst-A26 as a heterogeneous base was also reported from this group. Dr. Gnanaprakasam's research group has also developed novel rearrangement reactions using peroxides to generate several derivatives of N-substituted-2-phenylbenzo[d][1,3]dioxole-2-carboxamide and hexahydro-1H-xanthene-1,8-dione or dibenzo xanthene containing spirooxindole derivatives.

#### Macromolecular engineering

Non-invasive, real-time, longitudinal imaging of protein functions in living systems with unprecedented specificity is one of the critical challenges of modern biomedical research. Towards that goal, Dr. Britto Sandanaraj's group has developed a fusion technology called activity-based protein profiling-bioluminescence resonance energy transfer (ABPP-BRET). This method provides an opportunity to study the post-translational modification of a target protein in real-time in living systems in a longitudinal manner. This semi-synthetic BRET biosensor method is used for target engagement studies and further for inhibitor profiling in live cells. The simplicity of this method coupled with the critical physical distance dependent BRET read-out turned out to be a powerful method, thus pushing the activity-based protein profiling technology to the next level.

#### Nucleic acid chemistry and biophysics

Prof. Seergazhi G. Srivatsan's group is developing biophysical platforms and nucleic acid labeling technologies to understand the structure-function relationship of nucleic acids in cell-free and cellular environments. The group has developed a technology called sgR-CLK, wherein a terminal nucleotide transferase was used to remodel CRISPR gene editing and targeting system to display small molecules on specific gene targets by click chemistry. Taking forward, this technology was also put to use in synthesising aptamer-fluorophore/antibody and siRNA-probe conjugates for diagnostic and therapeutic applications. In addition, the group has developed multifunctional nucleoside probes for investigating the structure and ligand-binding properties of oncogenic G-quadruplex and i-motif forming sequences, and DNA polymerase activity in real time and in atomic level by using fluorescence and X-ray crystallography techniques. More recently, the group has devised an innovative platform using nucleoside probes to elucidate the structure, ligand recognition and population equilibrium of G-quadruplexes formed by oncogenic EGFR promoter region and HIV-1 long terminal repeat (LTR).



## 2.2 INORGANIC CHEMISTRY AND MATERIALS SCIENCE

### Interfacial materials chemistry

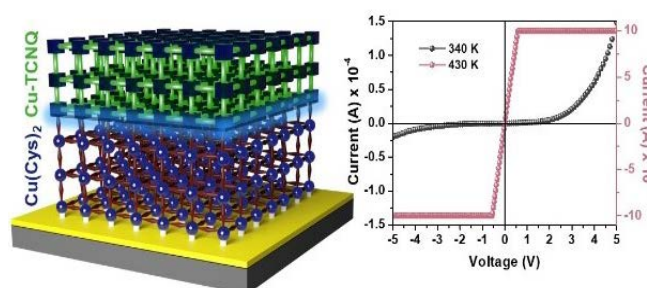
The primary research of Prof. Nirmalya Ballav focuses on interfacial materials chemistry, from fundamentals to applications, upon exploring various solid-solid and solid-liquid interfaces. Research platforms include thin films of coordination polymers, composite systems with conducting polymers, two-dimensional materials, and magnetic semiconductors. Prof. Ballav's group has demonstrated thermally driven and fully reversible insulator-to-metal-like transition in a thin film of biological coordination polymer at ambient pressure and a little above room temperature. The transition was achieved without a noticeable change in the structure and assigned to be of mainly electronic origin, viz., a charge cross-over phenomenon. Successful capturing of the insulator-to-metal-like transition in the photo-lithographically patterned sample, along with the robust current-voltage characteristics, ensured the device application possibilities of the thin film.

This work is anticipated to provide a new platform for studying the coupling of charge, spin, and lattice degrees of freedom in correlated biological reticular materials. Thermally-driven supercurrent in biological MOFs is also envisioned. The group has also captured the emergence of a bistable interface in a hetero-structured thin film of Mott-like electrically insulating coordination polymers whereby rectifying to non-rectifying current can be reversibly switched by applying thermal energy. The inherent resistive switching behaviour of both the individual coordination polymer layers at different temperatures coupled with charge-transfer apparently made the interface complex and warrants further understanding at the microscopic level.

**Figure 7:**

*Bistable interface: reversible switching of rectifying to nonrectifying current across heterostructured thin films of MOFs*

*(Prof. Nirmalya Ballav's Group)*

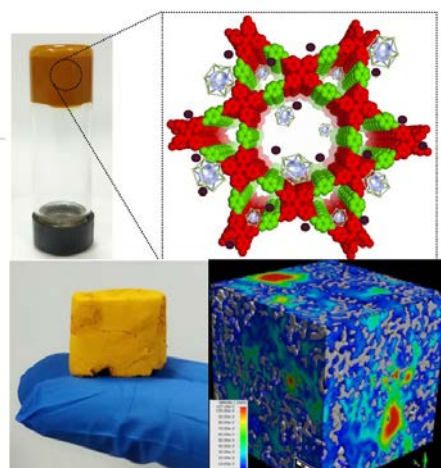


### Hybrid aerogel

Considering the importance of sustainable nuclear energy, effective management of radioactive nuclear waste, such as sequestration of radioiodine has inflicted a significant research attention in recent years. Despite the fact that materials have been reported for the adsorption of iodine, development of effective adsorbent with significantly improved segregation properties for widespread practical applications still remain exceedingly difficult due to lack of proper design strategies. By utilising unique hybridisation synthetic strategy, a composite crystalline aerogel material has been fabricated in Prof. Sujit Ghosh's laboratory by covalent stepping of an amino-functionalised stable cationic discretmetal-organic polyhedra with dual-pore containing imine-functionalised covalent organic framework. The ultralight hybrid composite exhibits large surface area with hierarchical macro-micro porosity and multifunctional binding sites, which collectively interact with iodine. The developed nano-adsorbent demonstrates ultrahigh vapor and aqueous-phase iodine adsorption capacities, in static conditions with fast adsorption kinetics, high retention efficiency, reusability and recovery (Nature Communications, 2024, 15, 1278).

**Figure 8:**

(Top) Synthesis and schematic illustration of Zr(IV)-MOP embedded COF hybrid aerogel (IPcomp-7); (Bottom) Crystalline aerogel and its structural characterization by 3D X-ray tomography showing composite void volume (blue to red) of IPcomp-7 (Prof. Sujit Ghosh's Group)



### Synthesis of low-valent compounds

Dr. Shabana Khan's group works on the development of new and fundamentally important areas of main group chemistry and inorganic chemistry. The group is interested in the synthesis of low-valent compounds, structure and bonding studies, and their application in various fields of science. The group synthesised low-coordinate stibonium cation and utilised it for the cyanosilylation reaction of aldehydes. Analogous bismuth(III) cations were also prepared and utilised for the same reaction, which demonstrated a very high TOF. They also started utilising commercially available  $\text{Ce}[(\text{N}(\text{TMS})_2)_3]$  as a catalyst for several organic transformations. It has been proven to be very efficient for the reduction of primary amides with HBPIn, which is a difficult task otherwise.

Recently, the group started exploring low-valent main group compounds as capping ligands on the surface of metal nanoparticles. In this regard, they first used electron-rich cyclic(alkyl)(amino)carbene (CAAC) as a surface modulating ligand and prepared CAAC supported gold nanoparticles and utilised it for  $\text{CO}_2$  reduction. This CAAC functionalised AuNPs demonstrate a remarkable faradaic efficiency (FE) of 94% towards selective carbon monoxide (CO) formation (at pH 6.3, 2 hr of controlled potential electrolysis at  $-0.7$  V vs NHE).

### Main-group and transition metal compounds for catalysis

Research in Dr. Moumita Majumdar's group is focused on expanding the chemical functionalities of low-valent compounds spanning Groups 13-15 of the periodic table. Arguably, the heavier main-group elements have fundamentally different electronic properties from their lighter congeners, which have always intrigued molecular chemists. The ongoing research in Dr. Majumdar's group is much directed in their syntheses and state-of-the-art applications. Among the major research targets are: (1) Cationic main-group compounds as ligands for transition metal catalysts; (2) Cooperative reactivity on main-group platform; (3) Main-group and Transition metal cluster chemistry; (4) Cationic Lewis Acids; (5) Main-group molecular precursors for energy-related materials syntheses.

Recently, the group has focused on designing germanium(IV) mono- and di-cations as Lewis acid catalysts. Although silylium ions have gained immense popularity as Lewis acid catalysts, there are scanty reports on germanium-based Lewis acid catalysts. The group has established the first examples of tetra-coordinate germanium(IV) di-cationic compounds and their efficacies as Lewis acid catalysts (Chem. Sci. 2023). Detailed investigations have been done on the role of intramolecular donor groups present in these di-cationic species for bond activations and catalytic transformations. The group has developed polycationic antimony and



bismuth compounds having catalytic implications (ChemPlusChem 2023). They isolated a tin(II) analogue of 12-crown-4, which is a well-known sequestering agent for lithium ions (Eur. J. Inorg. Chem. 2023).

### **Optoelectronic properties of perovskite semiconductors**

Dr. Angshuman Nag's research group works in the area of Materials and Physical Chemistry, related to semiconductor optoelectronics. Their recent work is focused on halide perovskite semiconductors. The correlation between chemical composition, structure, and optoelectronic property drives their work. They developed quantum-well of a series of 2D layered hybrid perovskites with monoclinic structure. The strong confinement effect, in conjunction of the low-symmetry crystal structure lead to the intense light emission from the so-called "dark excitons", that are not supposed to emit light (Nano Lett. 2023, 23, 6985). This is a fundamental new advancement, and the emission can be switched between dark and bright excitons (spin manipulation) just by varying the temperature, which has potential for future quantum technologies.

Another related research interest is to develop doped halide perovskites, that emit short-wave-infrared (SWIR, 900 to 1700 nm) radiations, and fabricate SWIR LEDs. Dr. Nag's group developed a Cr-doped halide double perovskite material exhibiting broad SWIR emission that strongly overlaps with the vibration overtones of water. These codoped samples are then used to fabricate phosphor-converted LED (pc-LED) panels, which are utilised for non-invasive imaging of fruits and vegetables detecting rotting at a very early-stage (Angew. Chem. Int. Ed. 2023, e202307689; ACS Energy Lett. 2024, 9, 819).

### **Electrochemical activity**

Electrocatalysts are crucial in energy conversion and storage, analytical chemistry, and green chemistry. Understanding their structure-activity relationships is a focus. Conventional electrocatalysts' activity can be improved through various modifications. Molecular electrocatalysts with the N<sub>4</sub> macrocyclic framework have been widely investigated for electrochemical applications due to their stability and tunable properties.

In processes with MPCs, the central metal ion was thought to drive reactivity and selectivity. Dr. Muhammed Musthafa's group's research with isomeric ligands questions the current understanding that attributes the electrochemical activity solely to the central metal ion. Specifically, ligand isomerisation induces a significant change in the ORR mechanism, transitioning from a 2-electron transfer to a 4-electron transfer through H-bonding interactions. Ligand isomerisation also enhances charge storage and electron transfer kinetics through a proton charge assembly, and notably, this phenomenon is independent of the central metal ion. This study reveals the crucial role of ligands in challenging electrochemical transformations.

### **Functional nanomaterials**

Research in Dr. Pramod Pillai's group is focused on regulating the interparticle forces to improve as well as impart newer properties at the nanoscale. This "interplay of forces" is achieved by decorating the surface of nanomaterials with the 'ligand of choice', wherein the surface ligands act as 'gatekeepers' in controlling the interactions of nanomaterials with their surroundings. The group's approach of 'ligand-directed interplay of forces' has helped in addressing several challenges in the areas of self-assembly, catalysis, photocatalysis, photophysics, and thermoplasmonics. For instance, the potency of electrostatic forces was elegantly explored to demonstrate efficient light induced energy and electron transfer processes in quantum dots



(QDs). Similar control over interparticle interactions helped in outplaying the ligand poisoning effect in various nanoparticle (NP) catalysed photochemical transformations. By tuning the NP-reactant interaction, the group was not only able to achieve efficient catalysis at low NP concentration, but also regulated the catalytic properties between completely 'ON' and 'OFF' states - rendering the same NP as a catalyst or a non-catalyst. The group is also interested in 'selectively' channelising the hot-charge carriers as well as the heat generated in plasmonic NPs, for fuelling important chemical and physical transformations. These advancements achieved in the light harvesting properties of nanomaterials will surely enable us to practise chemistry in a more sustainable fashion.

### **Synthetic inorganic chemistry: Materials applications**

The major research goals of Prof. Boomi Shankar's group are in the development of molecular ferroelectric and supramolecular materials with an emphasis on sustainable energy and electronic applications. Notably, they employ heteroleptic nitrogen-centric scaffolds and P(V)-derived moieties such as amino-phosphonium, phosphazanium and phosphoramidate systems for generating organic, hybrid organic-inorganic and metal-organic ferroelectric materials. By carefully employing binary systems containing a series of heteroleptic cations and various monoatomic, multi-atomic and metal-containing anions, they have shown the effect of these molecular components on achieving improved polarization and piezoelectric nanogenerator (PENG) performance attributes.

The group fabricated a large 3D-printed nanogenerator device using a chiral ferroelectric organic compound that shows the compatibility of small molecules for device miniaturization and scale-up applications. Recently, the group discovered a neutral intrinsically polar boron-nitrogen-based compound as a new frontier in ferroelectrics and piezoelectric energy harvesting. They also developed new examples of neutral polyhedral Pd(II) cages supported by imido-P(V) trianions, which exhibit applications in host-guest chemistry and chiral recognition and separation. By employing weakly coordinating oximido ligands as the linkers, the group was able to map the intermediates involved in the assembly of tetrahedral cages and use them as a template for obtaining a hitherto unknown chloro-bridged cubic cage assembly.

### **Study of enzyme reaction mechanisms through synthetic models**

Metalloenzymes perform a diverse range of reactions, including aliphatic hydroxylation, desaturation reactions, N-oxygenation of aminoarenes, and oxidation of tyrosine to tyrosyl radicals, which are essential for DNA biosynthesis. A thorough understanding of the reaction mechanisms of these enzymes is crucial for developing efficient catalysts. Dr. Debansu Sil's research group investigates synthetic models of enzyme active sites to better understand the coordination environment, function, and reactivity of corresponding metalloenzymes and their short-lived intermediates. The class I-c ribonucleotide reductases (RNRIc) and R2-like ligand-binding oxidases (R2lox) contain heterobimetallic MnFe cofactors. RNRIc, found in pathogens like *Chlamydia trachomatis*, plays a role in DNA biosynthesis, while R2lox from *Mycobacterium tuberculosis* is suggested as a virulence factor. The MnFe cofactor is proposed to help these pathogens cope with oxidative stress produced by the host defence mechanism. RNRs have been targeted for cancer treatment and combating multidrug-resistant pathogens. These heterobimetallic MnFe cofactors in RNRIc and R2lox represent promising targets for developing new therapeutics against these lethal pathogens. However, the lack of synthetic complexes mimicking the redox-active heterobimetallic MnFe cofactors of RNRIc and R2lox limits our understanding of enzyme mechanisms.



## 2.3 SPECTROSCOPY, THEORETICAL AND COMPUTATIONAL CHEMISTRY

### DNA-Protein recognition, the effect of heterogeneity in catalytic processes

Chemical and biological processes are stochastic and intrinsically heterogeneous at both microscopic and mesoscopic levels. Dr. Srabanti Chaudhury's research group employs methods of statistical mechanics and stochastic processes to study problems in chemical/biological processes and clarify the underlying physical-chemical mechanisms. The group develops stochastic models to study the role of stochastic fluctuations and heterogeneity in catalysed chemical reactions in enzymes and nanoparticles as revealed in single-molecule studies. Such discrete state models are also useful to study molecular mechanisms underlying certain biological processes such as understanding the role of macromolecular cellular crowding on target DNA target search by proteins and the capture/translocation of DNA through a nanopore.

Recent work from the group has focused on the dynamics and morphology of the self-assembled structure of amphiphilic block copolymers using coarse-grained molecular dynamics simulations. Through simulations, the group showed that the bridging effect of multivalent salt cations induces electrostatic correlations of the PE chains and leads to the formation of aggregates. Increasing salt concentration beyond a threshold value led to charge inversion and reentrant transition of the assembled micelles. The group found that varying the charge fraction of the PE blocks regulates the strength of the electrostatic interactions and plays an important role in determining the morphology of the assembled structures. Such studies can determine their transport properties and drug delivery capabilities.

### Spectroscopic studies of secondary structures of peptides

Prof. Alope Das's research group uses various gas phase laser spectroscopy techniques, 2D NMR, and X-ray crystallography in combination with quantum chemistry calculations to probe various types of weak non-covalent interactions, which are important for the stability of biomolecules and materials. Detailed understanding of these weak interactions is the key to designing improved drugs, catalysts, various supramolecular assemblies etc.

Recently, the group has studied secondary structures of various tripeptides stabilized by C10 hydrogen bonding interactions (beta-turn) employing 2D NMR, FTIR, and gas phase laser spectroscopy techniques as well as X-ray crystallography. The results of gas phase laser spectroscopy are interpreted through quantum chemistry calculations. In the case of Boc-Dpro-Gly-Ala-NHBn-OMe (PGA) peptide, two conformers are observed in the gas phase experiment where the global minimum conformer has double beta-turn or C10-C10 structure and the higher energy observed conformer has C7-C7-C7 structure. Interestingly, the structure of this peptide obtained from XRD and 2DNMR spectroscopy is the global minimum C10-C10 which is the preferred one in the gas phase experiment. The most striking feature of the present study is one to one correspondence between the structure of the peptide obtained from gas phase spectroscopy, XRD, and 2D NMR spectroscopy.

### Photophysics of biologically important molecules

In a recent work, Prof. Partha Hazra's group studied the excited state intramolecular double-proton transfer dynamics process of BP(OH)<sub>2</sub> within the silica nanochannels, namely, MCM-41 nanochannels. They observed an almost 100 times increment in emission intensity and a 30 nm blue shift in the emission maxima when the probe gets encapsulated inside the silica nanopores. Most importantly, the femtosecond up-conversion profile exhibited an interesting feature. The rise component of 10 ps, which was attributed to MK(monoketo)→DK (diketo) conversion in bulk





acetonitrile (MeCN), was not observed when the probe resides inside the MCM-41, suggesting the proton transfer is concerted rather than sequential, like in the case of bulk MeCN.

In another work, the group explored the distinct thermally activated delayed fluorescence (TADF) efficiencies of three donor-acceptor based regio-isomers: DPAOCN (ortho-isomer), DPAMCN (meta-isomer), and DPAPCN (para-isomer). DPAPCN exhibits maximum TADF efficiency in both solution and solid-state. Apart from TADF, differences in crystal packing of the regio-isomers result in intriguing bulk phase properties. DPAOCN, with its non-centrosymmetric P212121 space group and substantial crystal void volume, enchants with reversible tri-color mechanochromic luminescent behavior. Expanding the horizon of possibilities, the non-centrosymmetric nature of ortho-isomer further renders it an excellent SHG material, with the  $d_{22}$  value of 0.19 pm/V at 1220 nm and laser-induced damage threshold (LIDT) value of 13.27 GW/cm<sup>2</sup>. Overall, a comprehensive investigation into the regio-isomers has been carried out, encompassing their TADF, SHG, and mechanochromic luminescent properties.

### Understanding properties of materials through simulation methods

Research in Prof. Venkatnathan's group focuses on applying Molecular Dynamics (MD) simulations and quantum chemistry methods to obtain a molecular level understanding of materials used for batteries and carbon capture. In a battery project, the group investigates thermal stability, structure and ion transport in a (Adpn)<sub>2</sub>LiPF<sub>6</sub> soft sold electrolyte in collaboration with experimental groups of Prof. Michael Zdilla and Prof. Stephanie Wunder from Temple University, U.S.A. Another example is a Polyoligomeric silsesquioxane tailored with trifluoromethanesulfonylimide (POSS) lithium, solvated in tetraglyme (G4), where MD simulations are performed at various G4/POSS molar ratios to examine structure and ion dynamics. The group have also started using machine learning algorithms to predict ionic conductivity in battery electrolytes. In a CO<sub>2</sub> capture project, aqueous solutions of potassium lysinate as potential CO<sub>2</sub> absorbents have been studied using MD simulations. The goal is to examine various possible interactions, dynamics of CO<sub>2</sub> and extent of absorption at varying hydration, pressure and temperature.

## 3. DATA SCIENCE

### 3.1 DATA ASSIMILATION, MACHINE LEARNING

#### Dynamical systems, Data assimilation

The role of dynamical instabilities in the models of complex systems and the effects of these instabilities on the accuracy and uncertainty of Bayesian state estimates are the main broad goals of Prof. Amit Apte's research. The models of the atmosphere and ocean are chaotic, multiscale in time and space and the uncertainties grow exponentially in time. The observations of these systems are usually quite sparse, partial, and noisy and are incorporated using the Bayesian methodology. The stability of data assimilation, or in other words the nonlinear filters that give the time evolution of the Bayesian state estimates, is an important problem in earth science applications. Main aims of this work are two-fold: (i) to obtain mathematical results using only general assumptions about the chaotic, nonlinear systems; (ii) to demonstrate both theoretically and numerically the stability of the numerical algorithms such as ensemble Kalman filter and particle filter. The use of novel machine learning tools, mainly deep neural networks (DNN), in order to study a variety of scientific problems is another broad theme of Prof. Apte's current investigations. One direction is to develop new techniques for solving partial differential





equations such as the Fokker-Planck equations. Another is the use of DNN for prediction of chaotic dynamical systems.

### Machine Learning, Computational Biology

In a collaborative work with teams from IMSc and Seethapathy Clinic, Dr. Leelavati Narlikar's group from IISER Pune received funding from Bill & Melinda Gates Foundation under their ki Data Challenge for Maternal and Child Health program. The goal of their proposal was to predict in the first trimester (or as early as possible) the possibility of a woman giving birth to a baby that is small, i.e. has low birth weight, for its gestational age. Being small is associated with poor outcomes in childhood as well as adulthood. If predicted early during the pregnancy, appropriate intervention can help reduce incidence of low birth weight.

During pregnancy, ultrasound fetal biometry values including femur length, head circumference, abdominal circumference, biparietal diameter are measured and used to place fetuses on "growth charts". These growth charts typically are constructed from sample points that may not be representative of the Indian population. Indeed, a single growth chart cannot be expected to account for all the variation one sees in the highly diverse Indian population. Furthermore, there is no simple growth-model-based, predictive formula in use for fetal biometry. Estimation of fetal weight at birth currently depends on ultrasound data taken a short time before birth.

The team's work showed that the Gompertz model, a standard model for constrained growth, with just three intuitive parameters, can be used to model the growth of fetal biometry to a remarkable degree of accuracy. They found that deviation from Gompertz-like growth is linked to neonatal complications. They note that it can be used not just to fit the biometry but can be used in a predictive manner: birth weight estimation can be done without the need of late-term ultrasounds using machine learning. Aside from its clinical predictive value, the team suggests its use for future growth standards, with almost all variation described by a single scale parameter.

## 4. EARTH AND CLIMATE SCIENCE

### 4.1 EARTH STRUCTURE AND ITS EVOLUTION

#### Seismological imaging of Earth's interior

Dr. Arjun Datta's group works on developing and implementing advanced techniques for seismological data analysis, with the overarching goal of improving our knowledge of Earth's interior structure. Over the past year they have pursued the following lines of research:

*Ambient seismic noise interferometry using full-wave theory:* Ambient noise interferometry is a branch of seismology which extracts useful information from the ambient seismic field that always exists on Earth, and which was traditionally regarded as noise. Methods have been developed for ambient noise source inversion in 2-D, and one of the group members is working on structure inversion for his PhD thesis.

*Earthquake tomography by full waveform inversion:* The aim is to use spectral-element modelling of seismic wave propagation, for seismic adjoint tomography. This is theoretically the most sophisticated approach to seismological imaging, and is being implemented in a PhD thesis, under the guidance of Dr. Datta, focusing on the Deccan volcanic province.



*Rayleigh wave ellipticity inversion:* The goal of this work is to implement workflows for measuring Rayleigh wave ellipticity (or H/V amplitude ratio) from ambient noise data, and to develop algorithms for inverting these measurements, possibly jointly with surface wave dispersion. A 5th year BS-MS student is applying this to data from South India, for his Master's thesis.



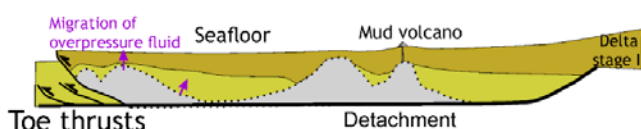
### Acoustic wave modelling of anisotropic media

Dr. Rahul Dehiya's research group developed an algorithm to simulate a two-dimensional frequency-domain acoustic wave response in a transversely isotropic medium with a tilted symmetry axis. The algorithm utilises a support-operator finite-difference technique for modelling. This methodology produces a nine-point stencil finite-difference scheme for second-order elliptic equations for generalised anisotropic physical properties. The medium's properties are described as P-wave velocity on the symmetric axis, density, Thomsen's anisotropic parameters (epsilon and delta), and the tilt angle. The benchmarking analysis of modelled amplitude matches well with the analytical solution of the isotropic whole-space model. Synthetic experiments illustrate the excellent accuracy of the scheme for anisotropic models. The results suggest that the developed algorithm simulates the P-wave solution and the fictitious S-wave mode, as reported in the literature. Modelling for a heterogenous subsurface with a spatially varying tilt angle of the medium symmetry axis proves the algorithm's robustness. In summary, the outcomes of the numerical experiments demonstrate that the developed algorithm can accurately simulate the frequency-domain response of acoustic waves in the tilted anisotropic media.

## 4.2 EARTH SURFACE PROCESSES

### Geophysical analysis of the Krishna-Godavari Basin

Gravity-driven collapse structures typically form with an up-dip extensional domain and down-dip compression, connected by a common detachment fault, predominantly observed in many passive margins. This detachment commonly arises within an over-pressured shale, often induced by rapid sedimentation and disequilibrium compaction. As fluid pressure approaches lithostatic levels, frictional resistance diminishes, facilitating collapse. The significance of gravity-driven collapse structures has attracted considerable attention from various perspectives. Understanding the complex structural evolution of collapsed systems is critical for hydrocarbon exploration and the stability of passive margins. Down-dip compression structures are characterized by the presence of antiforms and thrust faults, serving as effective structural traps for hydrocarbons. Dr. Sudipta Sarkar's group used pre-stack depth-migrated seismic data from the Krishna Godavari Basin to reconstruct the evolution of the deep-water fold-thrust belt and subsurface fluid migration systems. They traced the progressive development of fold and thrust belts and quantified shortening using sequential restorations. Their analysis contributes to a deeper understanding of subsurface fluid flow pathways and the distribution of hydrocarbons within structural traps.



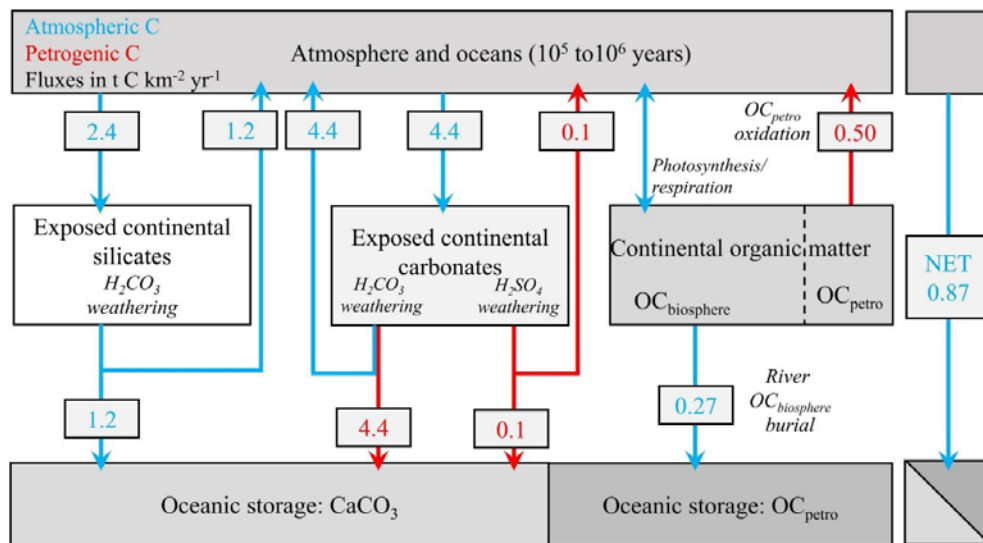
**Figure 9:**

*Illustration depicting the seaward advancement of a thrust duplex and shale ridge resulting from delta migration over a shale layer (Dr. Sudipta Sarkar's Group)*

### Sulfide oxidation in river basins

The GRASP (Geochemical Research for Aquatic and Sedimentary Processes) research group mainly focuses on sulfide oxidation in river basins, and its impact on contemporary and past oceanic sulfate inventories. These aquatic processes control the terrestrial acid-alkalinity budget, oceanic productivity and redox state, and long-term atmospheric CO<sub>2</sub> and O<sub>2</sub> cycles.

Dr. Gyana Ranjan Tripathy's studies in this regard mainly investigate chemical and sulfur isotopic ( $\delta^{34}\text{S}$ ) compositions of river water (Indus, Brahmaputra, Narmada, and Mahanadi), and organic-rich sedimentary rocks from various (Himalaya, Vindhyan, and Cuddapah) basins. The sulfur isotopes follow different fractionation mechanism during sulfur removal from seawater, and, hence, have distinct values for major sulfur-bearing minerals (eg., Gypsum and Pyrite). The  $\delta^{34}\text{S}$  data for the sulfate phases of river water confirm disproportionately higher oxidation of pyrites in the mountainous regions (than in floodplains), mainly due to continuous exposure of fresher minerals (due to intense physical erosion) with faster dissolution kinetics. In longer (million-year) timescales, the weathering intensity of pyrites was mostly linked to the availability of atmospheric oxygen, which can be assessed through temporal changes in seawater sulfate concentrations. The pyrite-sulfur isotopic compositions of the Proterozoic black shales and their mass-balance modelling reveal variable (but significantly lower than modern) seawater sulfate concentrations during these periods. These observed changes in seawater sulfate inventory were linked to an increase in continental weathering and the dynamic changes in O<sub>2</sub> contents of the ocean-atmospheric system.



**Figure 10:** Weathering pathways and their intensities for a large tropical river (Mahanadi river, India) system. These tropical weathering processes have a net negative effect on the global atmospheric CO<sub>2</sub> cycle (Rout and Tripathy, 2024) (Dr. Gyana Ranjan Tripathy's Group)

## 4.3 PALEOENVIRONMENT AND PALEOCLIMATIC EVOLUTION

### Ancient and recent marine ecosystems

Dr. Devapriya Chattopadhyay's group works on understanding how marine animals (primarily seashells) respond to changes in their environment in short and long timescale. The group uses data from fossils, dead shells and live animals to reconstruct their evolutionary response. Changes in the seaway have influenced the evolution of the marine community. The Tethyan seaway, connecting the Indian Ocean to the Mediterranean thirty million years ago changed with time. Around 19 million years ago, the Mediterranean Sea got separated from its eastern arm

of today's Arabian Sea when Arabian plate moved and created a land connection with Europe. This closure of seaway influenced the climate, ocean circulation and biogeography of this region. Large mammals, including ancestors of Elephants and Giraffes moved from Africa to Europe. However, how the marine organisms responded to this closure is yet to be explored fully. Using the global record of marine fossils, the group demonstrated the impact on the marine fauna. The group's work shows the proportion of taxa that used to be shared between the eastern and western end of the Tethyan seaway dropped after the seaway closure implying a reduced biological exchange. They also found an increase in the appearance in unique genera in the eastern region after this closure. Their study highlights the decrease in biotic exchange with gradual closure of the seaway before complete separation.

### Isotope biogeochemistry

A new project was initiated by Dr. Shreyas Managave's group to assess the effect of climate-change-induced variation in precipitation seasonality on tree growth in the western Himalayas. Two field excursions were conducted to check the seasonal growth pattern of various trees and associated variations in the isotopic composition of water in soil to leaf continuum. A seasonal tree-growth pattern of various species at two contrasting hydroclimatic settings was established. A cryogenic vacuum water extraction and tree-core processing systems were developed.

The soil aggregation, by physically and chemically protecting the soil organic matter, plays a crucial role in sequestering carbon in the soil. This work was continued and carbon-14 dating of soil aggregates formed under different vegetation and climate settings was carried out.

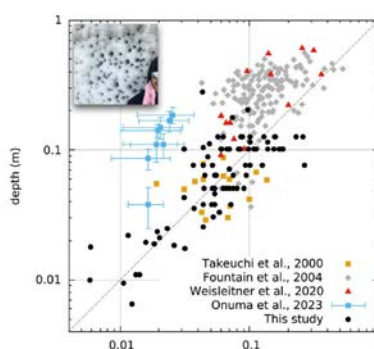
A project assessing vegetation's role in controlling rocks' chemical weathering was completed. Periodic measurements of cations in stream waters from catchments having different vegetation covers revealed vegetation hampers the chemical weathering of basalts in the western Ghats.

The sulfur isotopic composition of surface soils collected from various parts of India suggested spatial segregation of the sulfur source: sulfur in the soils from the Himalayas or Himalaya-derived sediments is depleted in  $^{34}\text{S}$  than the rest of India.

## 4.4 CLIMATE DYNAMICS

### Himalayan glaciers

Advancing our understanding of the co-evolution of ice, water, climate, and landscape in the Himalaya is critical to assess climate-change impact on the future of Himalayan people and ecosystem. A large number of interacting earth-system processes operating on different time and space scales, makes this task challenging. For example, it is debated if tiny cryoconite holes, which are ubiquitous on glaciers, contribute to the glacier runoff significantly.



**Figure 11:**

Observations on glaciers across the globe, including data from Dr. Argha Banerjee's group on a Himalayan glacier, suggest that the depth of cryoconite holes is approximately proportional to the radius. Inset: a typical Himalayan glacier surface dotted with nearly cylindrical melt holes, with dark 'cryoconite' substance at the bottom (Dr. Argha Banerjee's Group)

Dr. Argha Banerjee and his collaborators used in-situ field observations and idealised models to establish that the depth of cryoconite holes is proportional to their radii. This scaling relation implied that the net effect of these holes on the glacier-scale runoff can safely be neglected. The presence of these tiny holes efficiently negates the melt-enhancing effects of dark impurities deposited on glacier ice.

### **Genesis of tropical disturbances**

Synoptic scale disturbances account for a large fraction of rainfall variability in the tropics. A comprehensive understanding on the factors that govern the growth and amplification of the synoptic disturbances are crucial for improving prediction skills in weather and sub-seasonal time scales. The main objective of Dr. Suhas Ettammal's group's research is to understand the genesis of tropical synoptic scale disturbances. The physical processes that initiate the tropical synoptic disturbances can be broadly classified into in situ and external forcing. For the past few years, Dr. Ettammal's group has primarily focused on understanding the genesis of synoptic scale disturbances by external forcing which is manifested in the form of intruding extratropical forcing. Even though there are many modelling and observational studies that show the association between the intrusion of extratropical disturbances and tropical synoptic disturbances, none of them quantify such an association.

In a recent study, the group developed wave tracking methods and identified the episodes of intruding extratropical disturbances and Mixed Rossby-Gravity (MRG) waves as events and quantified their association. They found that 37% MRG waves are associated with the intrusion of extratropical disturbances and a large fraction of such events occurred in the east Pacific and Atlantic Ocean domains. In another study, they documented the properties of eastward propagating Doppler shifted MRG (E-MRG) waves. The group found that the interaction with Kelvin wave is important for the occurrence of E-MRG waves, especially in the presence of large-scale easterly winds. Currently, they are trying to provide a mechanistic explanation to the observed association between the intrusion of extratropical disturbances and MRG waves.

### **Monsoon variability**

Madden Julian Oscillations (MJO) convection is known to initiate over equatorial Indian Ocean (IO) and propagate equatorially eastward during boreal winter and exhibit northward propagation during boreal summer over the Indian Summer Monsoon (ISM) domain. Neena Joseph Mani's group's primary research focus was on the genesis of MJO convection over the IO and its predictability. MJO initiations over the Indian Ocean were objectively identified during boreal winter and summer seasons separately using the OLR MJO index (OMI). MJO initiations over the IO shows two preferred locations, one over western equatorial IO (WEIO) and another over eastern equatorial Indian Ocean (EEIO). While about 65% of boreal winter initiations are observed over WEIO, boreal summer initiations are equally distributed between the two locations.

Theories suggest that MJO convection can be initiated by two kinds of wave responses associated with a preceding event. Kelvin waves response to previous MJO convection over Western Pacific can trigger MJO initiation over WEIO and Rossby wave response to the suppressed MJO convection state over EEIO can also lead to MJO initiation over WEIO. Analysis of MJO initiations over these regions indicates that while a good fraction of WEIO initiations are forced by both Kelvin and Rossby response mechanisms during boreal winter, Rossby wave response mechanism mainly drives the EEIO initiations. Rossby wave response mechanism also dominates the EEIO initiations during boreal summer while the WEIO initiations show the signature of modified Gill response to the summer mean flow. A set of recent studies also indicates the role of Mixed Rossby-Gravity (MRG) wave dynamics in determining the genesis and propagation of the MJO (Takasuka and Satoh 2020, Takasuka et al. 2019, 2018).

The core idea is centered around the shallow meridional circulation associated with the MRG wave events and its role in advecting moisture and helping in the buildup of moisture over the western and central Indian Ocean leading to MJO convection. In a previous study by Dr. Mani, the predictability associated with MJO initiations were found to be lower than the general MJO prediction skill in operational models. The forecast skill of MJO initiations were further examined by classifying the MJO initiation into two categories: MJO initiation preceded by MRG wave events and the same without MRG precursor signal. The group found that MJO initiations preceded by MRG wave events exhibit significantly higher prediction skill. They also note that while most of the models do simulate the MRG wave dynamics in the control and forecast mode, model initializations including the moisture fields becomes a critical factor in enhancing the MJO initiation prediction skill.

### Extreme Events

Dr. Joy Merwin Monterio's research group works on understanding the mechanisms behind and the impacts of extreme events, particularly heatwaves. Towards this goal, the group uses mathematical modelling, observational analysis and novel computational methods. The group also collaborates with external groups to understand the health impacts of extreme heat, with the hope to inform public health policy surrounding heat and health in India.

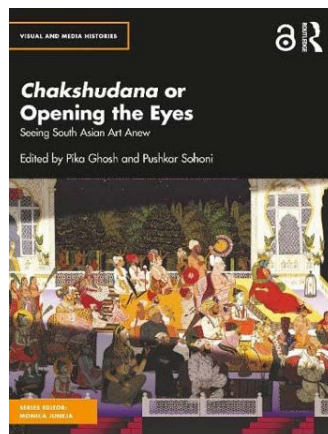
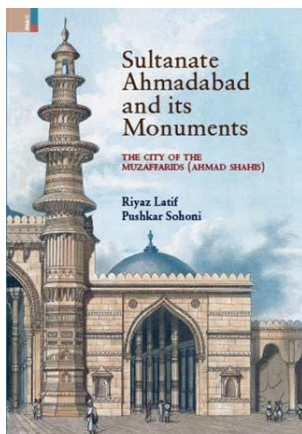


## 5. HUMANITIES AND SOCIAL SCIENCES

### 5.1 HISTORY OF SCIENCE, ARCHITECTURE, MATERIAL CULTURE

#### Material expression of cultural practices

Dr. Pushkar Sohoni works on the history of architecture and material culture. He published his research on market-halls as the monograph *Taming the Oriental Bazaar: Architecture of the Market-Halls of Colonial India* (Abingdon, Oxon; New York, NY: Routledge, 2023). In addition, he co-authored *Sultanate Ahmadabad and its monuments: the city of the Muzaffarids* (Delhi: Primus Books, 2023). He also co-edited a festschrift in honour of Michael W. Meister titled *Chakshudana or opening the eyes: seeing South Asian art anew* (Abingdon, Oxon: Routledge, 2024). He also wrote several research essays and book reviews; his public engagement included popular media like *Hindustan Times* (Mumbai edition), where he wrote an opinion piece titled 'Ahmednagar to Ahilyanagar: The flair for name-dropping'. Dr. Sohoni is currently working on the publication of a Marathi inscription from Thanjavur.



**Figure 12:**

*Literary works on the history of architecture and material culture*  
(Dr. Pushkar Sohoni)

## 5.2 DEVELOPMENT STUDIES

### Water, sustainability, and development

Dr. Bejoy Thomas and collaborators continued research and policy outreach on two areas during the year, (a) water resources management, and (b) climate action. As part of the work on food-water-biodiversity nexus in the Upper Bhima sub basin, a situational analysis was published based on existing literature, consultations with different stakeholders and field data. The document, also translated into Marathi, identifies current challenges and priorities in the basin, as well as poses research and action pointers for future.

Dr. Thomas was also part of consultations and policy outreach including C20 India 2023 Engagement Group of the G20 and on challenges and pathways to achieving Net-Zero.

## 5.3 HUMANITIES

### Literary and Language Studies

Dr. Pooja Sancheti's research is primarily in the area of contemporary South Asian Anglophone fiction. She uses theoretical frameworks such as postcolonialism, transnationalism, and feminism. Dr. Sancheti is also a Hindi-English translator, and is interested in exploring post-independence writing in India.

# 6. MATHEMATICS

## 6.1 ALGEBRA AND NUMBER THEORY

### Automorphic forms, special values and p-adic families

Dr. Baskar Balasubramanyam's research interests are in automorphic forms, special values and p-adic families. In work with Bergdall and Longo, they explore the relation between the ramification locus of the Hilbert eigenvariety and zeroes of the p-adic L-function. In work with Aryasomayajula and Roy, they derive estimates for Picard modular forms for subgroups of  $SU(2,1)$  using estimates of Bergman kernel.

### Moduli of curves

Automorphic form is the central focus of Dr. Debargha Banerjee's research. The theory of modular forms has important contributions in some major discoveries in modern mathematics, including the proof of Fermat's Last theorem. Dr. Banerjee worked on some interesting inter-related projects related to this area of mathematics. (a) Endomorphism algebras of modular motives; (b) Modular symbols and special values of L-functions; (3) p-adic L-functions and p-adic Hodge theory.

### Symplectic and orthogonal groups, commutative algebra

In a joint work with Dr. Maria Mathew (postdoc fellow, IISER Pune) Dr. Rabeya Basu showed that the elementary action of symplectic and orthogonal groups on unimodular rows of length  $2n$  is transitive for  $2n \geq \max(4, d + 2)$  in the symplectic case, and  $2n \geq \max(6, 2d + 4)$  in the orthogonal





case, over monoid rings  $R[M]$ , where  $R$  is a commutative Noetherian ring of dimension  $d$ , and  $M$  is commutative cancellative torsion free monoid. As a consequence, one gets the surjective stabilisation bound for the  $K1$  for classical groups. This is an extension of J. Gubeladze's results for linear groups. This work has been submitted for publication. They are working on injective stabilisation bound of  $K1$ -group of linear and symplectic groups over monoid rings.

Dr. Rabeya Basu is collaborating on the following topics in commutative algebra. (i) On reduction ideal with Prof. Irena Swanson in Purdue, U.S.A.; (ii) On the study of invariants related to the regularity conjecture with Prof. Clare D'Cruz in CMI, Chennai.



### Analytic number theory and arithmetic of modular forms

An important theme that connects probability and number theory is that of comparing the statistics of a uniformly distributed sequence in  $[0,1]$  (which arises from interesting arithmetic objects) with that of a sequence of random points chosen uniformly and independently on  $[0,1]$ . This comparison can be made in two broad ways:

*Global statistics:* These statistics refer to the study of discrepancy in asymptotically distributed sequences. The discrepancies are modeled as sums of appropriate random variables defined on our families, and we try to investigate if they obey laws similar to central limit theorems.

*Local statistics:* These statistics refer to explicitly defined notions such as pair correlation,  $m$ -level correlations and level spacing distribution. These small-scale statistics have been extensively studied for various types of arithmetic sequences, and help us to understand the random nature of a deterministic sequence.

Dr. Kaneenika Sinha studies such statistics arising in the context of modular forms and elliptic curves. During 2023-24, Dr. Sinha obtained the following results: (1) In the aspect of local statistics, along with PhD student, Jewel Mahajan, Dr. Sinha obtained bounds for all higher moments of a pair correlation function for modular forms. They also showed that the local pair correlation function of a random newform in large families is Poissonian. This work has appeared as a publication in the Journal of Number Theory in 2024. (2) A recent development in this context of global statistics is an omega-type result about discrepancies in the distribution of Satake parameters corresponding to Hilbert modular forms. This is joint work by Dr. Sinha with Baskar Balasubramanyam and joint PhD student, Jishu Das. This work is currently under review [arXiv:2307.16736].

## 6.2 ANALYSIS, DIFFERENTIAL EQUATIONS, APPLICABLE MATHEMATICS

### Poincaré-Sobolev equation, hyperbolic space

In a joint project with Prof. Debdeep Ganguly, Diksha Gupta and Alok K. Sahoo, Dr. Mousomi Bhakta worked in the Poincaré-Sobolev equation with a small perturbation in the hyperbolic space. In this work, they established existence and multiplicity of positive solutions with a presence of potential which asymptotically tends to 1 at infinity (i.e. distance  $(x, 0)$  in the hyperbolic space converges to  $\infty$ ) and with/without a non-homogeneous term. In the first part of this project, the following type of equations were studied:

$$-\Delta_{\mathbb{B}^N} u - \lambda u = a(x)|u|^{2^*-2}u + f(x) \quad \text{in } \mathbb{B}^N, \quad u \in H^1(\mathbb{B}^N),$$

Where  $\mathbb{B}^N$  denotes the ball model of the hyperbolic space of dimension  $N \geq 4$ ,  $2^* = \frac{2N}{N-2}$ ,  $\frac{N(N-2)}{4} < \lambda < \frac{(N-1)^2}{4}$  and  $f \in H^{-1}(\mathbb{B}^N)$  ( $f \not\equiv 0$ ) is a non-negative functional in the dual space of  $H^1(\mathbb{B}^N)$ . The potential  $a \in L^\infty(\mathbb{B}^N)$  is assumed to be strictly positive, such that  $\lim_{d(x,0) \rightarrow \infty} a(x) = 1$ .



They have established profile decomposition of the functional associated with the above equation and using the decomposition result, they derived various energy estimates involving the interacting hyperbolic bubbles and hyperbolic bubbles with localized Aubin-Talenti bubbles. Combining these estimates with topological and variational arguments, they have established multiplicity of positive solutions in the cases:  $a \geq 1$  and  $a \leq 1$  separately. In the second part of the project, they are considering the above equation with  $f$  equivalent to 0 and trying to establish existence of a positive solution in various ranges of  $\lambda$ .

### Nonlocal equations with gradient nonlinearity

Dr. Anup Biswas's work has mainly focused on solving some open problems in the area of nonlocal equations with gradient nonlinearity. More precisely, jointly with Erwin Topp, Dr. Biswas resolved the problem of nonlocal ergodic control problems wherein they prove a new gradient estimate.

### Shape optimisation problems

A typical shape optimisation problem is, as the name suggests, to find a shape which is optimal in the sense that it minimises a certain cost functional while satisfying given constraints. Mathematically speaking, it is to find a domain  $\Omega$  that minimises a functional  $J(\Omega)$ , possibly subject to a constraint of the form  $G(\Omega) = 0$ . In other words, it involves minimising a functional  $J(\Omega)$  over a family  $F$  of admissible domains  $\Omega$ . In certain cases, sharp bounds for  $J(\Omega)$  under volume constraints are also studied.

In this work, Dr. Anisa Chorwadwala considers mixed Steklov-Dirichlet eigenvalue problem on smooth bounded domains in Riemannian manifolds:

$$\Delta u = 0 \text{ on } U = \Omega \setminus B_R, u = 0 \text{ on } \partial B_R, \partial u / \partial n = \sigma u \text{ on } \partial \Omega.$$

Eigenvalues form a discrete spectrum  $0 < \sigma_1(U) \leq \sigma_2(U) \leq \sigma_3(U) \leq \dots \rightarrow \infty$ .

Each  $\sigma_k(U)$  is given by the min max of the corresponding Rayleigh quotient over appropriate function spaces.

Sharp bounds for higher Steklov-Dirichlet eigenvalues on domains with spherical holes (Sagar Basak, Anisa M H Chorwadwala and Sheela Verma): Here, the team obtained isoperimetric inequalities for  $\sigma_k(U)$ ,  $2 \leq k \leq n + 1$ , where  $\Omega$  enjoys certain symmetry. They also obtained sharp lower and upper bounds of  $\sigma_1$  on bounded star-shaped domains in the other space forms,  $S^n$  and  $H^n$ . Optimisation of a mixed Steklov-Dirichlet Eigenvalue (S Basak, A Chorwadwala, R Prakash and S Verma): In this work, they optimised  $\sigma_1$  over two different family of such domains.

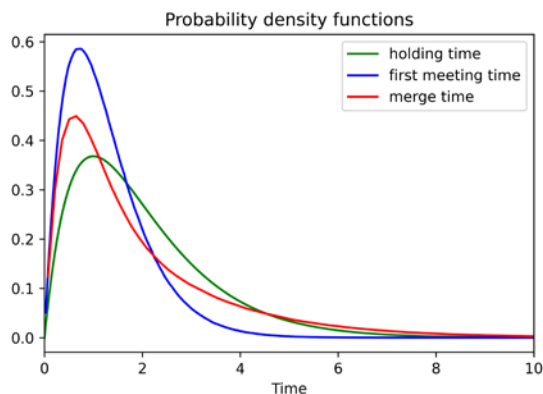
### Mathematical finance

*Locally risk minimising pricing of Asian option in a semi-Markov modulated market (with Bihan Chatterjee, and Ludger Overbeck):* In this work, Dr. Anindya Goswami and team consider a regime-switching model where the stock volatility dynamics is a semi-Markov process. Under this model assumption, they find the locally risk-minimising price of some Asian options with European-style exercise. The price function is shown to satisfy a non-local degenerate system of parabolic PDEs in dimension two with a terminal condition. They show this by deriving the F-S decomposition of the discounted contingent claim. The related Cauchy problem involving the PDE is shown to be equivalent to an integral equation (IE). The existence and uniqueness of the classical solution to the PDE are determined by studying the IE and using semigroup theory. To be more precise, they first obtain the mild solution of the PDE and then they show that the mild solution has sufficient regularity. The locally risk-minimising hedging for the option has also



been identified in this work. Finally, the computational aspects of Asian option prices have been discussed by solving the equation numerically.

*On meeting and merging of stochastic flow of non-homogeneous Markov and semi-Markov dynamics (with Dr. Subhamay Saha, and Mr. Ravishankar Kapildev Yadav):* A general class of semi-Markov processes is considered on countable state-space, with a differentiable kernel such that the embedded Markov chain may not be homogeneous. Using an SDE representation of the process, they study the associated flow by investigating meetings and merging related events for solutions, starting with different initial conditions. Some sufficient conditions for almost sure meeting and merging are also obtained. Many examples are considered to clarify the intricacies and implications of this study.



**Figure 13:**

*The probability density function of holding time, first meeting time, and merging time for a pair of binary state semi-Markov processes are plotted in green, blue, and red respectively. The last two are computed using an SDE formulation driven by Poisson random measure (Dr. Anindya Goswami's Group)*

### Probability and combinatorics

Dr. Moumanti Podder works on discrete probability overlapping with statistical mechanics, probabilistic automata, models of social learning etc. During 2023-24, along with Dhruv Bhasin, Sayar Karmakar and Souvik Roy, Dr. Podder published a paper titled “On a class of probabilistic cellular automata with size-3 neighbourhood and their applications in percolation games”, in the *Electronic Journal of Probability*, and along with Dhruv Bhasin, published a paper titled “Combinatorial games on Galton-Watson trees involving several-generation-jump moves”, in the *Moscow Journal of Combinatorics and Number Theory*.

Other works in which papers are being worked on include the following: “The spread of an epidemic: a game-theoretic approach”, co-authored with Sayar Karmakar, Souvik Roy and Soumyarup Sadhukhan; “Phase transition in percolation games on rooted Galton-Watson trees”, co-authored with Sayar Karmakar, Souvik Roy and Soumyarup Sadhukhan; “Bond percolation games on the 2-dimensional square lattice, and ergodicity of associated probabilistic cellular automata”, co-authored with Dhruv Bhasin, Sayar Karmakar and Souvik Roy; “Percolation games on rooted, edge-weighted random trees”, co-authored with Sayar Karmakar, Souvik Roy and Soumyarup Sadhukhan; “Learning models on rooted regular trees with majority update policy: convergence and phase transition”, co-authored with Anish Sarkar; and “Ergodicity of a generalized probabilistic cellular automaton with parity-based neighbourhoods”, co-authored with Dhruv Bhasin, Sayar Karmakar and Souvik Roy.

### Interpolation problem, spectral set theory of certain algebraic varieties

Dr. Haripada Sau's research during 2023-24 focused on two broad themes: The first theme was on Interpolation Problem and the spectral set theory of certain algebraic varieties. Here, the main goal was to understand the uniqueness of the solutions of a solvable Nevanlinna Pick Interpolation problem. This inspired a more general theme of research viz., given an analytic function  $f$  on a domain and a subset of the domain, how “rich” does the subset have to be for it to “determine” the function in the sense that if  $g$  is any other analytic function that coincides with

$f$  on the subset, one has  $f$  equal to  $g$  on the whole of the domain. The first paper in the following list finds interesting answers to this question.

The second theme blends algebraic geometry and spectral set theory. It is known that the rational dilation fails on the so-called distinguished varieties (these are those varieties that meet the open bidisk and exit the domain through the torus). In a recent investigation, Dr. Sau's group proposed a new related problem in this direction where they relax the hypothesis of the rational dilation problem and at the same time loosen the conclusion of the problem (Das, Kumar, and Sau, *Canad. Math. Bull.* 2023). This twisted rational dilation problem is praised by the experts in the field and is named "A constrained Ando dilation problem" for a natural reason. In the second paper (Das and Sau, *Proc. Amer. Math. Soc.* 2024), they proposed this problem and obtained some preliminary results. In their recent (submitted) investigation, they have been able to answer this question under a reasonable hypothesis, which in turn sheds new light on the 1963 dilation theory of Ando.

## 6.3 GEOMETRY AND TOPOLOGY

### Low-dimensional topology

Any two triangulations of a 3-dimensional manifold with the same number of vertices are related by local combinatorial moves (called bistellar flips) through triangulations with the same number of vertices. This is useful both for defining 3-manifold invariants using triangulations and also for improving efficiency in making censuses of 3-manifolds. In a joint project with Henry Segerman, Dr. Tejas Kalelkar is working on extending this result to triangulations of higher dimensional manifolds.

Triangulations are called essential, if every edge loop is non-trivial. They are working to show that essential triangulations of three-dimensional manifolds with the same number of vertices are related via bistellar flips through essential triangulations. This proves the invariance of the one-loop invariant. This is a joint project by Dr. Kalelkar with Henry Segerman and Saul Schleimer.

Incompressible surfaces are an interesting class of embedded surfaces along which a 3-manifold can be cut and simplified. Such surfaces are well-studied in orientable Seifert fiber spaces but not much work has been done in the non-orientable setting. The group has shown that incompressible surfaces in non-orientable Seifert fibered spaces are of one of two types, pseudo-horizontal or pseudo-vertical. This is joint work with student Ramya Nair.

### Toric vector bundles and tensor triangular geometry

*Derived categories and tt geometry (joint work by Dr. Vivek Mallick with Umesh Dubey and Samarpita Ray):* The properties of tensor triangulated categories and properties of the associated geometric space (described as a locally ringed space), the Balmer spectrum are being studied by Dr. Vivek Mallick.

*Toric Arakelov geometry (joint work by Dr. Vivek Mallick with Jose Ignacio Burgos Gil and Ana Botero):* Extending Burgos-Gil, Philippon and Sombra's work on describing metrised line bundles over toric varieties to equivariant vector bundles.

*Spaces associated with multigraded rings and T-varieties (Joint work by Dr. Mallick with Kartik Roy, Pavankumar Dighe):* With Kartik Roy, Dr. Mallick studied multihomogeneous spaces, which are obtained from multigraded rings in a fashion generalising the construction of a projective variety from a graded ring. They studied the relation between this construction and various other

constructions like T-varieties and Perlings tProj. With Pavankumar, a formula for computing equivariant Chern classes was developed. They also studied the problem of downgrading a T-variety.

*Elliptic curve cryptography (joint work by Dr. Mallick with Ayan Mahalanobis):* An attack on elliptic curve cryptography via an application of Bezout's theorem is being studied.

### Langlands Program

The Langlands Program is a significant and ambitious framework in modern mathematics that seeks to establish deep connections between various areas, particularly between number theory and harmonic analysis. Initiated by mathematician Robert Langlands in 1967, the program has evolved into a comprehensive set of conjectures and theories that link these seemingly disparate fields. Hecke algebras are certain associative algebras that arise in the course of study of the Langlands program. A long-standing program in the subject, which has been wide open, was a complete description of the Hecke algebra of a Bernstein block for a general connected reductive group. In a joint work with Jeff Adler, Jessica Fintzen and Kazuma Ohara, Dr. Manish Mishra completed this program.

### Complex manifolds and varieties

The research group of Prof. Mainak Poddar is engaged in the investigation of complex analytic manifolds and varieties and their interplay with the algebraic, smooth and symplectic counterparts. In particular, they have been investigating phenomena in Generalized Complex Geometry, which is a framework that unifies complex and symplectic geometries. With his PhD student Mr. Debjit Pal, Prof. Poddar has developed the foundations of a theory of strong generalized holomorphic principal bundles. This attempts to generalise the rich theory of holomorphic bundles over complex manifolds to the broader class of generalized complex manifolds. On the other hand, with Dr. Bivas Khan, Prof. Poddar has extended the notion of G-connection, introduced by Biswas et al. for holomorphic principal bundles, to principal bundles over algebraic varieties. G-connections are useful for studying group actions on bundles. With Dr. Abhishek Sarkar, Prof. Poddar has been studying a relative/anchored version of the correspondence between Lie algebroids and Gerstenhaber algebras. Prof. Poddar's group is also investigating several questions related to principal bundles over smooth Deligne-Mumford stacks.

## 6.4 DISCRETE MATHEMATICS

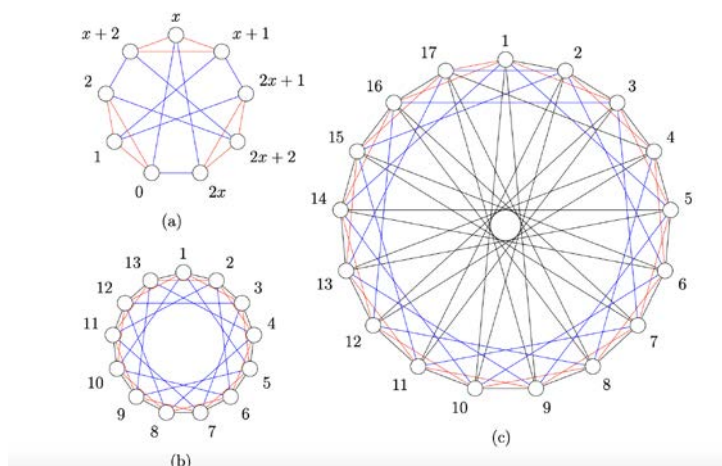
### Parameterised algorithms, Erdos-Hajnal Conjecture

Prof. Soumen Maity's research primarily focuses on parameterised algorithms and graph theory. Many computational problems that we want to solve are often NP-hard or worse, but somehow, they need to get solved. Over the years multiple paradigms for coping with NP-hardness have been introduced: for instance, approximation algorithms, average-case analysis, and randomised algorithms were all borne out of a desire to solve hard problems by relaxing the problem or strengthening the model. Within the last 20 years, a new paradigm has been introduced, where one measures the time complexity of an algorithm not just in terms of the input length but also a small parameter. The overall goal is to identify interesting parameterisations of hard problems where they can design algorithms running in time polynomial in the input length but possibly exponential (or worse) in the small parameter. Such an algorithm is called "fixed-parameter tractable" and it is the gold standard for parameterised algorithms. Prof. Soumen Maity's group works on the parameterised complexity and algorithms for globally and locally minimal defensive



alliances, edge deletion to restrict the size of an epidemic, the harmless set problem in social network, vertex splitting to cluster graphs and knot free vertex deletion (KFVD) problem.

Prof. Soumen Maity's group proved that every graph is an induced subgraph of some primitive Paley graph, and all Paley graphs are substitution prime. Thus, they have reduced the Erdos-Hajnal conjecture, by showing that it suffices to prove the Erdos-Hajnal property for primitive Paley graphs only.



**Figure 14:** Examples of Paley graphs: (a) Paley-9, (b) Paley-13, and (c) Paley-17. (Dr. Soumen Maity's Group)

## 7. PHYSICS

### 7.1 ATOMIC AND MOLECULAR PHYSICS, OPTICS, AND QUANTUM INFORMATION

#### **Correlated quantum systems, statistical mechanics, Fractional Quantum Hall effect**

Motivated by recent scanning tunnelling microscopy experiments performed on Graphene layers, Dr. Sreejith G.J. worked on the modelling of STM physics of fractional quantum Hall (FQH) phases. STM provides new microscopic insights of the physics of quantum Hall systems, allowing us to know finer aspects of the correlations between electrons. The construction of models based on known physics of FQH systems is crucial to interpreting what we see in experiments. Dr. Sreejit worked in collaboration with experimental groups working on semiconductor-based systems at Saha Institute and graphene-based systems at IISc, Bengaluru, towards understanding the nature of phase transitions in quantum Hall systems. He also worked on theoretical modelling of exciton condensation in bilayer semiconductor devices using many body theory techniques motivated from the field of superconductivity. He also worked on developing techniques of tensor networks and hydrodynamics to understand out-of-equilibrium physics of interacting quantum systems. Progress was made in other problems including exactly solvable models and inverse problems in FQH physics, statistical mechanics of constrained systems, etc.

#### **Ultra cold dipolar gases and Rydberg atoms**

The studies carried out by Dr. Rejish Nath's group mainly explored novel phenomena in Rydberg atoms, spinor, and dipolar Bose-Einstein condensates. For instance, the formation of maximally entangled Rydberg atom pairs subjected to Landau-Zener sweeps of the atom-light detuning is explored. Another study explores signatures of quantum chaos in the dynamics of Rydberg-dressed bosonic atoms held in a one-dimensional triple-well potential. The pattern formation in

spin-1 and a stack of quasi-one-dimensional dipolar condensates are explored in condensates. In the spinor case, interesting spin textures are revealed, whereas stripe and checkerboard patterns are found in the dipolar case.

### **Nanophotonics, thermoplasmonic systems**

Prof. G.V. Pavan Kumar's group is working at the forefront of nanophotonics research, pushing the boundaries of nanoscale optical trapping using thermoplasmonic fields generated by various plasmonic structures. Their recent work, published in ACS Photonics and J. Phys. Chem. Letters, showcases their achievement in creating a single-molecule-sensitive optical tweezer platform through the utilisation of optothermal fields from plasmons and phonons. This marks a significant milestone as they demonstrate the first experimental realisation of single-molecule surface-enhanced Raman scattering within a thermoplastic trap. Exploring the behavior of colloids in plasmonic optical potentials, the group is investigating the rules governing colloidal assembly and the influence of optical polarisation near plasmonic nanostructures. Furthermore, their research delves into structured light scattering with spin and orbital angular momentum, essential for understanding light-matter interactions and applications like optical tweezers and information processing. Through Fourier plane optical imaging methods, they aim to unravel how laser beams carrying orbital and spin angular momenta scatter from nanoscale objects, with a specific focus on leveraging orbital momentum to study unconventional hydrodynamics effects within nanoscale optical traps.



### **Quantum information processing**

Dr. Umakant Rapol's group's research focuses on using ultracold atoms and ions for precision measurements, quantum simulations, quantum information processing and computing. There are three experimental platforms viz. Ultracold Rubidium atoms, Ultracold Strontium atoms, and Calcium ion trap for quantum information processing.

With ultracold Rubidium atoms, the group performed a technology demonstration of gravimeter in addition to experiments to understand Anderson localisation with atom optic kicked rotor.

The strontium experiment has progressed to a stage wherein they can transfer cold Sr atoms from a blue mot to a second stage of cooling reaching temperature in the range of micro-kelvins. These atoms will now be used for building ultra-precise optical atomic clock and for distributed quantum information processing.

The calcium ion trap has been constructed and calcium ions can now be trapped in the completely home-built linear ion trap. Laser cooling of the ion cloud is in progress to produce linear ion chain that will be used for quantum information processing.

## **7.2 CONDENSED MATTER, STATISTICAL PHYSICS, MATERIALS**

### **Statistical physics of mesoscopic systems, nano-fluidics, Bose-Einstein condensate**

Dr. Arijit Bhattacharyay's group works on basic investigation of stochastic mesoscopic systems in and out of equilibrium. The theory of such systems needs to get investigated because of fundamental reasons and applicability across discipline. At present, they are also focusing on fluid flow through nanometer sized pores and channels (nano-fluidics) which also finds applications across disciplines and industry. The other area of investigation in the group is investigation of quantum phases in trapped spinor Bose-Einstein condensates which needs development of a

theoretical framework for understanding such small quantum systems which can play a very important role in future technologies.

### **Soft and living matter**

Dr. Apratim Chatterji's research focuses on the 'Physics of Soft and Living', using statistical physics with special emphasis on the Physics of Life. The group has been working on various aspects of spatio temporal organisation of bacterial chromosomes in fast growth conditions: E.coli cells grow with overlapping cell cycles in all but the slowest growth conditions. The fast growing bacteria can have four or more copies of the replicating DNA of different lengths. This makes the spatial segregation and the subsequent organisation of the DNA a difficult task with two rounds of replication going on simultaneously. The group showed how the principles of entropy maximisation of topologically modified confined ring DNA-polymers can achieve this. The time evolution of loci positions quantitatively match the corresponding experimentally reported results (FISH data), including observation of the cohesion time and the ter-transition. The group is also investigating the emergent organisation of topologically modified ring polymers with spherical confinement. They are continuing this project (started last year) on topologically modified polymers ensuring that there is no concatenation and chain crossing is not allowed, such that the results are also valid for non-DNA synthetic polymers (Manuscript in preparation). They have started new projects on topologically modified polymer with smaller loops confined in a cylinder, checking whether they can obtain "orientational" organisation of polymers, which are considered intrinsically disordered systems (Manuscript in preparation).

### **Optoelectronics**

Dr. Shouvik Datta's group showed phase coherent oscillations of collective electrical polarization of excitonic dipoles, interference of excitonic matter waves, Rabi oscillations of such waves over a macroscopically large area as experimental signatures of realising excitonic BEC and executing Hadamard Gate operations. These effects can be used to build a very large quantum register of millions or more identical excitons in the same quantum ground state of a two-component, interacting BEC. This work was recently highlighted in Phys.Org. (<https://phys.org/news/2023-07-tailoring-quantum-oscillations-bose-einstein-condensate.html>). The group demonstrated how measurements can be performed to determine the two dimensional (2D) spatial coherence function of emitted light, which can then be used to directly estimate the 2D in-plane momentum space distribution by calculating its Fourier transform. Most importantly, such optical set up based on modified Michelson Interferometers can also have a much wider applicability in astronomy as well as in next generation optical communications based on k-space resolved transmission, detection and imaging of optical communication signals from distant light sources. This work was recently highlighted by American Institute of Physics (<https://www.growkudos.com/publications/10.1063%25252F5.0160614/reader>).

The group is exploring how to generate a two-component, interacting BEC of excitons using a single photon source. Understanding the underlying physical mechanism(s) for generation of such N-particle ground state as tensor product of single particle states are being planned from the perspective of both theory and experiments for its application towards Quantum Communications, specifically in the realm of No-Cloning theorem.

### **Theoretical statistical physics, Phase transitions**

Prof. Deepak Dhar continued his work in the general area of theoretical statistical physics. In the last year, many universality classes in an interface model in one dimension were studied [with P. Grassberger (Julich), and P.K. Mohanty, IISER Kolkata)]. Phase transitions in hard-plate



lattice gas on a cubic lattice were studied [with, G. Rakala, D. Mandal, S. Biswas, K. Damle, and R. Rajesh]. A perspectives article on phase transitions in systems of particles with only hard-core interactions was published [with R. Rajesh (IMSc) and A. Kumar (IISERP)].

Phase transitions in a system of asymmetrically pivoted hard disks on a lattice were studied [with S. Saryal]. The distribution of waiting times in the asymmetric simple exclusion process on the percolation cluster was shown to have very fat tails [with C. Iyer and M. Barma (TIFRH)].

## 7.3 COSMOLOGY, PARTICLE PHYSICS, AND GRAVITY

### Higher derivative theories, general relativity

Prof. Sudarshan Ananth's group derives cubic interaction vertices for a class of higher-derivative theories involving three arbitrary integer spin fields. This derivation uses the requirement of closure of the Poincaré algebra in four-dimensional flat spacetime. The group finds two varieties of permitted structures at the cubic level and eliminate one variety, which is proportional to the equations of motion, using suitable field redefinitions. They then consider soft theorems for field theories with these higher-derivative interactions and construct amplitudes in these theories using the inverse-soft approach.

In General Relativity, the allowed set of diffeomorphisms or gauge transformations at asymptotic infinity forms the BMS group, an infinite-dimensional extension of the Poincaré group. Dr. Ananth with a collaborator also worked out the structure of this BMS group in two distinct forms of Hamiltonian dynamics - the instant and front forms.

### Experimental high energy physics

Dr. Sourabh Dube is an experimental particle physicist and a member of the CMS collaboration at the Large Hadron Collider at CERN, Geneva. The Run2 and Run3 dataset of the CMS experiment continued to be analysed. A targeted search for the singlet model of vector-like taus is being designed, which has additional final states with one or two leptons. A technique to identify taus with lower momenta has been prepared which will also increase sensitivity to this model. Additionally, a dedicated strategy is being built to identify pairs of electrons which impinge very close to each other in the detector. This will expand the scope of the multilepton analysis. A dedicated machine learning technique to produce fast simulation is also being built, combining dimensionality reduction with generative networks.

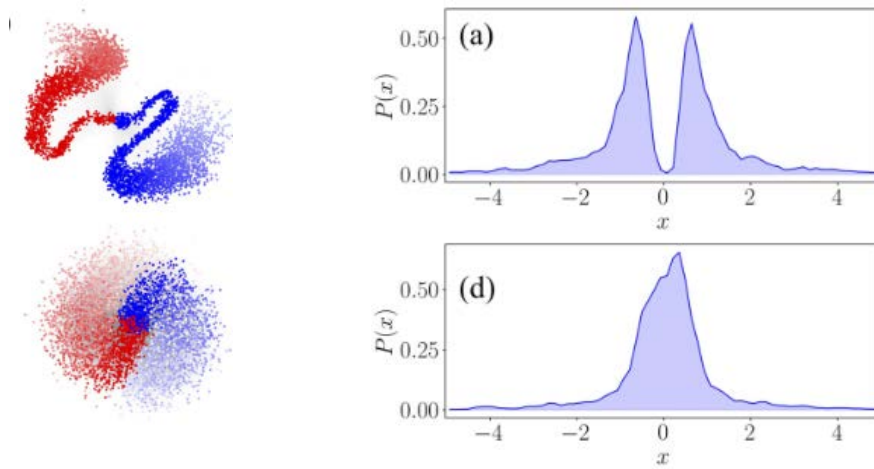
### Complex networks, quantum systems

Prof. M.S. Santhanam's group broadly works in the areas of quantum computing, quantum machine learning, quantum chaos, nonlinear dynamics and complex systems. In the area of quantum computing, the group's work is focused on understanding the many-body effects in quantum computing devices such as the coupled transmon systems. The many-body effects could include quantum localisation and delocalisation, entanglement and decoherence properties, and their computing power. In a recent work, they had shown that in coupled and driven quantum systems, several distinct phases can be observed, some of which are purely quantum in origin while there could be others which originate in corresponding classical dynamics.

In another strand of work, the group is interested in the emergent properties on complex networks. Over the years, they have studied various facets of extreme events on networks. More recently, they have also studied the asymptotic state of opinion dynamics on networks, with potential applications to social networks. Earlier works have shown how opinion polarisation emerges on



social networks, and their work has focused on how it can be mitigated. By minimal intervention through random nudging, the group has shown that polarisation can be considerably diluted on social networks.



**Figure 15:**

*(Left) A network of agents displaying strong polarisation of opinions. The blue and red colours represent two opposing opinions on any issue. After random nudge is applied, a dilution of polarisation is observed. (Right) Another view of polarisation of opinion among agents as seen in the bi-modal distribution. Upon application of nudge, polarisation is suppressed as seen in the unimodal distribution. (Prof. M.S. Santhanam's Group)*

### Probing new physics

Dr. Arun Thalappilil's work is broadly in the area of high energy physics and over the last year his research has been focused on studying exotic astrophysical compact objects and their signatures.

### Gravitation and mathematical physics

The Generalized second law (GSL) for black holes was proposed to make the second law of thermodynamics valid near black holes. The GSL was proved for Einstein gravity. Whether the GSL is true for arbitrary higher curvature gravity theories was an open question. Recently, with PhD student Mohd Ali, Dr. Suneeta Vardarajan proved a version of the GSL for quantum fields and gravitons in a static black hole spacetime in an arbitrary diffeomorphism invariant theory of gravity using techniques from von Neumann algebras. This generalises recent work of Witten and collaborators for the Schwarzschild black hole in Einstein gravity using the entropy associated to the von Neumann algebra of observables in the black hole exterior. Dr. Vardarajan is currently working on proving a GSL for general spacetimes with horizons like dynamical horizons. There is a useful recent proposal by Jensen, Speranza and Sorice for associating an entropy to arbitrary subregions in a spacetime by using a conjecture. They are completing work that provides evidence for this conjecture. The group aims to carry out further work in order to use this proposal to compare entropy across subregions. Comparison of this quantity across subregions will be useful to proving the GSL for more general spacetimes with horizons. Work on this aspect is in progress.



# RESEARCH CENTRES AND SECTION-8 COMPANIES

To foster advanced research and innovation in specific areas of study, IISER Pune hosts the following Research Centres and Section-8 companies on the campus. The Research Centres are developed around faculty members across departments working in a given related area and promote inter-disciplinary interactions and academic training to students. The Section-8 companies operate as independent units within the research ecosystem of the institute along with participation from institute faculty members.

## CENTRE FOR WATER RESEARCH



The Centre for Water Research (CWR) is an interdisciplinary initiative at IISER Pune constituted in November 2020. It draws upon expertise from faculty across different departments at the institute. CWR aims to generate interdisciplinary knowledge about water systems, including their history and heritage, resource management and sustainable use, and to train the next generation of scholars to look at water from an integrated/multi-dimensional lens. CWR also provides a platform for IISER Pune to engage in socially relevant research that will have impact on public policy and action.

An advisory group comprising of water scholars and practitioners based in Pune and elsewhere provides inputs to CWR in its research and outreach. The Living Waters Museum, a virtual repository launched in 2017 to curate visual narratives on our water heritage is part of the CWR. The past year has seen several activities and research projects, community outreach events, and academic outputs from CWR.

The academic outreach and community engagement for CWR continued with several of our faculty and staff being invited to give talks, conduct workshops, and organise dialogues. Several books and research articles were also published with support from CWR.

The WaterTalks series continued with four speakers, and the rubric for this year was Traditional Water System Designs. Accordingly, Abhijit Ghorpade, V. Govindankutty, Ashwin Paranjpe, and Meghal Arya gave talks. The last talk was also part of the new vidcast series sponsored by AQUAMUSE.

The Living Waters Museum (LWM) continued with its multiple efforts to bring awareness about water and its cultural significance. Their latest project AQUAMUSE, is supported by the Dutch Water Partnership Programme at IHE Delft, and brings together partners from three river basins: Volta, Blue Nile, and the Ganga.

During the year, the CWR initiated an audit of water usage across campus. The project is underway, with equipment, volunteers, and staff members in place. The Engineering section at IISER Pune is a partner in facilitating the water audit, reports of which will be anticipated to improve our own institutional practices of water consumption.

## CENTRE FOR ENERGY SCIENCE



### CENTRE FOR ENERGY SCIENCE

Set up under the Department of Science and Technology's Nanomission in 2015, the Centre for Energy Science is comprised of a team of about 15-20 faculty members from the Physics and Chemistry Departments at IISER Pune who joined hands to perform cutting-edge research in this interdisciplinary field to develop applications with direct societal impact. Research pursued by the members is in the areas of energy harvesting, storage, and conservation, and in characterising special materials along with predictive modelling.

## NATIONAL FACILITY FOR GENE FUNCTION IN HEALTH AND DISEASE



National Facility for Gene Function in Health and Disease (NFGFHD) was established in 2016 and it is a world-class state-of-the-art high-barrier animal facility for generating, maintaining and supplying various transgenic mouse and zebrafish models to the research community. It acts as one of the national repositories for animal models to cater to the needs of various investigators from academic and industrial R&D centers across the nation. The facility includes 53 clean rooms and 30 service rooms along with environmental control features. It houses mice (> 50 transgenic strains), rats, and rabbits, and provides animal experiment services and animal rooms on rental basis.

The following facilities are housed at this location:

- Whole animal imaging facility providing pre-clinical, non-invasive, in vivo imaging of experimental animals
- Genome engineering facility for generating knockout, knock-in, and transgenic mouse models, supporting research in gene function, disease mechanisms, and therapeutic development
- Rodent Assisted Reproductive Facility equipped with state-of-the-art technologies for breeding, genetic manipulation, and reproductive techniques such as IVF and embryo transfer
- BSL-3 (Biosafety Level 3) and ABSL-3 (Animal Biosafety Level 3) facilities to safely handle and study potentially hazardous pathogens and their effects on animals
- Zebrafish facility for maintenance of various zebrafish strains and for the generation of new transgenic zebrafish models



## I-HUB QUANTUM TECHNOLOGY FOUNDATION

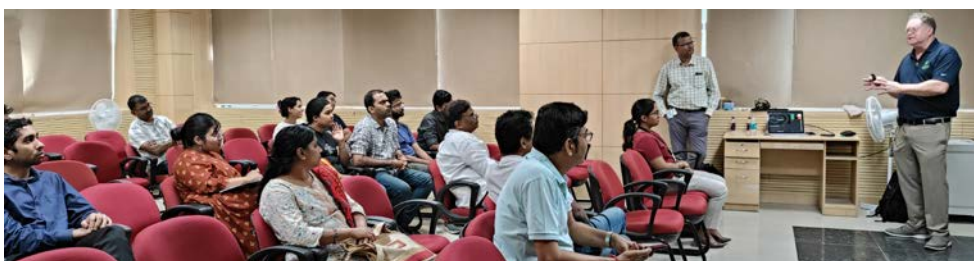


The I-HUB Quantum Technology Foundation (I-HUB QTF) is a Section-8 company hosted by IISER Pune, funded by the Department of Science and Technology (DST) under the National Mission for Interdisciplinary Cyber-Physical Systems (NM-ICPS). I-Hub has been actively working to develop a skilled workforce in quantum technologies over the past year.

Activities pertaining to the reporting year April 2023 to March 2024 are described below.

- I-HUB QTF awarded a total of 65 Fellowships in the year 2023-24 including 15 Chanakya Fellowships to undergraduates and 32 to postgraduates, alongside 18 doctoral fellowships through the QUEST project.
- The Foundation launched a self-paced introductory online certification course on Quantum Computing Prof. T.S. Mahesh and Prof. M.S. Santhanam of IISER Pune. The course is open throughout the year and is made for beginners and tech enthusiasts.
- This year the foundation incubated 4 additional startups working on Quantum Technologies, bringing the total number of Quantum Startups to 7 at I-HUB QTF.
- I-HUB QTF through its fellowships and projects contributed to over 90 research publications emanating from IISER Pune faculty members as well as through external projects at other institutions.
- I-HUB QTF organised over 15 Quantum Seminars, 10 conferences and workshops, including key notable events like 'Train the Trainer' with NVIDIA; 'Conference on Quantum Technologies using Ultracold Atoms' in collaboration with British Council; and a 'Capacity Building Workshop' for college teachers across Maharashtra which was the first step in building a robust capacity in skilled quantum technology workforce within state technical institutions.

Through these initiatives, I-HUB QTF continues to raise awareness about quantum technologies and foster a supportive ecosystem for their advancement in India.



## ATAL INCUBATION CENTRE

### SOCIETY FOR ENTREPRENEURSHIP EDUCATION AND DEVELOPMENT (AIC-SEED)



The AIC-SEED is a technology business incubator supported by the Atal Innovation Mission, NITI Aayog, Government of India, and aims to nurture the spirit of entrepreneurship in the campus. It is a Section-8 company hosted by IISER Pune. During the 2023-24 reporting period, the AIC-SEED incubated 32 startups, 10 of which are affiliated with IISER Pune. The 5 new startups (with an IISER Pune affiliation)

onboarded in the reporting period are: Biofound Biotech Pvt. Ltd., Cellagra Pvt. Ltd., Serah Zines LLP, Biomarkiq Scientific Technologies Pvt. Ltd., and Cryslis Bioworks Pvt. Ltd.

AIC-SEED launched the second cohort of its Student Entrepreneur-in-Residence Program (StEP), supported by corporate donors Expanded Polymer Systems Pvt. Ltd., Soujanya Colors Pvt. Ltd. and Deepak Nitrite Ltd. This cohort selected 11 fellows to foster student entrepreneurship.



AIC-SEED secured CSR support from HDFC Bank's Parivartan SmartUp grant to aid climate innovation startups, and from Bharat Seats Ltd. and NDR Auto Components Ltd. for the AIC-SEED Incubation of Innovative Solutions for Sustainability (I2S2) programme focused on sustainability. Through these initiatives, seven sustainability-focused startups received incubation support, complemented by a capacity-building bootcamp for entrepreneurs.

Several incubatee startups achieved significant milestones. For example, Ushm Pvt. Ltd. and Materials Magica LLP secured funding through the Startup India Seed Fund Scheme (SISFS), while Biofound Biotech won the TiE BizQuoTiEnt 2024 competition. AIC-SEED and its startups also showcased their innovations at the Startup Mahakumbh event in New Delhi.

.....  
*Visit this page for more information on these initiatives*  
<https://www.iiserpune.ac.in/research/research-centres-and-initiatives>  
.....

# PUBLICATIONS AND PATENTS



**Publications during  
2006-2023** (In 2023  
calendar year)

**TOTAL: 4994** (559)



**885** (87)  
BIOLOGY



**1496** (139)  
CHEMISTRY



**9** (4)  
DATA SCIENCE



**136** (26)  
EARTH AND  
CLIMATE SCIENCE



**66** (11)  
HUMANITIES AND  
SOCIAL SCIENCES



**355** (69)  
MATHEMATICS



**2047** (223)  
PHYSICS

## Publications

IISER Pune has published a total of 4994 papers since its inception to the end of 2023. During the 2023 calendar year, institute members published 559 publications (as per Web of Science and information received from our faculty members): 547 research papers, 3 books, 6 book chapters, 2 book reviews, and 1 conference paper.

The list of publications from IISER Pune members in the 2023 calendar year is given in the Appendix section of this report.

## Patents

As of December 31, 2023, IISER Pune has filed 85 patent applications, and had 65 published patents, and 37 granted patents. PCT applications and abandoned applications are not included in this count.

During the 2023 calendar year, IISER Pune filed 13 patent applications, had 12 patents published, and 21 patents granted. In addition, 5 applications were filed, and 2 published for PCT approval during the 2023 calendar year.

# PATENTS

Here is the list of patents filed / published / granted during the 2023 calendar year.

*Granted*
 *Published and Granted*
 *Published*
 *Filed and Published*
 *Filed*

Sr. No.	Inventors	Title	Country and Patent Info
1	Ottakam Thotiyil, Muhammed Musthafa; Thimmappa, Ravikumar	Fuel and power producing galvanic cell	<b>India</b> Application No.: 2898/MUM/2015 Publication No.: IN201502692I3 Granted No.: 466251
2	Jha, Plawan Kumar; Ballav, Nirmalya	A process for wet-chemical reduction of graphene oxide (GO) to reduced graphene oxide (rGO) for ultrahigh performance supercapacitor and energy storage applications	<b>India</b> Application No.: 201621023063 Publication No.: IN201621023063A Granted No.: 421476
3	Halder, Sattwick; Roy, Kingshuk; Nandi, Shyamapada; Vaidhyanathan, Ramanathan	Self-exfoliated triazole-triformyl phloroglucinol based covalent organic nanosheets for high and reversible lithium ion storage	<b>Korea</b> Application No.: 10-2019-7037190 Publication No.: 10-2020-0015566 Granted No.: 10-2553208
4	Halder, Sattwick; Roy, Kingshuk; Nandi, Shyamapada; Vaidhyanathan, Ramanathan	Self-exfoliated triazole-triformyl phloroglucinol based covalent organic nanosheets for high and reversible lithium ion storage	<b>Japan</b> Application No.: 2020-516978 Publication No.: 2020525636A Granted No.: 7241743
5	Britto, Sandanaraj Selvaraj; Bhandari, Pavankumar Janardhan; Reddy, Mullapudi Mohan	Supramolecular protein assemblies with advanced functions and synthesis thereof	<b>India</b> Application No.: 201721034557 Publication No.: IN201721034557A Granted No.: 490760
6	Britto, Sandanaraj Selvaraj; Bhandari, Pavankumar Janardhan; Reddy, Mullapudi Mohan	Generation-dependent supramolecular assemblies of protein-dendron conjugates	<b>India</b> Application No.: 201721044279 Publication No.: IN201721044279A Granted No.: 466848
7	Britto, Sandanaraj Selvaraj; Bhandari, Pavankumar Janardhan; Reddy, Mullapudi Mohan	Generation-dependent supramolecular assemblies of protein-dendron conjugates	<b>U.S.A.</b> Application No.: US16/771,124 Publication No.: US20210163916A1 Granted No.: US11807884 B2
8	Puthusseri, Dhanya; Wahid, Malik; Basu, Aniruddha; Ogale, Satischandra Balkrishna	Doped carbon nano-onion film as scaffold for stabilizing lithium metal anode	<b>India</b> Application No.: 201821007031 Publication No.: IN201821007031 A Granted No. 489111



Sr. No.	Inventors	Title	Country and Patent Info
9	Britto, Sandanaraj Selvaraj; Bathla, Punita	Process for determining enzyme activity in a cell by Activity-Based Reporter Gene Technology (ABRGT)	<b>U.S.A.</b> Application No.: US16401906 Publication No.: US20190338373A1 Granted No.: 11834698
10	David J. Hannapel; Anjan K. Banerjee	Nucleic acid constructs, plants with increased tuber yield, and methods for increasing tuber yield in a plant	<b>U.S.A.</b> Application No.: US16/246321 Publication No.: US20190218565A1 Granted No.: US11795468
11	Jose, Gregor; Pucadyil, Thomas	A novel bifunctional lipid probe for proximity labelling-based identification of membrane-associated proteins	<b>India</b> Application No.: 201921022074 Publication No.: IN201921022074 A Granted No.: 459831
12	Vaidhyanathan, Ramanathan	Covalent organic framework derived lightweight nanomagnets and a chemical method thereof	<b>India</b> Application No.: 202021004764 Publication No.: IN202021004764A Granted No.: 447206
13	Haldar, Sattwick; Vaidhyanathan, Ramanathan	Method of tuning the electronic energy level of covalent organic framework for crafting high-rate Na-ion battery anode	<b>India</b> Application No.: 202021013731 Publication No.: IN202021013731A Granted No.: 440727
14	Kushwaha Rinku; Vaidhyanathan, Ramanathan	Method of enhancing the supercapacitance of covalent organic framework via use of redox active additives in electrolyte	<b>India</b> Application No.: 202021021759 Publication No.: IN202021021759 A Granted No.: 463530
15	Abraham, Nixon Mundathukudiyil	Olfactory-action meter for precise quantification of olfactory deficits	<b>India</b> Application No.: 202021035482 Publication No.: IN202021035482A Granted No.: 432345
16	Abraham, Nixon Mundathukudiyil	Olfactory-action meter for precise quantification of olfactory dysfunctions and neurocognitive deficits	<b>U.S.A.</b> Application No.: US17/443,527 Publication No.: US20220054075A1 Granted No.: US 11786164B2
17	Kikkeri, Raghavendra; Kumar, N. Vijendra; Shanthamurthy, Chethan D.; Jain, Prashant; Raigawali, Rakesh; Vered Padler-Karavani; Leviatan Ben-Arye Shani	Heparan sulfate compounds as chemokine inhibitors	<b>India</b> Application No.: 202121003052 Publication No.: IN202121003052A Granted No.: 423269

Sr. No.	Inventors	Title	Country and Patent Info
18	Britto, Sandanaraj Selvaraj; Bathla, Punita, Abhijit De	Assay for determining target engagement in real time	<b>India</b> Application No.: 202121011849 Publication No.: IN202121011849A Granted No.: 421037
19	Rapol, Umakant D.; Hotha, Srinivas; Nair, Sunil; Patel, Kushal H.; Dutta, Pranab; Maurya, S. Sagar; Biswas, Korak; Das, Pratim Kumar	Chemical oxygen generator	<b>India</b> Application No.: 202121020842 Publication No.: IN202121020842A Granted No. 417410
20	Gokul M.A.; Atikur Rahman	Process for synthesis of monolayer transition metal dichalcogenide	<b>India</b> Application No.: 202221005450 Publication No.: IN202221005450 A Granted No.: 463578
21	Gnanaprakasam, Boopathy; Pandey, Akanksha M.; Mondal, Shankhajit	A continuous flow process for synthesis of organic azides	<b>India</b> Application No.: 202221031963 Publication No.: IN202221031963A Granted No.: 440209
22	Sonde, Ramakrishna Ramnath; Bhatia, Divesh; Roy, Shantanu; Pant, Kamal Kishor; Hotha, Srinivas; Rapol, Umakant; Nair, Sunil; Mhatre, Dwijra; Singh, Kuldeep; Parmar, Kaushal; Singh, Shreya; Patel, Kushal; Dutta, Pranab; Maurya, Shivasagar; Biswas, Korak; Das, Pratim Kumar	Hybrid oxygen system using passive and active systems	<b>India</b> Application No.: 202111029508 Publication No.: IN202111029508A
23	Wable, Minal; Furquan, Mohammad; Banerjee, Abhik; Ogale, Satishchandra	Process for graphene-like carbon coating on substrates	<b>India</b> Application No.: 202121059467 Publication No.: IN202121059467A
24	Wable, Minal; Furquan, Mohammad; Banerjee, Abhik; Ogale, Satishchandra	Microgradient patterned carbon coated current collector for alkali metal battery and method of preparation thereof	<b>India</b> Application No.: 202221006134 Publication No.: IN202221006134A
25	Jakhar, Navita; Singh, Surjeet	Method for making high figure-of-merit nanostructured thermoelectric materials	<b>India</b> Application No.: 202221018408 Publication No.: IN202221018408A

Sr. No.	Inventors	Title	Country and Patent Info
26	De, Avirup; Prabhakaran, Dharmalingam; Nair, Sunil	Device and method for measuring topologically protected surface magnon	<b>India</b> Application No.: 202221043561 Publication No.: IN202221043561A
27	Haldar, Sattwick; Vaidhyathan, Ramanathan	Method of tuning the electronic energy level of covalent organic framework for crafting high-rate Na-ion battery anode	<b>U.S.A.</b> Application No.: US17/914,925 Publication No.: US20230123529A1
28	Haldar, Sattwick; Vaidhyathan, Ramanathan	Method of tuning the electronic energy level of covalent organic framework for crafting high-rate Na-ion battery anode	<b>Japan</b> Application No.: JP2022-558106 Publication No.: JP2023527105A
29	Wable, Minal; Furquan, Mohammad; Banerjee, Abhik; Ogale, Satishchandra	Process for graphene-like carbon coating on substrates	<b>U.S.A.</b> Application No.: US18/085,540 Publication No.: US2023-0193469A1
30	Hotha, Srinivas; Sutar, Yogesh; Walke, Gulab; Kasdekar, Niteshlal	Silver assisted gold catalysis for the preparation of fondaparinux pentasaccharide and intermediates	<b>Australia</b> Application No.: 2021381706 Publication No.: 2021381706
31	Hotha, Srinivas; Sutar, Yogesh; Walke, Gulab; Kasdekar, Niteshlal	Silver assisted gold catalysis for the preparation of fondaparinux pentasaccharide and intermediates	<b>Europe</b> Application No.: 21894152.4 Publication No.: EP4247826
32	Kumar, Nikhil; Banerjee, Abhik; Ogale, Satishchandra	Separator assembly for anode-free metal battery	<b>India</b> Application No.: 202331004828
33	Wable, Minal; Furquan, Mohammad; Banerjee, Abhik; Ogale, Satishchandra	Microgradient patterned carbon coated current collector for alkali metal battery and method of preparation thereof	<b>U.S.A.</b> Application No.: US18/164,750
34	Jakhar, Navita; Singh, Surjeet	Method for making high figure-of-merit nanostructured thermoelectric materials	<b>U.S.A.</b> Application No.: US18/127941
35	S.B. Ogale; Mohammad Furquan; Abhik Banerjee	Silicon and graphite direct writing and patterning electrode eco-friendly fabrication process for rechargeable batteries application	<b>India</b> Application No.: 202321051016
36	Kikkeri, Raghavendra; Kumar, N. Vijendra; Shanthamurthy, Chethan D.; Jain, Prashant; Raigawali, Rakesh; Vered Padler-Karavani; Leviatan Ben-Arye Shani	Heparan sulfate and its mimetics as chemokine inhibitors	<b>U.S.A.</b> Application No.: US18/262,463

Sr. No.	Inventors	Title	Country and Patent Info
37	Datta, Shouvik; Bhunia, Amit; Singh, Mohit Kumar; Mohamed Henini; Maryam Al huwayz	Excitonic Bose-Einstein Condensate (BEC) as qubits using semiconductor nanostructures for quantum technologies	<b>U.S.A.</b> Application No.: US18/258,691
38	Vaidhyathan, Ramanathan; Singh, Himan Dev	A steam-stable three-dimensional (3D) zinc-adeninate metal organic framework with a high selectivity for industrial CO <sub>2</sub> capture	<b>India</b> Application No.: 202321049364
39	Pramod Padmanabha Pillai; Radha Krishna Kashyap	Plasmonic solar thermoelectric generator	<b>India</b> Application No.: 202321058513
40	Jain, Chitvan; Ramanathan, Vaidhyathan	Knitting the layers of two-dimensional covalent organic framework with one-dimensional polymer to make conducting quasi-three-dimensional architecture	<b>India</b> Application No.: 202321056536
41	Gokul M.A.; Atikur Rahman	A method for synthesis of metal halide perovskite (CsPbBr <sub>3</sub> ) nano/microcrystals	<b>India</b> Application No.: 202321063998
42	Gnanaprakasam	Method of cross-etherification of at least one alkylated ether phenyl compound under continuous-flow condition	<b>India</b> Application No.: 202321089054
43	Gokul M.A.; Atikur Rahman	Process for synthesis of monolayer transition metal dichalcogenide	Application No.: PCT/IB2023/050869 Publication No.: WO/2023/148626
44	Gnanaprakasam, Boopathy; Pandey, Akanksha M.; Mondal, Shankhajit	A continuous flow process for synthesis of organic azides	Application No.: PCT/IB2023/055692 Publication No.: WO/2023/233371
45	De, Avirup; Prabhakaran, Dharmalingam; Nair, Sunil	Device and method for measuring topologically protected surface magnon	Application No.: PCT/IB2023/057737
46	Vaidhyathan, Ramanathan; Singh, Himan Dev	Three-dimensional (3D) hydrophobic amine-rich metal organic framework with a high selectivity for humid CO <sub>2</sub> capture	Application No.: PCT/IB2023/060803
47	Ogale, Satishchandra Balkrishna; Furquan, Mohammad; Kumar, Nikhil; Bobade, Richa Amod; Varma, Karikath Sukumar	A process for coating integrative patterning and functionalization of glass, and uses thereof	Application No.: PCT/IB2023/062394

ISER Pune faculty members have been consistently securing competitive research funds from various government science and technology departments. In the 2023-24 financial year, ₹99.02 crores of research funds have been received by / assigned to the institute for 165 research projects.

*The list of new extramural grants sanctioned during the 2023-24 financial year is given in the Appendix section of this report.*

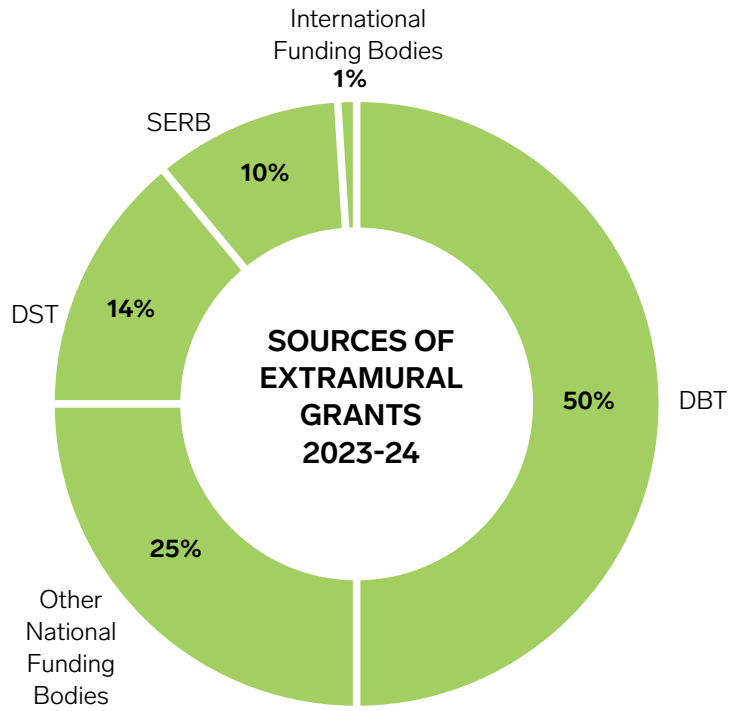
## **NEW PROJECTS SANCTIONED IN 2023-24**

In the 2023-24 financial year, 69 new research projects have been initiated. Some of the high-value projects initiated in the 2023-24 financial year are highlighted here:

- Funding from Mumbai Metropolitan Region Development Authority (MMRDA) for valorization of mangrove species for the livelihood improvement of the mangrove-associated local communities via sustainable utilization
- Funding from Maharashtra State Road Development Corporation Limited for bioprospecting and pollution tolerance capacity analysis of mangrove species for the livelihood improvement of the mangrove-associated local communities via sustainable utilization and conservation
- Funding from the Department of Biotechnology, Govt, towards an evidence-based regimen for treating Extra-Pulmonary Tuberculosis (EPTB)
- Wellcome Trust / DBT India Alliance Fellowships to four faculty members
- A grant from I-Hub Quantum Technology Foundation for upgradation of 500 MHz Bruker NMR Spectrometer
- Funding from the Pratiksha Trust to study the disruption of brain rhythms as an early marker of Alzheimer's disease using a multiscale computational modelling approach, and to study the VAPB protein at membrane contact sites in the context of iALS-FTD at the crossroads of ER stress, proteostasis, lipid homeostasis and inflammation.

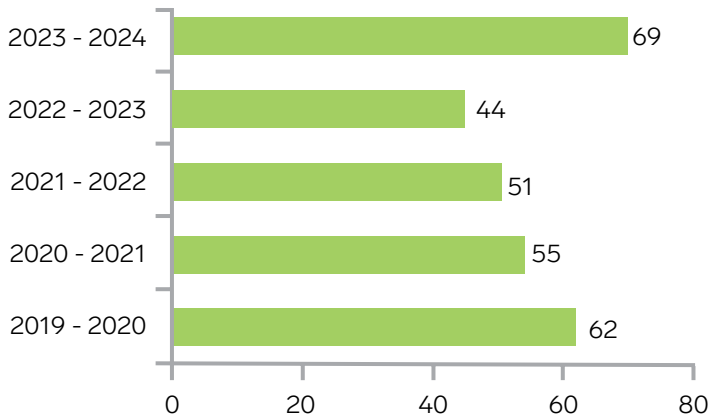
## **SOURCES OF EXTRAMURAL GRANTS IN 2023-24**

Majority of the funds received through extramural grants have been from government bodies, with research funds from DBT contributing to 50% of the research funds received (in 108 projects) in 2023-24, followed by DST at 14%, and SERB at 10%. Funding from other Indian funding bodies (Wellcome Trust-DBT India Alliance, IFCPAR, MoES, MHRD, DAE, ICMR, CSIR, IUCAA, ICSSR, SPARC, UGC, etc) has contributed to 25% of funds for research in sectors such as education, defense, atomic energy, etc (in 50 projects). International funding bodies (AOARD, SIMON Foundation, etc) have contributed to 1% of the total research funds (in 7 projects).



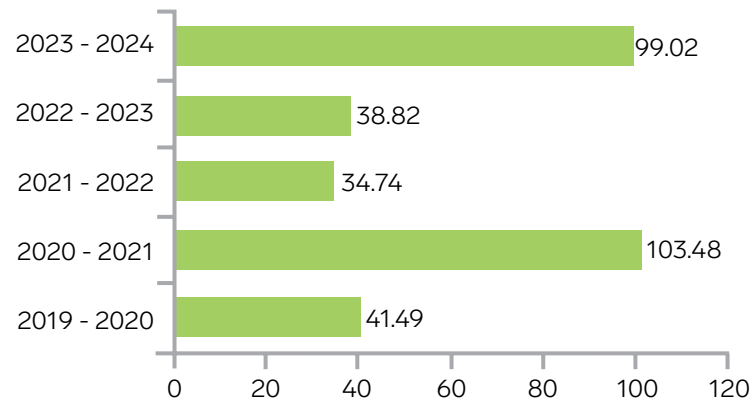
**NUMBER OF NEW EXTRAMURAL GRANTS SANCTIONED**

*Data is as per the last 5 financial years*



**EXTRAMURAL FUNDS RECEIVED / ASSIGNED**

*Data is as per the last 5 financial years; Amount is in crore rupees*



# AWARDS AND HONOURS

Through the year, many of our faculty members received numerous awards for their research excellence and promise as highlighted below.



**Dr. Ashish Arora**

*Assistant Professor, Physics*  
Young Achiever Award at the 67th DAE Solid State Physics Symposium held December 20-24, 2024



**Prof. Sunil Bhagwat**

*Director and Professor, Chemistry*  
Fellow of the Indian National Academy of Engineers (INAE) for 2023; ICC-K.V. Mariwala Award for Effective Chemical Industry-Academia Partnership jointly with Balmer Lawrie & Co. Ltd. and ICT Mumbai



**Dr. Srabanti Chaudhury**

*Associate Professor, Chemistry*  
Selected as one of the three Early Career Researchers in Chemistry to represent India in the Commonwealth Chemistry Congress (CCC) in Trinidad & Tobago from May 23-25, 2023; DAAD Scholarship for Research Stays for University Academics and Scientists, 2024



**Prof. Deepak Dhar**

*Distinguished Emeritus Professor, Physics*  
Received the Boltzmann Medal (announced in 2022) from IUPAP during the Statphys 28 Conference in Tokyo, August 9, 2023; Champions for Change Maharashtra Award, January 30, 2024



**Dr. Diptimoy Ghosh**

*Associate Professor, Physics*  
Associate Fellow of the Indian National Science Academy (INSA), New Delhi, for 2023



**Dr. Prasenjit Ghosh**

*Associate Professor, Physics, Chemistry (Joint)*  
JSPS Invitational Fellowship for Research in Japan (Short-term), for 2023, from Japan Society for the Promotion of Science (JSPS)



**Prof. Sujit K. Ghosh**

*Professor, Chemistry*  
Distinguished Lectureship Award for 2023 by the Chemical Society of Japan (CSJ); Fellow of the Royal Society of Chemistry (FRSC) (Invited and 'Leaders in the Field' scheme); Chemistry in India Leader Award by Research.com



**Prof. Partha Hazra**

*Professor, Chemistry*  
JSPS Invitational Fellowship for Research in Japan (Short-term), for 2023, from Japan Society for the Promotion of Science (JSPS)



**Dr. Shabana Khan**

*Associate Professor, Chemistry*  
9th Venus International  
Women Awards - VIWA  
2024, Outstanding Woman  
Researcher in Chemistry 2023



**Dr. Moumita Majumdar**

*Associate Professor, Chemistry*  
Chemical Research Society of  
India (CRSI) Bronze Medal for  
2024; Featured in "She Is - 75  
Women in Chemistry" by the  
Royal Society of Chemistry  
and the Office of the Principal  
Scientific Adviser to the  
Government of India, 2023; LN Mathur-Asima Chatterjee  
Women Scientist Award, Indian Chemical Society, 2023



**Dr. Angshuman Nag**

*Associate Professor, Chemistry*  
India Research Excellence  
- Citation Awards in Natural  
Sciences 2023, Awarded by  
Clarivate (Web of Science);  
Featured in "35 Years and  
35 Voices from Chemistry of  
Materials"



**Dr. Mridula Nambiar**

*Assistant Professor, Biology*  
DBT/Wellcome Trust India  
Alliance Intermediate  
Fellowship for 2023



**Prof. Satishchandra Ogale**

*Adjunct Faculty, Physics*  
Researcher of the Year Award  
from India Energy Storage  
Alliance



**Dr. Gayathri Pananghat**

*Associate Professor, Biology*  
DBT/Wellcome Trust India  
Alliance Senior Fellowship  
for 2023; S. Ramachandran  
National Bioscience Award  
for Career Development,  
Department of Biotechnology,  
2021 (Award announced in  
2023)



**Dr. Sagar Pandit**

*Assistant Professor, Biology*  
DAAD (German Academic  
Exchange Service) Research  
Ambassador



**Dr. Moumanti Podder**

*Assistant Professor,  
Mathematics*  
Associate of the Indian  
Academy of Sciences (IAS),  
Bengaluru, for 2023





**Dr. Sudha Rajamani**  
*Associate Professor, Biology*  
Scientific High Level Visiting  
Fellowship-2023, by the  
French Institute in India (IFI)  
and the Embassy of France in  
India



**Dr. Pooja Sancheti**  
*Assistant Professor,*  
*Humanities and Social*  
*Sciences*  
Rajendra Yadav Hans Anudit  
Katha Samman '23 for Best  
Translated story by Hans  
Katha Masik Magazine, Akshar  
Prakashan (2023)



**Dr. Haripada Sau**  
*Assistant Professor,*  
*Mathematics*  
Associate Fellow of the Indian  
National Science Academy  
(INSA) 2023; Associate of the  
Indian Academy of Sciences  
2023

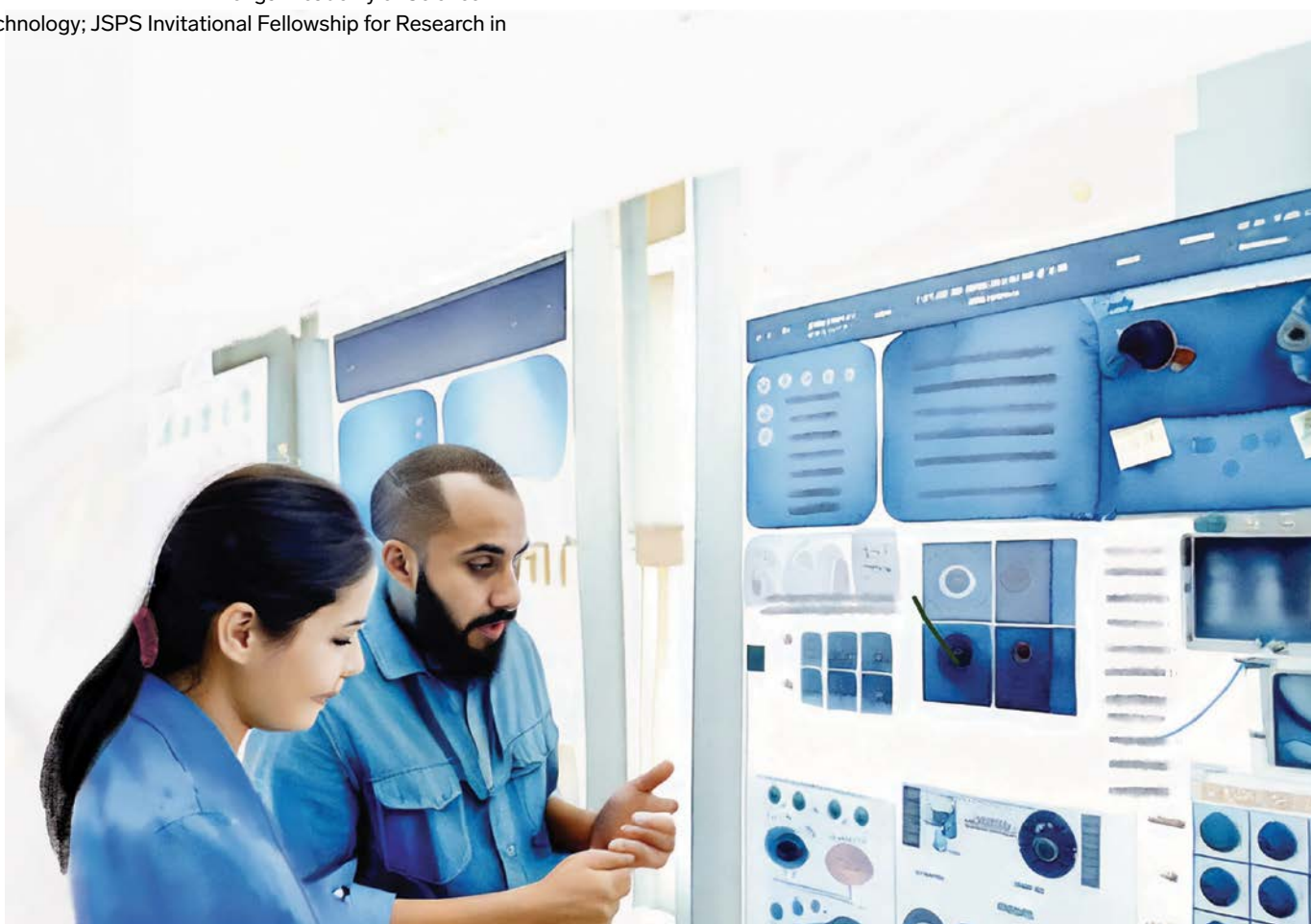


**Prof. Srivatsan Seergazhi  
Gopalan**  
*Professor, Chemistry*  
Alexander von Humboldt  
Renewed Research Fellowship,  
University of Konstanz,  
Germany May 01, 2023-July 31,  
2023 (sponsored by Humboldt  
Foundation)



**Prof. Pinaki Talukdar**  
*Professor, Chemistry*  
Fellow of the Royal Society  
of Chemistry, U.K., for 2023;  
National Prize for Bio-physical  
Chemistry Research (2023)  
from C.N.R. Rao Education  
Foundation; Fellow of the West  
Bengal Academy of Science

and Technology; JSPS Invitational Fellowship for Research in  
Japan



# MEMBERSHIPS AND AFFILIATIONS



**Dr. Baskar Balasubramanyam**  
*Associate Professor, Mathematics*  
Short term Visitor at the Institute of Advanced Study, Princeton, as part of Summer Collaborators Program (2023)



**Prof. Sunil Bhagwat**  
*Director and Professor, Chemistry*  
Member, Board of Governors, COEP Technological University, Pune; Member, Academic Council, Savitribai Phule Pune University, Pune; Member, Academic Council, Parle Tilak Vidyalyaya Association's Mulund College of Commerce (Autonomous), Mulund (W); Chancellor Nominee, Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon; Chancellor Nominee, Punyashlok Ahilyadevi Holkar Solapur University, Kegaon, Solapur; Chancellor Nominee, Gondwana University, Gadchiroli



**Dr. Gnanaprakasam Boopathy**  
*Associate Professor, Chemistry*  
Board of Studies Member, Pimpri Chinchwad College of Engineering, Pune (2023 onwards)



**Prof. Devapriya Chattopadhyay**  
*Professor, Earth and Climate Science*  
Member, Technical Expert Committee, Biological Science Programme, DBT, India; Member, Paleosynthesis Advisory Board; Visiting Faculty Fellowship, Christ College Autonomous, Irinjalakuda, Kerala, India



**Dr. Srabanti Chaudhury**  
*Associate Professor, Chemistry*  
Member of Editorial Advisory Board, *Journal of Physical Chemistry A/B/C* (from Jan 2024)



**Dr. Anisa Chorwadwala**  
*Associate Professor, Mathematics*  
Visiting Professor in the PhD Program Doctorado en Matemática, Facultad de Ciencias Físicas y Matemáticas, Universidad de Concepción, Chile



**Dr. Sreejith G.J.**  
*Associate Professor, Physics*  
Adjunct Faculty at Department of Theoretical Physics, TIFR Mumbai (from Mar 2024); Visiting Associate Professor, Joint Quantum Institute and Condensed Matter Theory Center, University of Maryland



**Prof. Sujit K. Ghosh**  
*Professor, Chemistry*  
AvH Visiting Fellow, Humboldt University, Germany (July-Aug, 2023)

College Park (July 2023-Jan 2024)



**Dr. Anindya Goswami**  
Associate Professor,  
*Mathematics*  
Nominated to the Board  
of Studies in Dept. of  
Mathematics & Statistics in  
MIT World Peace University  
(MIT-WPU), Pune



**Prof. G.V. Pavan Kumar**  
Professor, *Physics*  
Editorial Advisory Board of  
*ACS Photonics*; Editorial  
Advisory Board, *Resonance*  
(Indian Acad Sciences); Editor,  
Web Outreach, *DIALOGUE:*  
*Science, Scientists, and*  
*Society* (2024 - )



**Prof. Soumen Maity**  
Professor, *Mathematics*  
Visiting Faculty, School  
of Data Science, IISER  
Thiruvananthapuram



**Dr. Muhammed Musthafa  
O.T.**  
Associate Professor, *Chemistry*  
Editorial Board Member,  
*Discover Electrochemistry*,  
Springer Nature; Life Member,  
SMC India



**Dr. Kalika Prasad**  
Associate Professor, *Biology*  
Member of Department  
of Biotechnology, Govt of  
India, Plant Biotechnology  
Funding Task force  
(2022- ); Executive Board  
Member of Indian Society  
of Developmental Biology;

Editorial Board Member of *Journal of Genetics*; Guest Editor  
of *Developmental Biology* (U.S.A.)



**Dr. Moumanti Podder**  
Assistant Professor,  
*Mathematics*  
Associate Editor, *Sankhya:*  
*Series A*; Associate, Indian  
Academy of Sciences (IASc),  
Bengaluru



**Dr. Sudha Rajamani**  
Associate Professor, *Biology*  
Invited as an Astrobiology  
expert for 'Vikram  
Discussions-1', Jan 5-6,  
2024, and for a discussion  
meeting, on "Academic  
Capacity Building in Planetary,  
Exoplanetary and Star-Planet

Interaction Sciences", on Sept 15, 2023; Elected Councillor  
of the ISSOL Executive Council, June 2023- May 2026; Life  
Member of the Society for Biological Chemists, India (July  
2023 onwards)



**Prof. Richa Rikhy**  
Professor, *Biology*  
Academic Editor, *Journal*  
*of Cell Science*; Board  
Member, Indian Society for  
Developmental Biology



**Dr. Pooja Sancheti**  
*Assistant Professor,  
Humanities and Social  
Sciences*  
Member of South Asian  
Literary Association (SALA),  
U.S.A.



**Prof. M.S. Santhanam**  
*Professor, Physics*  
Associate Editor, *Dialogue*  
(Published by the Indian  
Academy of Sciences,  
Bengaluru)



**Dr. Kaneenika Sinha**  
*Associate Professor,  
Mathematics*  
Member of the Editorial  
Board, *Springer University  
Texts in the Mathematical  
Sciences*



**Prof. Arun Venkatnathan**  
*Professor, Chemistry*  
Member, Board of Studies,  
Chemistry, Savitribai Phule  
Pune University, Pune

.....  
*Shown above are new memberships and affiliations obtained during 2023-24. Many other faculty members have ongoing editorial board memberships and other academic recognitions through which they contribute to the scientific community and the education sector. Every year, faculty members are invited to present their research work at conferences, workshops, and other events across India and elsewhere. Faculty members are also involved in organising scientific conferences in topics relevant to their research.*

*The list of invited lectures given by the faculty members and academic events they have organised during 2023-2024 is given in the Appendix section of this report.*  
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# Academic Programmes

PhD Programme 68

Integrated PhD Programme 75

MSc Programme 80

BS-MS Programme 84

List of Courses 100



# PhD PROGRAMME

PhD student numbers  
across departments  
as on March 31, 2024

TOTAL: 506



**153**

BIOLOGY



**187**

CHEMISTRY



**3**

DATA SCIENCE



**31**

EARTH AND  
CLIMATE SCIENCE



**18**

HUMANITIES AND  
SOCIAL SCIENCES



**33**

MATHEMATICS



**81**

PHYSICS

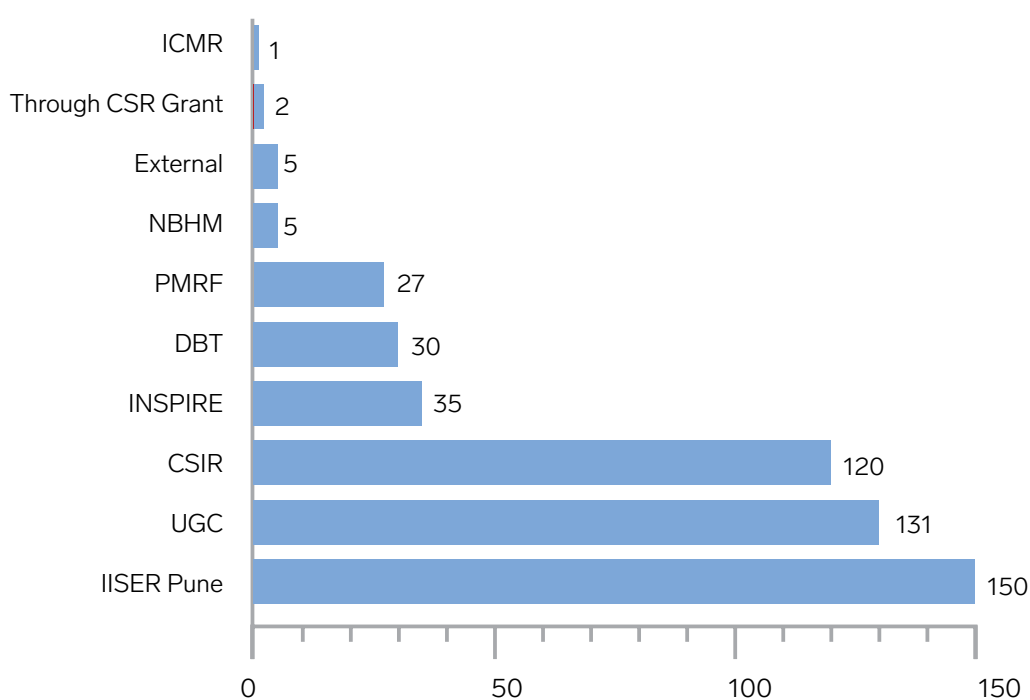
PhD students are the main driving force in the research programmes at the Institute. The PhD programme has a year-long coursework before the research work begins. Admission to PhD programmes at the Institute is through national-level tests followed by interviews conducted separately for each department.



During the August 2023 and January 2024 admission sessions, 106 (Men 59, Women 47) PhD students were admitted to the PhD programme: 34 (Men 11, Women 23) in Biology, 38 (Men 21, Women 17) in Chemistry, 2 (Men 2) in Data Science, 4 (Men 3, Women 1) in Earth and Climate Science, 3 (Men 2, Women 1) in Humanities and Social Sciences, 7 (Men 5, Women 2) in Mathematics, and 18 (Men 15, Women 3) in Physics.

The strength of PhD students at the Institute as of March 31, 2024 is 506 (Men 298, Women 208). Here is a break-up of the numbers across departments: 153 (Men 65, Women 88) students in Biology, 187 (Men 116, Women 71) in Chemistry, 3 (Men 2, Women 1) in Data Science, 31 (Men 19, Women 12) in Earth and Climate Science, 18 (Men 7, Women 11) in Humanities and Social Sciences, 33 (Men 26, Women 7) in Mathematics, and 81 (Men 63, Women 18) in Physics.

### SOURCES OF FELLOWSHIPS FOR PhD STUDENTS



### Category-wise Numbers of PhD Students (as on March 31, 2024)

Gender	GE	OBC	SC	ST	PD	EWS	Total
Men	181	66	18	6	5	22	298
Women	149	36	11	3	1	8	208
<b>Total</b>	<b>330</b>	<b>102</b>	<b>29</b>	<b>9</b>	<b>6</b>	<b>30</b>	<b>506</b>

The following PhD students received the Prime Minister's Research Fellowship (PMRF) during the August 2023 cycle: Somnath Ghosh (Chemistry); Sidharth Shankar Pathak (Chemistry); Kumar Gaurav (Chemistry); Souvik Khan (Chemistry); Augustus Camellus R.B. (Chemistry); Adhra S. Sury (Chemistry); Mridul Biswas (Mathematics); Katha Ganguly (Physics); Shuvarati Roy (Physics).

A total of 29 PhD students received one or more travel grants for participating in international conferences and for carrying out collaborative research work. The funding agencies that the students secured travel awards from include CSIR, SERB, EMBO, Ignite Life Science Foundation, Fulbright Nehru Doctoral Research Program, and DBT-CTEP. In some cases, the travel was supported through the students' PMRF Fellowship or by the host organisation.

**In the 10th convocation held on May 31, 2023, 45 students were conferred PhD degree.**

**The following 70 students have successfully completed their requirements for the award of PhD degree** (completed thesis defense between April 1, 2023 and March 31, 2024). Of these, 12 students have received their degrees in the 10th Convocation held on May 31, 2023.

Sr. No.	Student	Department	Advisor	Thesis Title
1	<b>Warankar Avinash Manohar</b> 20143307	Chemistry	Pankaj Mandal	Ultrafast time-resolved terahertz spectroscopy of charge carrier dynamics in semiconductors
2	<b>Prajna Nayak</b> 20143322	Biology	Girish Ratnaparkhi	Regulation of the <i>Drosophila</i> innate immune response by SUMO conjugation of amino acyl tRNA synthetases
3	<b>Shinde Ganesh Punjaram</b> 20143339	Chemistry	Srinivas Hotha	Synthesis of heptamannoside, lactam glycoconjugates and spirocyclic glycooxazolines
4	<b>Chandan Kumar Singh</b> 20143353	Physics	Mukul Kabir	Superconductivity, magnetism and their interplay in two-dimension
5	<b>Ankita Sharma</b> 20153386	Biology	Sanjeev Galande	Understanding the regulation of transcription factor SP1 via Wnt and Hippo signaling pathways in colon development and cancer
6	<b>Udaya H.S.</b> 20153403	Chemistry	V.G. Anand	Synthesis, conformational dynamics and spectro-electrochemical characteristics of core-modified expanded isophlorinoids
7	<b>Sumit Srivastav</b> 20153415	Physics	Bhas Bapat	Dissociation dynamics and ionization processes in slow ion-molecule collisions
8	<b>Mulani Imrankhan Bashir</b> 20153417	Physics	Aparna Deshpande	Charge density waves in transition metal dichalcogenides
9	<b>Laxman Rambhau Sawase</b> 20163424	Chemistry	Harinath Chakrapani	Synthesis and evaluation of enzyme activated nitroxyl (HNO) generators
10	<b>Sarang Mahajan</b> 20163440	Biology	Nixon M. Abraham	Neural mechanisms underlying mechanosensation through rodent olfactory system
11	<b>Uttekar Bhavin Dashrathrav</b> 20163447	Biology	Richa Rikhy	Analysis of mitochondrial morphology dynamics in the maintenance of epithelial polarity in <i>Drosophila</i> oogenesis



Sr. No.	Student	Department	Advisor	Thesis Title
12	<b>Vibishan B.</b> 20163448	Biology	Sutirth Dey	Ecological and evolutionary processes at multiple scales of biological organization
13	<b>Puneeth Kumar D.R.</b> 20163455	Chemistry	Hosahudya N. Gopi	Exploring the structural properties of alpha, gamma-hybrid peptide foldamers to design antimicrobials, A $\beta$ <sub>42</sub> -oligomers aggregation inhibitors and nanotubes
14	<b>Ruma Ghosh</b> 20163457	Chemistry	Manickam Jayakannan	Theranostic antibacterial agents based on biodegradable polymer nanoarchitectures
15	<b>Khatik Saddam Husen Yusuf</b> 20163460	Chemistry	S.G. Srivatsan	Probing nucleic acid conformations and recognition by fluorescence and 19F NMR using dual-purpose nucleoside analogs
16	<b>T. Anand Kumar</b> 20163463	Chemistry	Harinath Chakrapani	Design, synthesis and evaluation of bioreductively-activated fluoroquinolone prodrugs
17	<b>Neetu</b> 20163465	Chemistry	R. Boomi Shankar	Design and synthesis of ferroelectric metal-ligand architectures and their piezoelectric energy harvesting studies
18	<b>Padmini Sahoo</b> 20163467	Chemistry	Moumita Majumdar	Study of multimetallic germanium and tin compounds in their low oxidation state
19	<b>Rashmi Sharma</b> 20163468	Chemistry	Pinaki Talukdar	Development of supramolecular channels for the selective transport of chloride via hydrogen and halogen bond interactions
20	<b>Nair Ramya Ravindran Jayashri</b> 20163482	Mathematics	Tejas Kalelkar	Seifert fiber spaces with singular surfaces
21	<b>Kartik Roy</b> 20163484	Mathematics	Vivek Mohan Mallick	Some spaces associated with multigraded rings
22	<b>Bhagyashri Devaru Bhat</b> 20163486	Physics	Mukul Kabir	Dichalcogen semiconductors for optoelectronic and spintronic applications
23	<b>Vineet Kumar Pandey</b> 20163492	Physics	Prasenjit Ghosh	Computational study of thermoelectric properties of two Heusler alloys and a wide gap semiconductor
24	<b>Dibyata Rout</b> 20163493	Physics	Surjeet Singh	Investigation of structure-property relationship in some low dimensional nickelates
25	<b>V.R. Krithika</b> 20163496	Physics	T.S. Mahesh	Exploring nonlinear effects in spin-systems using NMR
26	<b>Sumanta Let</b> 20173499	Chemistry	Sujit K. Ghosh	Function-led design & syntheses of advanced porous organic polymers and their composites: Heterogeneous catalysis and toxic pollutants separation
27	<b>Debasish Laha</b> 20173500	Chemistry	Ramakrishna G. Bhat	Design, development, and applications of new alpha-diazo carbonyl compounds as carbene surrogates to access useful organic compounds

Sr. No.	Student	Department	Advisor	Thesis Title
28	<b>Shabnum Maqbool</b> 20173507	Chemistry	Pankaj Mandal	Linear and nonlinear optical properties and ultrafast dynamics of hybrid lead halide perovskites
29	<b>Aslam Uddin</b> 20173509	Chemistry	Partha Hazra	Design, synthesis of novel organic molecules towards early-stage detection amyloid fibrils and their mechanistic role in protein misfolding disease
30	<b>Shirsa Palit</b> 20173510	Biology	Anjan K. Banerjee	Investigating the molecular role of bryophyte-specific protein SHORT-LEAF (SHLF) in gametophore development of moss ( <i>Physcomitrium patens</i> )
31	<b>Rajeshwari B.R.</b> 20173512	Biology	Nagaraj Balasubramanian	Cell-matrix adhesion-dependent differential regulation of cis-medial vs trans-Golgi organisation
32	<b>Sandra Aravind A.</b> 20173515	Biology	Pranay Goel	Modelling growth processes in Indian children and adolescents
33	<b>Firdousi Parvez</b> 20173519	Biology	Jeetender Chugh	Understanding the RNA-recognition mechanism of dsRNA binding domains (dsRBDs) using TAR RNA binding protein (TRBP) as a model system
34	<b>Writakshi Mandal</b> 20173524	Chemistry	Sujit K. Ghosh	Advanced porous materials for environmentally relevant toxic pollutants detection and sequestration
35	<b>Sahel Fajal</b> 20173525	Chemistry	Sujit K. Ghosh	Advanced functional porous materials and their hybrid composites for energy-efficient chemical separation application
36	<b>Nilanjana Sen</b> 20173526	Chemistry	Shabana Khan	Syntheses, reactivities, and catalytic applications of low-valent compounds with p-block elements
37	<b>Naveen Joseph Roy</b> 20173528	Chemistry	Pinaki Talukdar	Development of transmembrane ion transport systems for biomedical applications
38	<b>Shaikh Javed Yasin</b> 20173529	Chemistry	Ramakrishna G. Bhat	Direct C3-(sp <sup>2</sup> )-H alkenylation and C(γ-sp <sup>3</sup> )-H arylation of five membered heteroaryl compounds via palladium catalysis: An access to novel compounds with photophysical properties
39	<b>Mohammed Khuddus Md. Iqbal</b> 20173530	Chemistry	M. Jayakannan	L-Aspartic acid based functional polyesters for drug delivery and antimicrobial applications
40	<b>Manjeet Singh</b> 20173533	Chemistry	Hosahudya N. Gopi	A strategic approach to α,β-unsaturated γ-lactam synthesis via trans-cis isomerization of carbon-carbon double bonds in vinylogous γ-amino acids
41	<b>Sumit Roy</b> 20173539	Chemistry	Pramod P. Pillai	Regulation of interparticle interactions enables the formation of functional nanoparticle assemblies

Sr. No.	Student	Department	Advisor	Thesis Title
42	<b>Arijeet Dutta</b> 20173542	Earth and Climate Science	Neena Joseph Mani	Role of atmospheric teleconnection processes in the observed relationship between the Atlantic Multidecadal Oscillation and Indian summer monsoon
43	<b>Namrata Arvind</b> 20173544	Mathematics	Manish Mishra	On $Z_n \rtimes Z_2$ -Hopf-Galois structures and unit group of some group algebras
44	<b>Yadav Ravishankar Kapildev</b> 20173545	Mathematics	Anindya Goswami	A study of component-wise semi-Markov process
45	<b>Visakh Narayanan</b> 20173551	Mathematics	Rama Mishra	Knots, links and spherical braids in real projective 3-space
46	<b>Gokul M.A.</b> 20173554	Physics	Atikur Rahman	Synthesis and fabrication of heterostructures of novel semiconductors for device application
47	<b>Bhumika Kansal</b> 20173559	Physics	Seema Sharma	Search for supersymmetry in proton-proton collisions at $\sqrt{s} = 13$ TeV with at least one photon, jets and missing transverse momentum
48	<b>Vrinda Narayanan P.</b> 20173562	Physics	Atikur Rahman	Study of optoelectronic properties of two-dimensional materials and mixed dimensional heterostructures through dielectric engineering
49	<b>Navita</b> 20173564	Physics	Surjeet Singh	New and innovative approaches for enhancing the repeatability and thermoelectric performance of $Ag_2X$ ( $X = S, Se, \text{ and } Te$ ) and $SnTe$
50	<b>Kanitkar Tejashree Rajaram</b> 20173568	Biology	M.S. Madhusudhan	Role of local environments in stabilizing protein structures
51	<b>Arjun K.M.</b> 20173569	Biology	Pranay Goel	Modeling GSH metabolism in diabetes to study the role of redox status in anti-diabetic treatment
52	<b>Md. Javed Hossain</b> 20183573	Chemistry	Shabana Khan	Utilization of $Ce[N(SiMe_3)_2]_3$ as a catalyst for the hydroboration of organic substrates: scope and mechanistic aspect
53	<b>Pandey Akanksha Mahendra Kumar Asha</b> 20183576	Chemistry	Boopathy Gnanaprakasam	Studies on sustainable oxidation, azidation, rearrangement, and annulation reactions towards heterocyclic scaffolds under batch and continuous flow
54	<b>Nirmala Mohanta</b> 20183579	Chemistry	Boopathy Gnanaprakasam	Sustainable approach towards the functionalization of carbonyl derivatives: alkylation, rearrangement and lactonization
55	<b>Anindita Bhowmick</b> 20183590	Chemistry	Ramakrishna G. Bhat	Different mechanistic aspects of photoredox catalysis and its application in organic transformations

Sr. No.	Student	Department	Advisor	Thesis Title
56	<b>Shaikh Moseen Ayyub</b> 20183591	Chemistry	Boopathy Gnanaprakasam	Domino C-H functionalisation of oxindole, indole, phenol and fluorene & its application towards cyclopropanation
57	<b>Ubale Akash Shahu</b> 20183594	Chemistry	Boopathy Gnanaprakasam	Studies on peroxidation and rearrangement reactions toward the synthesis of heterocyclic scaffolds under batch/continuous flow
58	<b>Pooja Sindhu</b> 20183595	Chemistry	Nirmalya Ballav	Heterostructured thin films of coordination polymers: Study on growth and electrical conductance
59	<b>Kameshwar Prasad</b> 20183601	Chemistry	Srinivas Hotha	Synthesis of MTX-Capped octasaccharide & metal-free activation of carbonate donor
60	<b>Habibul Arfin</b> 20183604	Chemistry	Angshuman Nag	Doping ns <sup>2</sup> -Ions and lanthanide ions in metal halide perovskites: Visible to short-wave infrared emission
61	<b>Pallavee Aditya Gokhale</b> 20183610	Humanities and Social Sciences	Pushkar Sohoni	Signs of Harappan culture: Contextual narratives of excavated artefacts
62	<b>Jewel Mahajan</b> 20183614	Mathematics	Kaneenika Sinha	The second moment of a certain pair correlation function for Sato-Tate sequences
63	<b>Dighe Pavankumar Ramesh</b> 20183615	Mathematics	Vivek Mohan Mallick	Exploring equivariant chow groups for complexity one T-Varieties via downgrading techniques
64	<b>Jishu Das</b> 20183617	Mathematics	Baskar Balasubramanyam	Discrepancy results for modular forms
65	<b>Mitesh Chandrakant Modasiya</b> 20183618	Mathematics	Anup Biswas	Regularity theory of integro-differential operators and its application
66	<b>Abhishek Anand</b> 20183620	Physics	Sreejith G.J.	Models and methods extending the composite fermion theory
67	<b>Abhishek Kumar Mehta</b> 20183621	Physics	Sachin Jain	Quantum field theory at strong coupling
68	<b>Anju P.S.</b> 20213132	Biology	Kalika Prasad	Molecular mechanisms controlling innate responses to injuries in plants
69	<b>Vijina V.P.</b> 20213133	Biology	Kalika Prasad	Molecular genetic regulation of de novo assembly of shoot meristem in <i>Arabidopsis</i>
70	<b>Biswas Anushua Biswabrota</b> 20213301	Data Science	Leelavati Narlikar	Mixture modelling to characterize diversity in DNA regions

# INTEGRATED PhD PROGRAMME

The Integrated PhD programme offers students with a bachelor's degree in science a head-start in identifying an area of research leading to a PhD. Offered in the departments of Biology, Chemistry, Mathematics, and Physics, the programme begins with 1.5-2 years of coursework followed by research. Admission is through national-level tests followed by interviews conducted separately for each department.

Integrated PhD student numbers across departments as on March 31, 2024

TOTAL: 166



**67**

BIOLOGY



**37**

CHEMISTRY



**13**

MATHEMATICS



**49**

PHYSICS



During the August 2023 session, 19 (Men 13, Women 6) students took admission to the post-BSc Integrated PhD programme: 9 (Men 4, Women 5) in Biology, and 10 (Men 9, Women 1) in Physics.

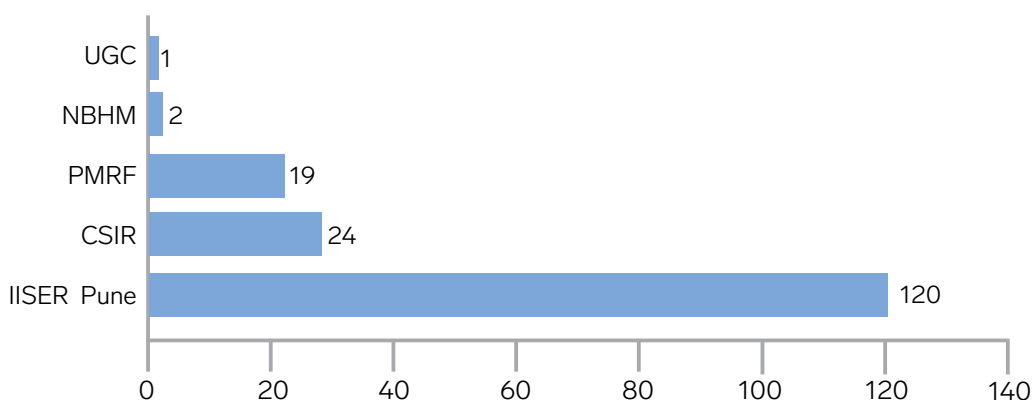
The strength of Integrated PhD students as of March 31, 2024 is 166 (Men 106, Women 60). Here is the break-up of the numbers across departments: 67 (Men 28, Women 39) students in Biology; 37 (Men 28, Women 9) in Chemistry; 13 (Men 11, Women 2) in Mathematics; and 49 (Men 39, Women 10) in Physics.

#### Category-wise Numbers of Integrated PhD Students (as on March 31, 2024)

Gender	GE	OBC	SC	ST	EWS	Total
Men	83	16	5	0	2	106
Women	53	6	0	0	1	60
<b>Total</b>	<b>136</b>	<b>22</b>	<b>5</b>	<b>0</b>	<b>3</b>	<b>166</b>

#### SOURCES OF FELLOWSHIPS FOR INTEGRATED PhD STUDENTS

All Integrated PhD students are provided with fellowships, subject to fulfilling the prescribed academic criteria.



One Integrated PhD student received the Prime Minister's Research Fellowship (PMRF) during the August 2023 cycle: Eishica Chand (Physics)

A total of 22 Integrated PhD students received one or more travel grants for participating in international conferences. The funding agencies that the students secured travel awards from include CSIR, SERB, EMBO, and DBT-CTEP. In some cases, the travel was supported through the students' PMRF Fellowship or by the host organisation.

**In the 10th Convocation held on May 31, 2023, 25 Integrated PhD students were awarded dual Master's and PhD degrees and 14 students received MS degree.**

**The following 29 students have successfully completed their requirements for the award of MS and PhD degrees through the Integrated PhD programme** (completed thesis defense between April 1, 2023 and March 31, 2024). Of these, 5 students have received their degrees as well in the 10th Convocation held on May 31, 2023.

Sr. No.	Student	Department	Advisor	Thesis Title
1	<b>Malankar Nilam Namdeo Namita</b> 20142002	Biology	Anjan K. Banerjee	Investigating the functions of small non-coding RNAs in stolon-to-tuber transition stages of potato development
2	<b>Shikha Kalra</b> 20142005	Biology	Raghav Rajan	Understanding the origin and function of introductory vocalizations before male zebra finch song
3	<b>Yashaswi Singh</b> 20142006	Biology	Jeet Kalia	Dissecting the roles of toxin bivalency, membrane affinity, and stoichiometry in DkTx-activation of TRPV1
4	<b>Projwal Kanti Kanjilal</b> 20142026	Physics	Arijit Bhattacharyay	Investigation of ground states of spin-1 Bose-Einstein condensate in a harmonic trap
5	<b>Aparna Thulasidharan</b> 20152002	Biology	Girish Ratnaparkhi	Age-dependent VAP (P58S) aggregation in a <i>Drosophila</i> model of amyotrophic lateral sclerosis
6	<b>Mrinmayee Anant Nilima Bapat</b> 20152005	Biology	Gayathri Pananghat	Characterisation of Spiroplasma citri fibril: Insight into the polymerization interface and interaction with other cytoskeletal proteins
7	<b>Avisikta Upadhyay</b> 20152022	Chemistry	Pinaki Talukdar	Design and fabrication of small molecule-based supramolecular systems for the selective transmembrane transport of ions
8	<b>Meghamala Sarkar</b> 20152023	Chemistry	R. Boomi Shankar	Design, synthesis, and host-guest properties of neutral Pd(II) coordination cages supported by Imido-P(V) anions
9	<b>Rinku</b> 20152026	Chemistry	R. Vaidhyanathan	Redox-active 2D covalent organic frameworks for energy storage and proton conduction
10	<b>Soumodip Sur</b> 20152029	Chemistry	M. Musthafa O.T.	Aqueous OH <sup>-</sup> /H <sup>+</sup> Dual-ion gradient energy assisted electrochemical energy storage and conversion devices
11	<b>Unmesh Mondal</b> 20152031	Chemistry	Prasenjit Ghosh	Nuclear quantum effects in hydrogen-bonded systems: A path integral molecular dynamics study
12	<b>Debesh Bhattacharjee</b> 20152036	Physics	Prasad Subramanian	Characterizing magnetic clouds associated with solar coronal mass ejections through in situ observations
13	<b>Surya Pratap S. Deopa</b> 20152043	Physics	Shivprasad Patil	Viscoelasticity of a single folded protein
14	<b>Gauri Binayak</b> 20162002	Biology	Sagar Pandit	Host specialization: chemical ecology of a plant-insect herbivore system
15	<b>Himani Khurana</b> 20162003	Biology	Thomas Pucadyil	A novel membrane anchor in the PH-domain is indispensable for dynamin functions
16	<b>Kaveri Vaidya</b> 20162004	Biology	Siddhesh Kamat	Biochemical characterisation of ABHD14B: A novel Lysine deacetylase

Sr. No.	Student	Department	Advisor	Thesis Title
17	<b>Krishnendu Roy</b> 20162005	Biology	Thomas Pucadyil	Regulation of mitochondrial quality control by membrane fission
18	<b>Manish Kumar</b> 20162006	Biology	Sagar Pandit	Molecular and chemical ecology of eggplant-insect herbivore interaction
19	<b>Rituparna Ghosh</b> 20162008	Biology	Sagar Pandit	Plant-insect interaction beyond folivory: chemical ecology of a non-folivore herbivore <i>Leucinodes orbonalis</i> 's interaction with its host <i>Solanum melongena</i>
20	<b>Soumya Bhattacharyya</b> 20162011	Biology	Thomas Pucadyil	Membrane tubulation coupled with fission by a minimal two-component module
21	<b>Sukanya Chakraborty</b> 20162012	Biology	Gayathri Pananghat	Understanding the mechanism of regulation of a small Ras-like GTPase, MglA, driving <i>Myxococcus xanthus</i> motility
22	<b>Vani Pande</b> 20162013	Biology	Gayathri Pananghat	Nucleotide dependence in polymerization and membrane remodelling by the bacterial actin MreB5 from <i>Spiroplasma citri</i>
23	<b>Indra Narayan Chakraborty</b> 20162015	Chemistry	Pramod P. Pillai	Light-to-chemical energy conversion with surface engineered quantum dots
24	<b>Debanjan Mahato</b> 20162020	Chemistry	Sujit K. Ghosh	Functionality tailored porous materials toward detection and sequestration of toxic pollutants
25	<b>Suman Manna</b> 20162021	Chemistry	Harinath Chakrapani	Enhancing cellular persulfides through artificial substrate of 3-mercaptopyruvate sulfurtansferase (3-MST)
26	<b>Abhishek Mondal</b> 20162022	Chemistry	Pinaki Talukdar	Development of artificial anion transport systems and evaluation of their biological activity
27	<b>Saikat Pahan</b> 20162023	Chemistry	H.N. Gopi	Design, construction and conformational analysis of gamma-peptide double helices
28	<b>Ateek Shah</b> 20162025	Chemistry	Amrita B. Hazra	An enzyme engineering approach to the biosynthesis and utilization of FAD nucleobase analogues
29	<b>Debarshi Mitra</b> 20162033	Physics	Apratim Chatterji	Theoretical models of emergent structure and organization of (bio-) polymeric systems



The following 9 students admitted through the Integrated PhD programme have successfully completed their requirements for the award of MS degree between April 1, 2023 to March 31, 2024. Of these, 8 students have received their degrees as well in the 10th Convocation held on May 31, 2023.

Sr. No.	Student	Department	Advisor	Project Title
1	<b>Dhrubojyoti Patra</b> 20192012	Biology	Deepak Barua	Variation in seed size and its relationship to other functional traits in a seasonally dry tropical forest
2	<b>Shree Hari Mittal</b> 20192031	Physics	Susmita Adhikari	Splashback radius of groups and galaxies
3	<b>Kushan Lahiri</b> 20202001	Biology	Deepa Agashe, NCBS, Bengaluru	Impact of mutation rate and bias on bacterial adaptation in fluctuating environments
4	<b>Sagar Malik</b> 20202012	Physics	Vijayakumar Chikkadi & Apratim Chatterji	Universal strain correlations in amorphous solids
5	<b>Rupesh Kumar</b> 20202015	Physics	Surjeet Singh	Investigation of thermoelectric properties of ruthantes pyrochlore and a new Si-based high entropy pyrochlore
6	<b>Ajay Agarwal</b> 20202019	Physics	M.S. Santhanam	Extreme events and congestion on urban street networks
7	<b>Tushar Arora</b> 20202022	Mathematics	Aniruddha Pant, AlgoAnalytics, Pune	Comparison of different types of volatility models for NIFTY 50 index
8	<b>Rajat</b> 20202023	Mathematics	Venkateswaran P. Krishnan, TIFR-Centre for Applicable Mathematics, Bengaluru	Star block polycaprolactone biodegradable unimolecular micelles for drug delivery
9	<b>Bittu Kumar</b> 20202027	Mathematics	Aparna Mehra, IIT Delhi	Inverse and stochastic DEA: Models and applications

# MSc PROGRAMME

MSc student numbers  
across departments  
as on March 31, 2024

TOTAL: 45



**24**

CHEMISTRY



**11**

EARTH AND  
CLIMATE SCIENCE



**10**

MATHEMATICS

A new two-year Master of Science (MSc) programme was launched in the 2022-2023 academic year. Aimed at highly motivated students with a bachelor's degree in any branch of science, the Master of Science programme has an increased emphasis on course-work with research experience gained through short semester credit projects, summer training and a major research project in the second year.



As of the 2023-24 Academic Year, Masters' programmes are being offered in Chemistry, Geology, and Mathematics by the Departments of Chemistry, Earth and Climate Science, and Mathematics, respectively

During the August 2023 session, 19 (Men 11, Women 8) students took admission to the Master of Science programme. This included 10 (Men 5, Women 5) in Chemistry; 5 (Men 3, Women 2) in Earth and Climate Science; and 4 (Men 3, Women 1) in Mathematics.

#### Category-wise Distribution of Masters' Students Enrolled in 2023

Gender	EWS	GE	KM	OBC	PD	SC	ST	Total
Men	0	5	0	0	0	6	0	11
Women	0	3	0	1	0	1	3	8
<b>Total</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>7</b>	<b>3</b>	<b>19</b>

Subsequent to admission, 2 students discontinued from the programme, as they got admission in other courses, making the final number of students enrolled in the 2023-24 academic year to 17.

The strength of MSc students as of March 31, 2024 is 45 (Men 27, Women 18). Here is the break-up of the numbers across departments: 24 (Men 12, Women 12) in Chemistry; 11 (Men 9, Women 2) in Earth and Climate Science; and 10 (Men 6, Women 4) in Mathematics.

Three of the Masters' students are receiving INSPIRE fellowship and one student is receiving NBHM Fellowship.

#### Overall Category-wise Distribution of Existing Masters' Students (as of March 31, 2024)

Gender	EWS	GE	KM	OBC	PD	SC	ST	Total
Men	1	12	0	5	0	9	0	27
Women	0	9	0	4	0	3	2	18
<b>Total</b>	<b>1</b>	<b>21</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>12</b>	<b>2</b>	<b>45</b>

#### Details of the projects carried out by the outgoing batch of Master of Science students during 2023-24

Sr. No.	Student	Advisor	Project Title
<b>CHEMISTRY DEPARTMENT</b>			
<i>MSc in Chemistry; project carried out across both the semesters of the second year</i>			
1	<b>Archita Barma</b> 20226201	Boopathy Gnanaprakasam	Copper-catalyzed cross-coupling reaction between peroxy-benzofuran-2-ones and Phenol derivatives for the synthesis of 3-aryl-3-phenyl-benzofuran-2(3H)-ones
2	<b>Parth Kalpesh Bhavsar</b> 20226202	Shabana Khan	Synthesis of borocations and their catalytic application in cyanosilylation
3	<b>Abhishek A.P.</b> 20226203	Muhammed Musthafa Ottakam	Electrochemical ammonia production using pyrolyzed cobalt phthalocyanine

Sr. No.	Student	Advisor	Project Title
4	<b>Keerthivason S.</b> 20226204	Hosahudya N. Gopi	Synthesis of peptides with C-terminal Z-γ- lactam via E→Z isomerization
5	<b>Ajit Kumar Sahu</b> 20226205	Ramakrishna G. Bhat	Electrochemically promoted regioselective C3-H trifluoromethylation of 2H-Indazoles
6	<b>Sanchi Luthra</b> 20226206	Manickam Jayakannan	Design and development of biodegradable zwitterionic polymers for drug delivery in cancer
7	<b>Yashasvi Banyla</b> 20226207	Sujit K. Ghosh	Efficient organic iodide and iodine vapour phase capture by viologen-based organic framework
8	<b>Ankan Kundu</b> 20226208	Moumita Majumdar	Stabilization and characterization of Bi(III) compounds with peri-substituted acenaphthene based ligands
9	<b>Aniruddha Shailendra Mahattam</b> 20226209	Nirmalya Ballav	Iodine-induced enhancement in electrical conductivity of electro-deposited thin film of copper-carboxylate MOF
10	<b>Vartika Jaiswal</b> 20226210	Sujit K. Ghosh	Highly conjugated imidazoline Porous Organic Polymer (POP) for green photocatalytic degradation of toxic mustard gas
11	<b>Kashish</b> 20226212	Shabana Khan	Application of NHSi and NHGe supported Cu(I) halide complexes as efficient catalysts for A3 and KA2 coupling reaction: Solvent-free approach in a microwave reactor
12	<b>Pavithra Parthiban</b> 20226213	Angshuman Nag	Deciphering the co-formation of layered two-dimensional hybrid CdCl <sub>2</sub> (hexylamine) <sub>2</sub> and CdS nanocrystals
13	<b>Arijit Panja</b> 20226214	Debangsu Sil	Synthesis, characterization, and nitrite reductase activity of Ni(II) complexes
14	<b>Prabhakar Tiwari</b> 20226215	Shabana Khan	Bis-NHC-based Manganese(I) complex catalyzed amide and CO <sub>2</sub> hydroboration
15	<b>Mansi Jain</b> 20226216	Arnab Mukherjee	Effect of surface topography and hydrophobicity on water entropy

#### EARTH AND CLIMATE SCIENCE DEPARTMENT

*MSc in Geology; project carried out across both the semesters of the second year*

1	<b>Sanket Samal</b> 20226401	Gyana Ranjan Tripathy	Geochemistry of Panjal Traps from Zaskar Region: Implications for petrogenesis and geochemical variabilities
2	<b>Paritosh Bhattacharyya</b> 20226402	Durga Prasanna Mohanty (SPPU, Pune)	Paleostress analysis and petrography of Newer Dolerite Dykes from Ghatagaon and surrounding area of North Odisha Singhbhum Craton
3	<b>Raniria Mitra</b> 20226403	Gyana Ranjan Tripathy	Sources and cycling of vanadium in a tropical coastal lagoon system and the Bay of Bengal
4	<b>Gopinatha Nayak</b> 20226404	Durga Prasanna Mohanty (SPPU, Pune)	Structural studies of Quartzo-Feldspathic veins from parts of North-Odisha Singhbhum Craton: Special reference to Paleo-stress Analysis

Sr. No.	Student	Advisor	Project Title
5	<b>Athul Suresh</b> 20226405	Shreyas Managave	Investigating the role of vegetation in controlling chemical weathering
6	<b>Samarpan Mahato</b> 20226406	Gyana Ranjan Tripathy	Major elemental chemistry of geothermal springs from the Deccan traps: Solute sources and chemical fluxes
7	<b>Asish Tanay Behera</b> 20226407	Shreyas Managave	Characterising representative soil types of India based on their major exchangeable cation concentration

### MATHEMATICS DEPARTMENT

MSc in Mathematics; project carried out during the final semester of the programme

1	<b>Saptarshi Dandapat</b> 20226602	Amit Hogadi	Topics in positivity of line bundles
2	<b>Joson Josh Martires Henriques</b> 20226603	Diganta Borah	Topics in Riemann Surfaces
3	<b>Priyanka Dey</b> 20226604	Chandrasheel Bhagwat	Analysis and Arithmetic of p-adic Numbers
4	<b>Sakshi Manmode</b> 20226605	Rama Mishra	An expository report on the paper "From Goeritz matrices to quasi alternating links" by Józef H. Przytycki
5	<b>Sutirtha Datta</b> 20226606	Steven Spallone	An excursion in Chern groups



# BS-MS PROGRAMME

Fifth-year projects by the outgoing batch of BS-MS students during 2023-24

TOTAL: 195



**74**

BIOLOGY



**21**

CHEMISTRY



**6**

DATA SCIENCE



**8**

EARTH AND  
CLIMATE SCIENCE



**3**

HUMANITIES AND  
SOCIAL SCIENCES



**1**

INTER-  
DISCIPLINARY



**22**

MATHEMATICS



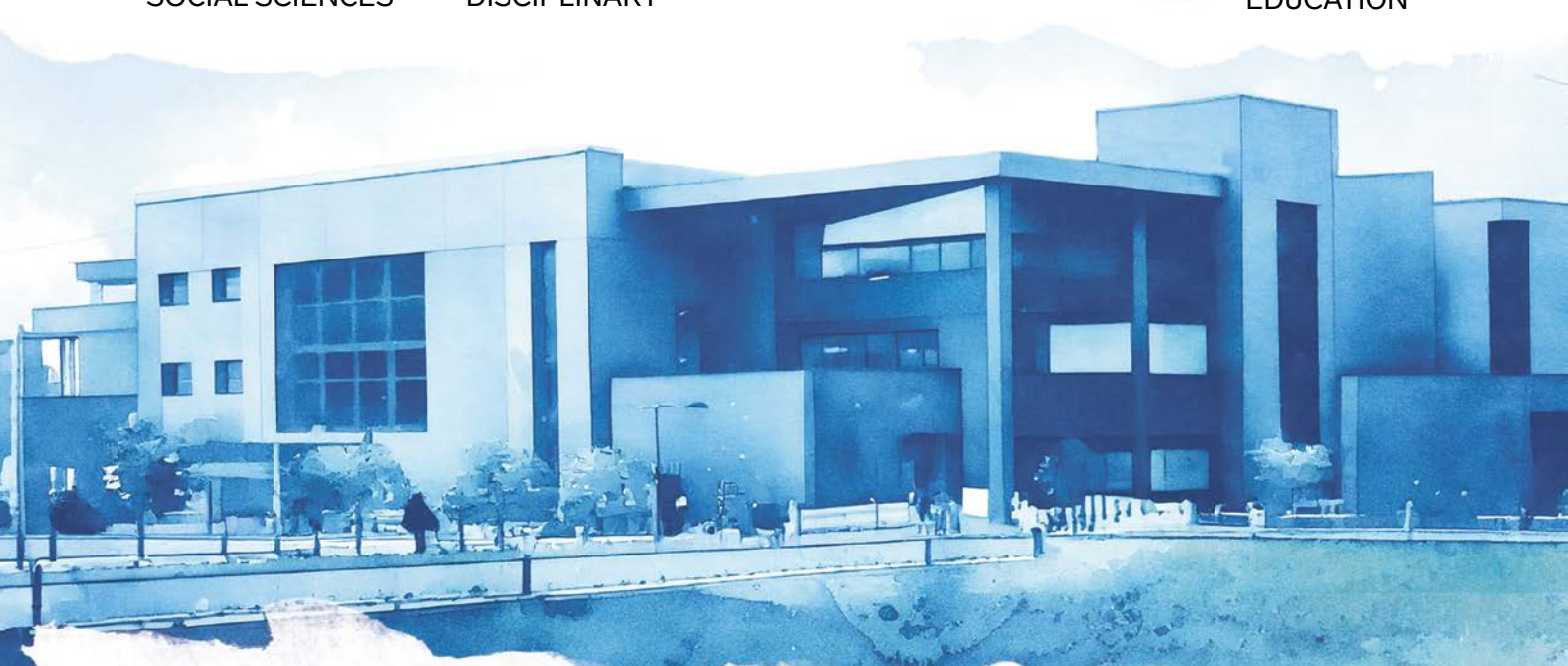
**58**

PHYSICS



**2**

SCIENCE  
EDUCATION



The 5-year BS-MS programme gives students a well-rounded exposure to all areas of science by combining undergraduate-level teaching with research. Basic training in Biology, Chemistry, Data Science, Earth and Climate Science, Humanities and Social Sciences, Mathematics, and Physics is imparted in the first two years. In the next two years, students can choose courses offered by one or more departments according to their liking and future career perspective. The fifth year is allocated to a research project or an internship, leading to a thesis.

FIFTH-YEAR PROJECTS  
AS PER HOST ORGANISATION

**76**  
IISER PUNE

**79**  
NATIONAL

**40**  
INTERNATIONAL

The academic year 2023-24 saw 250 students (178 boys and 72 girls) taking admission to the BS-MS programme. Of these, 207 were admitted through the state and central boards' stream, via the IISER Aptitude Test; 36 through the IIT-JEE stream; and 7 through the KVPY stream.

#### Category-wise Distribution of Students Enrolled in 2023

Gender	GE	OBC	SC	ST	EWS	KM	PD	Total
Girls	41	13	8	5	2	1	2	72
Boys	67	46	28	11	18	1	7	178
<b>Total</b>	<b>108</b>	<b>59</b>	<b>36</b>	<b>16</b>	<b>20</b>	<b>2</b>	<b>9</b>	<b>250</b>

#### Overall Category-wise Distribution of Existing BS-MS Students (as of March 31, 2024)

Gender	GE	OBC	SC	ST	EWS	KM	PD	Total
Girls	127	94	53	30	15	3	13	335
Boys	380	197	98	38	76	4	21	814
<b>Total</b>	<b>507</b>	<b>291</b>	<b>151</b>	<b>68</b>	<b>91</b>	<b>7</b>	<b>34</b>	<b>1149</b>

#### Total BS-MS Student Strength During 2023-24

*Shown as per enrolment year of students*

Batch	2017	2018	2019	2020	2021	2022	2023	Total
Girls	0	1	40	86	69	68	71	335
Boys	3	16	149	169	157	144	176	814
<b>Total</b>	<b>3</b>	<b>17</b>	<b>189</b>	<b>255</b>	<b>226</b>	<b>212</b>	<b>247</b>	<b>1149</b>

Subsequent to admission of the 2023-24 batch, 3 students discontinued from the programme, as they got admission in other courses, making the final number of students enrolled in 2023 from 250 to 247. In addition, from the previous batches, 6 students opted to discontinue the programme.

From the 2023 batch, 70 students were found eligible for receiving DST-INSPIRE scholarship and 12 students qualified for KVPY scholarship.

**The total number of BS-MS students receiving DST-INSPIRE and KVPY scholarships is as follows:**

DST-INSPIRE = 261, KVPY = 207

## Details of the fifth-year projects carried out by the outgoing batch of BS-MS students during 2023-24

Sr. No.	Student	Supervisor	Project Title
 <b>BIOLOGY</b>			
1	<b>Kiratkar Pallavi Nana</b> 20171063	Saif Nalband, Thapar Institute of Engineering and Technology Deemed University, Patiala	A comparative study of machine learning algorithms for leishmanial activity prediction based on molecular fingerprints
2	<b>Ruchitha B.G.</b> 20181005	Sudipta Tung, Ashoka University, Sonipat	The role of developmental and adult diets in modulating reproductive senescence: Insights from <i>Drosophila melanogaster</i>
3	<b>Swastik Sobhan Padhy</b> 20181014	Deepa Agashe, National Centre for Biological Sciences, Bengaluru	Effects of mutation rate and bias on bacterial adaptive dynamics
4	<b>Akhil Javad</b> 20181049	Emanuel Gloor, University of Leeds, U.K.	Leaf temperatures and physiological vulnerability of a tropical forest in Western Ghats
5	<b>Kunjai Parnami</b> 20181050	Sumanta Bagchi, Indian Institute of Science, Bengaluru	Sensitivity of vegetation in India to climatic factors at multiple timescales
6	<b>Vikram Iyer</b> 20181065	Devapriya Chattopadhyay, IISER Pune	Biogeographic patterns in the Indian Ocean and their drivers
7	<b>Siddhartha Naik Mudavath</b> 20181109	Anindita Bhadra, IISER Kolkata	Indian free-ranging dogs ( <i>Canis lupus familiaris</i> ): A longitudinal census and the long term effects of sterilization on their time activity budget
8	<b>Nirav Nitin Saharey</b> 20181130	Krishanpal Karmodiya, IISER Pune	Developing a rapid, sensitive and accurate Malaria detection scheme using Reverse Transcription Loop Mediated Isothermal Amplification coupled CRISPR-Cas module
9	<b>Manas Mahaveer</b> 20181145	Saikrishnan Kayarat, IISER Pune	Attempts towards site-directed mutation of an endonuclease gene and insertion of a gene in a bacteriophage genome
10	<b>Shrutika Lokapure</b> 20181153	Gaurav Das, National Centre for Cell Science, Pune	Understanding the role of proteins and carbohydrates in driving the feeding behavior of <i>Drosophila melanogaster</i>
11	<b>Mupade Shwetang Rajendra</b> 20181161	Saif Nalband, Thapar Institute of Engineering and Technology Deemed University, Patiala	Study of cancer drug resistance: insights from differentially expressed genes and computational approaches
12	<b>Misaal Bedi</b> 20181185	Attila Becskei, University of Basel, Switzerland	Investigating the influence of codon composition and configuration on mRNA stability in <i>Saccharomyces cerevisiae</i>
13	<b>Shikhar Kumar</b> 20181211	Rajlakshmi Vishwanathan, ICMR-National Institute of Virology, Pune	Characterization of aerobic gram-negative gut microflora of mother-baby pairs in normal and caesarean section deliveries



Sr. No.	Student	Supervisor	Project Title
14	<b>Krishna Samkaran Girish</b> 20191004	Serguei Saavedra, Massachusetts Institute of Technology, U.S.A.	Assessing the sensitivity of microbial communities to external perturbations
15	<b>Amisha Devan</b> 20191006	Linheng Li, Stowers Institute for Medical Research, U.S.A.	Investigating the potential role of Protocadherin-7 in determining the fate of long-term hematopoietic stem cells
16	<b>Divyansh Gupta</b> 20191007	Adrienne Fairhall, University of Washington, U.S.A.	Network modeling and behavioral characterization of hydra contraction dynamics
17	<b>Ranade Amogh Vinay</b> 20191009	Sudha Kumari, Indian Institute of Science, Bengaluru	Tracking cytotoxic T-cell degranulation in diverse cholesterol conditions
18	<b>Pratham Shivhare</b> 20191012	Kalika Prasad, IISER Pune	Investigating the interplay of auxin signalling and PLETHORA 7 during de novo root regeneration
19	<b>Pritam Pathak</b> 20191017	Ariel A. Bazzini, Stowers Institute for Medical Research, U.S.A.	Characterisation of translated downstream open reading frames in human cells
20	<b>Yadav Sumit Surenderkumar</b> 20191025	Kartik Shanker, Indian Institute of Science, Bengaluru	In the jaws of pollution: quantifying micro-plastic and heavy metal burden in commercial sharks in the Andaman Islands
21	<b>Shreelekha B.S.</b> 20191032	Pragathi Priyadharsini Balasubramani, IIT Kanpur	Designing a spatial navigation paradigm for analysing the effect of mental overload on mild cognitive impairment in Alzheimer patients
22	<b>Maria Kondooparambil Sabu</b> 20191033	Dipshika Chakravorty, Indian Institute of Science, Bengaluru	PD-L1 in <i>Salmonella</i> pathogenesis- An effector-mediated response
23	<b>Subramanya Gond</b> 20191035	Kalika Prasad, IISER Pune	Investigating the potential interactors during PLT7-driven DNRR
24	<b>Talele Ritvee Rajendra</b> 20191036	Matt Gibson, Stowers Institute for Medical Research, U.S.A.	Understanding the role of paraxis in <i>Nematostella</i> <i>vectensis</i> segmentation
25	<b>Aaryan</b> 20191043	Sureshkumar Balasubramanian, Monash University, Australia	Genomic determinants of tissue-specific splicing in the human genome
26	<b>Neel Ajay Shah</b> 20191045	Raphael Mercier, Max Planck Institute for Plant Breeding Research (MIPZ), Germany	Mechanism of crossover patterning
27	<b>S.S. Dhanush</b> 20191048	Jahnvi Joshi, Laboratory for the Conservation of Endangered Species (LaCONES), Hyderabad	Comparative phylogeography of select scolopendrids from Western Ghats
28	<b>Shankar Krishna V.R.</b> 20191052	Mahipal Ganji, Indian Institute of Science, Bengaluru	A dynamic single molecule approach to study negative supercoiling induced G-quadruplex formation in B-DNA

Sr. No.	Student	Supervisor	Project Title
29	<b>Vasudha T. Kulkarni</b> 20191057	Judith M. Burkart, University of Zurich, Switzerland	Automated tracking of behavioural synchrony in cooperating marmosets
30	<b>Sanjana Vasanth</b> 20191058	Bruno Lemaitre, École Polytechnique Fédérale de Lausanne, Switzerland	Three clustered serine proteases, hayan, persephone and skanda, regulate toll pathway-mediated immunity in <i>Drosophila</i>
31	<b>Vachan S.J.</b> 20191059	Jai Polepalli, National University of Singapore, Singapore	Cerebellin-4 (Cbln-4) signalling mediating memory-guided behaviours
32	<b>Manali Upadhyaya</b> 20191061	Raghav Rajan, IISER Pune	Context-dependent changes in pre-bout activity in adult male Zebra Finch HVC
33	<b>Jason Joby</b> 20191062	S.P. Arun, Indian Institute of Science, Bengaluru	Neural correlates of sleep, and game-playing in bonnet macaques
34	<b>Mahima Gautam</b> 20191064	Rishikesh Narayanan, Indian Institute of Science, Bengaluru	Role of electrical synapses in multidimensional population activity of golgi cell network in cerebellar cortex
35	<b>Atharva Sanjay Bhingare</b> 20191066	Richa Rikhy, IISER Pune	Elucidation of the role of inner mitochondrial membrane organization in <i>Drosophila</i> neural stem cell differentiation
36	<b>Gavali Tushar Chandrakant</b> 20191068	Sagar Pandit, IISER Pune	Deciphering eggplant's response to the eggplant shoot and fruit borer's frugivory
37	<b>Vidushi Sharma</b> 20191072	Raghav Rajan, IISER Pune	Role of LMAN in introductory notes learning in the male zebra finch
38	<b>Darshini Mohan Poola</b> 20191075	Seth Shipman, Gladstone Institute of Data Science and Biotechnology, San Francisco, U.S.A.	Using retron recombineering for efficient and targeted bacteriophage genome modification
39	<b>Kritika Kumari</b> 20191077	Mukund Thattai, National Centre for Biological Sciences, Bengaluru	Exploring the emergence of complexity in vesicle traffic networks through molecular and topological constraints
40	<b>Ashli Jain</b> 20191082	Raghu Padinjat, National Centre for Biological Sciences, Bengaluru	Functional assessment of single nucleotide polymorphisms in Nir2 in the context of neurodegeneration
41	<b>Hate Vidisha Prashant</b> 20191089	Raman Sukumar, Indian Institute of Science, Bengaluru	Understanding the behaviour of male Asian Elephants ( <i>Elephas maximus</i> ) in a human-dominated landscape
42	<b>Abir Dutta</b> 20191092	Raghav Rajan, IISER Pune	Neural activity during introductory vocalisations in zebra finches
43	<b>Bapat Vibha Ajit</b> 20191096	Elizabeth Gould, Princeton Neuroscience Institute, Princeton University, U.S.A.	Investigating mechanisms underlying differential effects of early life adversity on maternal care, neuronal activation, and social behavior in mice
44	<b>Anand C. Krishnan</b> 20191097	Raghav Rajan, IISER Pune	Effect of LMAN on learning of introductory vocalizations produced before the song by male zebra finch

Sr. No.	Student	Supervisor	Project Title
45	<b>Fajar P.M.</b> 20191106	Veena S. Patil, National Institute of Immunology, New Delhi	Identification of differentially expressed lncRNAs in CD4+ T cell memory compartments
46	<b>P.S. Sivaprasad</b> 20191112	Saikrishnan Kayarat, IISER Pune	Biochemical studies of SARS-CoV-2 RTC
47	<b>Shweta Garg</b> 20191113	Richa Rikhy, IISER Pune	Elucidation of the role of peroxisome homeostasis in <i>Drosophila</i> embryogenesis
48	<b>Shaikh Arsh Yusuf</b> 20191115	Shaon Chakrabarti, National Centre for Biological Sciences, Bengaluru	Investigating the emergence of circadian clock-mediated therapeutic windows in the cell cycle of cancer cells
49	<b>Aditya Prasad Pujari</b> 20191117	Gwyneth Card, Columbia Zuckerman Institute, U.S.A.	<i>Drosophila</i> escape behaviours in spatially complex environments
50	<b>Swayam Prakash Singh</b> 20191122	Thomas Pucadyil, IISER Pune	A proximity-based labelling approach to analyse lipid binding in proteins
51	<b>Butle Amish Ashok</b> 20191125	Kalika Prasad, IISER Pune	Probing the role of Reactive Oxygen Species (ROS) in the plant regeneration
52	<b>Shivani Verma</b> 20191127	Sufyan Ashhad, National Centre for Biological Sciences, Bengaluru	Biophysical modeling of preBötzing complex Type-1 neuron
53	<b>Sudeepta Sarkar</b> 20191130	Vatsala Thirumalai, National Centre for Biological Sciences, Bengaluru	Characterisation of cerebellar efferents in larval zebrafish
54	<b>Sreedev H.</b> 20191133	Siddhesh Kamat, IISER Pune	Identifying the protein interactors of cholesterol in phagosomes
55	<b>Gangasagare Shruti Pandurang</b> 20191140	Sanjay Sane, National Centre for Biological Sciences, Bengaluru	Regulation of soil moisture by mound-building termites ( <i>Odontotermes obesus</i> )
56	<b>Harshita Rani Patnaik</b> 20191143	M.S. Madhusudhan, IISER Pune	Small molecule-protein interaction by binding site similarity
57	<b>Raghunandan D.R.</b> 20191145	Srimonta Gayen, Indian Institute of Science, Bengaluru	Investigating the role of CIZ1 in the maintenance of imprinted X-inactivation
58	<b>Asmita Bag</b> 20191146	Corinne Grey, Institute of Human Genetics, Montpellier, France	Understanding the dynamics of PRDM9-dependent and independent meiotic recombination hotspots at the single cell level
59	<b>Akshata Kotwal</b> 20191167	Bruno Lemaitre, École Polytechnique Fédérale de Lausanne, Switzerland	Functional characterization in the immunity of DNase II in <i>Drosophila melanogaster</i>
60	<b>Netra Pegu</b> 20191168	Pralay Majumder, Presidency University, Kolkata	Synergistic regulation of border cell migration by singed and Arp2/3 complex in <i>Drosophila</i> : Insights into F-Actin dynamics

Sr. No.	Student	Supervisor	Project Title
61	<b>Likhith Chandragiri</b> 20191173	Satyajit Mayor, National Centre for Biological Sciences, Bengaluru	Setting up an in vitro reconstitution system to study actomyosin-driven membrane organisation
62	<b>Sherkhane Tushar Manik</b> 20191180	Nagaraj Balasubramanian, IISER Pune	Understanding extracellular matrix stiffness dependent regulation of Golgi organisation and function in anchorage-independent breast cancer cells
63	<b>Infas Raheem P.</b> 20191182	Sunish Radhakrishnan, IISER Pune	Designing genetically encoded probes to quantify nucleotide cofactors during the cell cycle in <i>Caulobacter crescentus</i>
64	<b>Abhilash V.A.</b> 20191189	Anniina Färkkilä, University of Helsinki, Finland	Evaluation of immune cell-specific functional response following single or combinatorial treatment with DNA damaging and immunotherapy agents using patient-derived immunocompetent cultures of high grade serous ovarian cancer
65	<b>Vikas Kumar</b> 20191192	C Ron Yu, Stowers Institute for Medical Research, U.S.A.	Enhancement of relevant information through bottom up bias is facilitated by tyrosine hydroxylase in the glomeruli layer
66	<b>Deolankar Soham Vishwas</b> 20191196	Linda Kenny, University of Texas Medical Branch, Galveston, U.S.A.	Characterisation of <i>Salmonella enterica</i> serovar <i>typhi</i> lifestyle in human like macrophages
67	<b>Patil Shruti Arun</b> 20191197	Siva Sankari, Stowers Institute for Medical Research, U.S.A.	Identification and characterization of genes responsible for the resistance of gram-negative bacteria towards nodule-specific cysteine rich peptides
68	<b>Katkar Chaitanya Anand</b> 20191198	Siddhesh Kamat, IISER Pune	Identification of protein interactors of cholesteryl esters
69	<b>Sudhanshu Kumar</b> 20191199	Jahnvi Joshi, CSIR-Centre for Cellular & Molecular Biology, Hyderabad	Climatic niche divergence in allopatry shapes the speciation among select Scolopendrid centipedes in Peninsular India
70	<b>Suyog Zinjurte</b> 20191200	Radha Chauhan, National Centre for Cell Science, Pune	To unravel the interaction between Nup155 and Nup93 via structural studies
71	<b>Aditi Singh</b> 20191216	Anand Jeyasekharan, National University of Singapore, Singapore	Characterising the cell-surface proteins in ARID1A-deficient gastric cancer
72	<b>Nived A.P.</b> 20191217	Aurnab Ghose, IISER Pune	CART in modulating memory and risk-taking behaviours
73	<b>Golatkar Omkar Manojkumar</b> 20191223	Gayathri Pananghat, IISER Pune	Integrative structural modelling of fission yeast contractile ring and analysis of actin-protein interactions
74	<b>Salima Shiju</b> 20191227	Annapoorni Rangarajan, Indian Institute of Science, Bengaluru	Role of AMPK during early embryonic development of <i>Drosophila</i>

Sr. No.	Student	Supervisor	Project Title
 <b>CHEMISTRY</b>			
1	<b>Lokesh Godavarthi</b> 20181096	Srinivas Hotha, IISER Pune	Synthesis of thiosugars and disaccharides
2	<b>Abhradeep Sarkar</b> 20191003	Rahul Banerjee, IISER Kolkata	A study of the design and stability of one dimensional hydrogen bonded nanotubes
3	<b>Ranojoy Baisya</b> 20191008	Ankona Datta, Tata Institute of Fundamental Research, Mumbai	Development of cell-permeable, water-soluble, peptide-based fluorescent sensors for detection of analytes in a biological system
4	<b>Shayandeep Bhaumik</b> 20191010	Harinath Chakrapani, IISER Pune	Design and synthesis of nitroreductase activated HNO donor
5	<b>Vaishak Bhat</b> 20191018	M. Jayakannan, IISER Pune	Development of fluorophore-tagged biodegradable star polymers
6	<b>Abhijith Hari Menon</b> 20191047	Samir H. Chikkali, CSIR-National Chemical Laboratory, Pune	Castor oil-derived polyoxalates
7	<b>Ronedey Naorem</b> 20191067	Pinaki Talukdar, IISER Pune	Development of H <sub>2</sub> O <sub>2</sub> triggered ion transporters
8	<b>Arjun Jagdish</b> 20191071	Mark Brönstrup, Helmholtz Centre for Infection Research, Germany	Design, synthesis and characterization of artificial siderophores and their conjugates
9	<b>Pratishruti Panda</b> 20191080	Arnab Mukherjee, IISER Pune	Molecular understanding of three-way junction prohead RNA (3WJ-pRNA) stability
10	<b>Daksh K. Telang</b> 20191103	Ravindar Kontham, CSIR-National Chemical Laboratory, Pune	Stereo-selective total synthesis of calofolic acid-A: Vasorelaxant natural products
11	<b>Prathith Bhargav</b> 20191119	Arnab Mukherjee, IISER Pune	Probing structure disrupting mutations in helices through reinforcement learning
12	<b>Anuradha Meena</b> 20191123	Michela Simone, Newcastle CSIRO Energy Centre, Australia	Microwave enhanced water splitting reaction for hydrogen production
13	<b>Namitha Deepak</b> 20191131	Pramod Pillai, IISER Pune	Plasmonic photocatalysis with metal semiconductor hybrid nanostructures
14	<b>Shingote Ajinkya Sundarnath</b> 20191136	Angshuman Nag, IISER Pune	Temperature-dependent structure-property relationship in [(4AMTP)PbBr <sub>2</sub> ] <sub>2</sub> PbBr <sub>4</sub> single crystal
15	<b>Hritwik Haldar</b> 20191151	Moumita Majumdar, IISER Pune	Bis (α-iminopyridine) stabilized dimeric Sb(II) and Bi(II) tetra-cation: Bond lability based reactivity
16	<b>Chauhan Tirth Vijay</b> 20191159	Krishna P. Kaliappan, IIT Bombay, Mumbai	A formal synthesis of (-)-brasilenol

Sr. No.	Student	Supervisor	Project Title
17	<b>Mokal Rhuja Satyendra</b> 20191169	M. Jayakannan, IISER Pune	Poly(L-cysteine) based functional polypeptides
18	<b>Shirodkar Ashutosh Ganpat</b> 20191194	M. Jayakannan, IISER Pune	Polyester-polypeptide hybrid copolymer brushes
19	<b>Kadlas Angela Dilraj</b> 20191202	Pramod Pillai, IISER Pune	Multi-functional Fe <sub>3</sub> O <sub>4</sub> -Au hybrid nanostructures for catalytic studies
20	<b>Yadram Meena</b> 20191207	Pabitra Kumar Nayak, Tata Institute of Fundamental Research, Hyderabad	Synthesis of a novel n-type conducting polymer and its applications for enhanced perovskite stability
21	<b>Kumar Ashutosh</b> 20191220	Abhik Banerjee, Research Institute for Sustainable Energy (RISE), TCG-CREST, Kolkata	Rational design of a low-solvating non-flammable electrolyte for Na-ion/metal battery



## DATA SCIENCE

1	<b>Vinaykumar Daivajna</b> 20171043	Manmeet Singh, Indian Institute of Tropical Meteorology, Pune	Development of continuous spatiotemporal flood masks using deep learning and remote sensing
2	<b>Manohar Shardul Pramod</b> 20181104	Ajinkya Mundankar, Automation Edge, Vyom Labs, Pune	Cell detection in tabular data
3	<b>Vishal Choudhary</b> 20181188	Manmeet Singh, Indian Institute of Tropical Meteorology, Pune	Development of 300-m gridded digital twins of precipitation over Delhi for 1980-2020
4	<b>Garvit Agarwal</b> 20191041	Shailesh Deshpande, Tata Research Development and Design Centre, Pune	Building a deep learning model for atmospheric transport of gases
5	<b>Ankit Kumar Vishwakarma</b> 20191088	Ravindra Chaugule, Renishaw Metrology Systems Limited, Maan	Depth Map preparation and salient object segmentation using focal stack
6	<b>Rakshit Rohan</b> 20191171	Kshitij Jadhav, Koita Centre for Digital Health, IIT Bombay, Mumbai	A novel AI based prognostic approach using histopathology images for Hodgkin Lymphoma



## EARTH AND CLIMATE SCIENCE

1	<b>Aby K. Mathai</b> 20181003	Gnanappazham Lakshmanan, Indian Institute of Space Science and Technology, Kerala	Temporal change detection of mangrove species utilizing Sentinel-2 Satellite data for various study sites in India
2	<b>Parag Hembram</b> 20181007	Raymond Duraiswami, Savitribai Phule Pune University, Pune	Characterisation of 70k Toba Ash from Dahigaon, upland Deccan Traps, India

Sr. No.	Student	Supervisor	Project Title
3	<b>Tonta Varaprasad</b> 20181029	Raymond Duraiswami, Savitribai Phule Pune University, Pune	Glimpses into the petrogenesis of some classical lithotypes from the Fen carbonatite complexes, Norway
4	<b>Amita Prajna Mallik</b> 20181051	Devapriya Chattopadhyay, IISER Pune	Spatio-temporal co-occurrence patterns of marine molluscan taxa and their potential drivers
5	<b>Saksham Rohilla</b> 20181071	Sudipta Sarkar, IISER Pune	Seismic volcanostratigraphy of the Faroe-Shetland Basin
6	<b>Devyani Jambhule</b> 20181152	Adrita Choudhuri, Birbal Sahani Institute of Paleosciences, Lucknow	Morphological variability of stromatolites and their cyclicity: Examples from a proterozoic carbonate platform of Vindhyan Supergroup, India
7	<b>Chahana N.</b> 20181221	Arjun Datta, IISER Pune	Rayleigh wave H/V amplitude ratio inversion for one-dimensional elastic Earth structure
8	<b>Akash Dutta</b> 20191040	Vincent Rossi, Mediterranean Institute of Oceanography, France	How do ocean fronts structure pelagic ecosystems? A multi-sensor analysis in the Mozambique Channel



## HUMANITIES AND SOCIAL SCIENCES

1	<b>Akshay Kumar</b> 20181015	M.T. Ansari, University of Hyderabad, Hyderabad	Murmuring stories: postmodern storytelling and ecological perspectives in S. Hareesh's <i>Moustache</i>
2	<b>Khandekar Pallav Yogesh</b> 20191098	Nikhila H., English and Foreign Languages University, Hyderabad	The power and tragedy of vengeful female ghosts in contemporary Indian cinema
3	<b>Varun</b> 20191190	Bejoy Thomas, IISER Pune	Analyzing synergies and trade-offs within and between sustainable development goals: A global perspective through the lens of human development index



## INTER-DISCIPLINARY

1	<b>Raghav Sharma</b> 20191087	Nir Gov, Weizmann Institute of Science, Israel	Swarming midges as self-propelled particles with long-range interactions
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## MATHEMATICS

1	<b>Siddhesh Sundar</b> 20181037	Indranil Sengupta, North Dakota State University, U.S.A.	Levy processes in finance
2	<b>Arjun Ranganathan</b> 20181043	Matthew Kwan, Institute of Science and Technology, Austria	Inducing graphs, hypergraphs, and tournaments
3	<b>Chebiyyam Subrahmanya Venkataram</b> 20181045	Hanzhe Zhang, Michigan State University, U.S.A.	Bargaining in Game Theory

Sr. No.	Student	Supervisor	Project Title
4	<b>Reetish Padhi</b> 20191005	Ion Victor Gosea, Max Planck Institute for Dynamics of Complex Technical Systems, Germany	Model order reduction of nonlinear dynamical systems
5	<b>Sriram V.</b> 20191014	Anisa Chorwadwala, IISER Pune	Shape optimization problems on polygons
6	<b>Arya S. Narnapatti</b> 20191020	Konstantin Mischaikow, State University of New Jersey	An algorithm to resolve dynamics in outer approximations
7	<b>Aniketh Sivakumar</b> 20191046	A.V. Jayanthan, IIT Madras	Splittings of binomial edge ideals
8	<b>Shah Varun Kaushal</b> 20191051	Amritanshu Prasad, Institute of Mathematical Sciences, Chennai	Enumerating subspaces relative to linear operators
9	<b>Mohire Sanket Sunil</b> 20191070	T.V. Ramanathan, Savitribai Phule Pune University, Pune	Modelling credit risk using survival analysis and bayesian techniques
10	<b>Samarth Pardhi</b> 20191078	Leelavati Narlikar, IISER Pune	Probabilistic unsupervised learning with heterogeneous noisy data
11	<b>Rajeet Ghosh</b> 20191079	Avishek Adhikari, Presidency University, Kolkata	Cryptanalysis on symmetric ciphers in the quantum realm
12	<b>Shubhankar Sahu</b> 20191090	Ankur Sinha, Indian Institute of Management, Ahmedabad	Predictive statistical modelling approaches for events in discrete space and time
13	<b>Abhay Chandran</b> 20191100	Anisa Chorwadwala, IISER Pune	Eliciting altruistic responses by incentivizing strategic choices: Implications for CSR policy-making
14	<b>Musunuri Bhavana</b> 20191102	Anup Biswas, IISER Pune	Nonlocal Ergodic control problem with near-monotone cost
15	<b>Ravish Mehta</b> 20191132	Niels Benedikter, Università degli Studi di Milano, Italy	Hartree Fock theory for the electron gas in the mean field regime
16	<b>Gaurav Kumar</b> 20191155	Anisa Chorwadwala, IISER Pune	Isoperimetric inequalities in the hyperbolic plane
17	<b>Anurakti Gupta</b> 20191156	Abhijit Champanerker, City University of New York	Right-angled volume of alternating links
18	<b>Shruti Suresh Barapatre</b> 20191165	Rama Mishra, IISER Pune	Links, quantum groups and TQFTs
19	<b>T.I. Darsan</b> 20191172	Soumen Maity, IISER Pune	Exact exponential algorithms to solve NP-Hard problems
20	<b>Bhide Atharva Vivek</b> 20191184	Ankur A. Kulkarni, IIT Bombay, Mumbai	Applications of game theory in market microstructure modeling



Sr. No.	Student	Supervisor	Project Title
21	<b>Pathlavath Anitha</b> 20191208	Arnab Kumar Laha, Indian Institute of Management, Ahmedabad	Detecting regime change in finance: a framework with hidden Markov model
22	<b>Tridash Srivastava</b> 20191226	Ludger Overbeck, Justus Liebig University Giessen, Germany	Bayesian inference In Markov Modulated Levy Process



## PHYSICS

1	<b>Parakh Piyush Uttam</b> 20171105	Aparna Deshpande, IISER Pune	Observation of novel charge ordering and study of unique interlayer oxidation in VdW itinerant ferromagnet $\text{Fe}_3\text{GeTe}_2$
2	<b>M. Abinaya</b> 20171108	K.C. Shyama Narendranath, U R Rao Satellite Centre, ISRO Bengaluru	Lunar geochemical characterisation with multiwavelength spectroscopy
3	<b>Gharwade Sumedh Dashrath</b> 20171119	Ashna Bajpai, IISER Pune	Micron-size crystallites of $\text{CrO}_2$ with insulating surface layer
4	<b>Nishanga P.</b> 20181016	Snehal Shekatkar, SPPU, Pune	Resource dependency in complex networks
5	<b>Akshay Shanbhag</b> 20181057	Umakant D. Rapol, IISER Pune	Direct digital synthesis for applications in atom interferometry
6	<b>Ravi Prakash Rao</b> 20181127	Atikur Rahman, IISER Pune	From pixels to nanometers: integrating machine learning and mechatronics for photolithography automation with a focus on 2D materials
7	<b>Janani R.G.</b> 20181167	Ashna Bajpai, IISER Pune	Synthesis and characterization of $\text{Fe}_3\text{O}_4@\text{CNT}$ & its transport properties
8	<b>Hunnervir Singh</b> 20181169	Deepak Dhar, IISER Pune	Drift and trapping of particles under biased motion on disordered lattices
9	<b>Mashale Sarang Siddharam</b> 20181190	Aditya Sadhanala, Indian Institute of Science, Bengaluru	Novel perovskite nanocrystal synthesis pathways to obtain high brightness colour-pure emission: a stepping stone towards high efficiency LEDs
10	<b>Saoji Pushkar Ashish</b> 20181191	Nishita Desai, Tata Institute of Fundamental Research, Mumbai	Collider signatures for Hidden Valley jets
11	<b>Shah Neev Vinay</b> 20191011	Parameswaran Ajith, TIFR-International Centre for Theoretical Sciences, Bengaluru	Effect of gravitational lensing on the population inference of binary black holes using gravitational-wave observations
12	<b>Adrian John Pinto</b> 20191015	Apratim Chatterji, IISER Pune	A coarse-grained model for DNA loop extrusion

Sr. No.	Student	Supervisor	Project Title
13	<b>Lokendra Singh Rathore</b> 20191021	Sachin Jain, IISER Pune	Thermalization in open quantum systems
14	<b>Sujal Kataria</b> 20191023	Shivprasad Patil, IISER Pune	Nanomechanics of soft and living matters
15	<b>Abhinav Suresh</b> 20191024	Annabelle Bohrdt, University of Regensburg, Germany	Applications of transformer neural networks in correlated matter
16	<b>Namasivayam G.</b> 20191026	M. Girish Chandra, TCS Research, Bengaluru	Quantum-enhanced reinforcement learning using causal models to improve resilience under observational interference
17	<b>Soorya Narayan R.</b> 20191027	Susmita Adhikari, IISER Pune	Study on separating objects in LCDM cosmological simulations using machine learning algorithms
18	<b>Ghuge Deep Prakash</b> 20191028	Prasad Subramanian, IISER Pune	Characterizing turbulent magnetic field, density and velocity fluctuations in earth-directed ICMEs
19	<b>Vatsal Garg</b> 20191044	Kanghoon Lee, Asian Pacific Center for Theoretical Physics, Korea	Unitarity via quantum off-shell recursions
20	<b>Jezer Jojo</b> 20191049	M. Girish Chandra, TCS Research, Bengaluru	Exploration of quantum algorithms for singular value decomposition problems
21	<b>Shivam Dosajh</b> 20191053	Sebastian Deffner, University of Maryland, Baltimore County, U.S.A.	Quantum thermodynamics of non-hermitian otto engines
22	<b>Shridhar Sanjay Shanbhag</b> 20191056	Jan Wilhelm, Institute for Theoretical Physics, University of Regensburg, Germany	Local bandgap variations in Moiré structures - origin and parametric dependence
23	<b>Chirayu Gupta</b> 20191060	Seema Sharma, IISER Pune	Novel deep learning techniques for reconstruction of particles decaying to merged photons and energy calibration of hadrons
24	<b>Parijat Banerjee</b> 20191063	Sourabh Dube, IISER Pune	Study of low-momentum taus at CMS
25	<b>Mehul Pandita</b> 20191069	Aniruddha Pant, AlgoAnalytics, Pune	Optimal arbitrage detection using quantum annealing
26	<b>Arindam Ghara</b> 20191074	Surjeet Singh, IISER Pune	Strange metal behavior in electron doped cuprates superconductor
27	<b>Gadekar Vedant Bhageshwar</b> 20191083	Yogesh Wadadekar, National Centre for Radio Astrophysics -TIFR, Pune	Galaxy morphologies in the early universe
28	<b>Chandak Soham Mukund</b> 20191085	Deepak Dhar, IISER Pune	Understanding spin glass systems
29	<b>Shreyas S. Nadiger</b> 20191086	Rejish Nath, IISER Pune	Faraday patterns in a stack of driven quasi-one-dimensional dipolar Bose-Einstein condensates

Sr. No.	Student	Supervisor	Project Title
30	<b>Soumil Kelkar</b> 20191091	Joy Merwin Monteiro, IISER Pune	An exploration of the effects of clouds on the characterization of a remote earth
31	<b>S.S. Vishak</b> 20191093	Surjeet Singh, IISER Pune	Study of thermoelectric behavior of some 'double' and 'triple' half-Heuslers
32	<b>Amogh Rakesh</b> 20191094	Debasish Banerjee, Saha Institute of Nuclear Physics, Kolkata	Numerical investigations of U(1) lattice gauge theory
33	<b>Adhiraj Sundar</b> 20191105	Abha Misra, Indian Institute of Science, Bengaluru	Exploring thermoelectric potential: Seebeck coefficient investigations in Bi <sub>2</sub> S <sub>3</sub> thin films
34	<b>Drishti Gupta</b> 20191108	Arun M. Thalapillil, IISER Pune	Pade-Borel reconstruction of Euler-Heisenberg Lagrangian
35	<b>Kshitij Verma</b> 20191109	Diptimoy Ghosh, IISER Pune	Positivity constraints in flat-space QFT
36	<b>Umesh Sow</b> 20191110	Sachin Jain, IISER Pune	Explicit computation of 4-point correlators in Chern-Simons matter theory and verification of bosonisation dualities
37	<b>Hebbar Pradyun Prasad</b> 20191114	Stefan Kluth, Max Planck Institute for Physics, Werner-Heisenberg- Institute, Germany	A study of physics-motivated deep learning based algorithms for jet tagging at the LHC
38	<b>Shivang Yadav</b> 20191120	Sachin Jain, IISER Pune	Superconformal field theories: A momentum space voyage
39	<b>Abhinav Dhawan</b> 20191121	Bijay Kumar Agarwalla, IISER Pune	Quantum transport in 1D and Quasi-1D lattice systems
40	<b>Mahalinga Gautham Upadhyaya M.</b> 20191135	Subhadeep De, Inter- University Centre for Astronomy and Astrophysics, Pune	Designing and vibrational analysis of a transportable reference optical cavity
41	<b>Soumya Sarkar</b> 20191138	Sourabh Dube, IISER Pune	Reconstruction of merged electrons at CMS
42	<b>Sahil Milind Prabhudesai</b> 20191139	Debraj Rakshit, Harish- Chandra Research Institute, Prayagraj (Allahabad)	Development of floquet theory and applications in time crystals
43	<b>Anirban Roy Chowdhury</b> 20191141	Sabine Thater, Department of Astrophysics, University of Vienna, Austria	Studying the effect of dark matter and galaxy shape on supermassive black hole mass measurements using triaxial Schwarzschild modelling
44	<b>Pendse Vinayak Narendra</b> 20191144	Shamik Gupta, Tata Institute of Fundamental Research, Mumbai	Quantum synchronization in interacting non-linear oscillators
45	<b>Subhrajit Dalai</b> 20191148	Aparna Deshpande, IISER Pune	Understanding 2D van der Waals antiferromagnets: MnPS <sub>3</sub> and CrSBr

Sr. No.	Student	Supervisor	Project Title
46	<b>Pandharpatte Aashay Somdatta</b> 20191153	Aditi Sen De, Harish-Chandra Research Institute, Prayagraj (Allahabad)	Subspace detection in measurement induced quantum walks
47	<b>Rohan Thangaraj</b> 20191154	Atikur Rahman, IISER Pune	Synthesis and characterization of 2D tellurene flakes for device application
48	<b>Sanjay Bhandarkar</b> 20191158	Apratim Chatterji, IISER Pune	Entropy-driven orientational order of topologically modified polymers in confinement
49	<b>Rohan Hela</b> 20191161	Vagesh D. Narasimhamurthy, IIT Madras	Free-stream turbulence effects on vortex shedding: A CFD study
50	<b>Pushparaj Chakravarti</b> 20191176	Apratim Ganguly, Inter-University Centre for Astronomy and Astrophysics, Pune	Probing post-Newtonian formalism of binary black holes in general relativity and beyond
51	<b>Kaustubh Rajesh Gupta</b> 20191179	Arka Banerjee, IISER Pune	Spatial clustering of gravitational wave sources with k-nearest neighbour distributions
52	<b>Pranav Maheshwari</b> 20191181	Ankur Raina, IISER Bhopal	Simulating fault tolerance in quantum stabilizer codes
53	<b>Vaibhav Chaturvedi</b> 20191187	Apratim Chatterji, IISER Pune	Investigating the dynamics of ring polymers with different internal topologies
54	<b>Vedhanth S.V.U.</b> 20191188	Shouvik Datta, IISER Pune	Studying the coherence properties of excitonic Bose-Einstein condensates
55	<b>Ingole Hrishikesh Shivaji</b> 20191193	Shivprasad Patil, IISER Pune	The novel design of a nano-positioner for interferometer-based atomic force microscope
56	<b>Vishal</b> 20191211	Felix Rico, Aix-Marseille University, France	Viscoelasticity of the folded domain of a single protein at varying frequencies
57	<b>Velvankar Sakshi Vilas</b> 20191213	Sumilan Banerjee, Indian Institute of Science, Bengaluru	Entanglement phase transition of interacting bosons under random measurements
58	<b>Raghav Kaul</b> 20191219	Aniruddha Pant, AlgoAnalytics, Pune	Application of quantum annealing in factory layout optimization



## SCIENCE EDUCATION

1	<b>Manav Sivaram</b> 20191142	Nagarjuna G., IISER Pune	A framework for assessed cognitive abilities in entrance examinations
2	<b>Jashika</b> 20191224	Savita Ladage, Homi Bhabha Centre For Science Education-TIFR, Mumbai	Adopting inquiry based approach for chemistry laboratory in India: challenges and opportunities

## ACADEMIC ACHIEVEMENTS OF BS-MS STUDENTS

Institute Prizes related to academic excellence (CNR Rao Education Foundation Prize and Prizes for Academic Excellence) are given every year to BS-MS and Integrated PhD students.

**CNR Rao Education Foundation Prize** was awarded (during the 14th Foundation Day held on April 8, 2024) to the following BS-MS students. This prize is given to first-year BS-MS students who have secured the highest CGPA in the first two semesters.

Pawar Manomay Rushikesh (Batch 2023, Semester I)

Piyush Vinit Kolhe (Batch 2023, Semester I)

Dhritiraj Bastav Kalita (Batch 2022, Semester II)

**Prizes for Academic Excellence** were awarded (during the 14th Foundation Day held on April 8, 2024) to the following BS-MS students. These prizes are given to the BS-MS students who attained the highest CGPA in Semesters 3 to 8.

Riddhiman Biswas (Batch 2021, Semester III)

Vignesh M. Pai (Batch 2021, Semester IV)

Valanju Atharva Abhijit (Batch 2020, Semester V and VI)

Hritwik Haldar (Batch 2019, Semester VII and VIII)

**During the 10th Convocation of the Institute held on May 31, 2023, 207 students graduated with BS-MS dual degrees, and 17 students received BS degree.**

**Mihir Neve who secured a CGPA of 9.7 was awarded the Institute Gold Medal.**

**The following 17 students passed with Distinction (CGPA>9.0):**

Rishika Mohanta

Saismit H. Naik

Apurva Saha

Vasudha Kishor Aher

Mihir Neve

Mihir Shridhar Dingankar

Rapti Pal

Venkata Sai Sreyas Adury

Kushan Ashvin Panchal

Aditya Bhattacharyya

Ajaykrishnan E.S.

Abhishek Ravishankar

Arjun Murlidhar

Madheshvaran S.

Rajat Sharma

Kartik Sharma

P.B. Harita

# LIST OF COURSES

## August 2023 Semester

Note: Semesters 1, 3, 5, and 7 refer to BS-MS; Semesters 11 and 13 refer to iPhD; 31 and 33 refer to MSc; 21 and 22 refer to PhD | Total of 147 courses, of which 7 are dual-coded courses across departments

Course Code <i>BS-MS/ MSc / iPhD</i>	Credits <i>BS-MS/ MSc / iPhD</i>	Course Code <i>PhD</i>	Credits <i>PhD</i>	Course Title	Open to Semester	Coordinator / Instructor
<b>BI1113</b>	3			Introductory Biology-I	1	Nagaraj Balasubramanian, Kundan Sengupta
<b>BI1123</b>	3			Experimental Biology	1	Kalika Prasad, Richa Rikhy, Sagar Pandit, Nishad Matange, Krishanpal Karmodiya, Sunish Kumar Radhakrishnan, Mridula Nambiar, Thomas Pucadyil
<b>BI2113</b>	3			Ecology and Evolution	3	Sutirth Dey
<b>BI2123</b>	3			Introduction to Biological Systems	3	Aurnab Ghose, Collins Assisi
<b>BI3124</b>	4	<b>BI6114</b>	4	Advanced Molecular Biology	5,11,21	Gayathri Pananghat, Mayurika Lahiri
<b>BI3134</b>	4	<b>BI6124</b>	4	Bioinformatics	5,7,11,13,21	M.S. Madhusudhan
<b>BI3144</b>	4	<b>BI6134</b>	4	Cellular Biophysics-I	5,7,11,13,21	Chaitanya Athale
<b>BI3154</b>	4	<b>BI6144</b>	4	Neurobiology-I	5,7,11,13,21	Nixon M. Abraham, Suhita Nadkarni
<b>BI3164</b>	4	<b>BI6154</b>	4	Plant Biology-I	5,7,11,13,21	Anjan Banerjee, Kalika Prasad
<b>BI3174</b>	4	<b>BI6184</b>	4	Advanced Biochemistry-I	5,7,11,13,21	Siddhesh S. Kamat, Sudha Rajamani
<b>BI3184</b>	4	<b>BI6194</b>	4	Ecology-I	5,7,11,13,21	Deepak Barua
<b>BI3194</b>	4	<b>BI6314</b>	4	Developmental Biology	5,7,11,13,21	Girish Ratnaparkhi, Richa Rikhy
<b>BI3313</b>	3			Semester Project	5	Sagar Pandit
<b>BI3323</b>	3	<b>BI6333</b>	3	Structural Biology	5,7,11,13,21	Saikrishnan Kayarat, Gayathri Pananghat
<b>BI3333</b>	3	<b>BI6363</b>	3	Disease and Discourse	5,11,13,21	Nishad Matange, Pooja Sancheti
<b>BI3344</b>	4	<b>BI6374</b>	4	Microbial Genetics	7,11,13,21	Sunish Kumar Radhakrishnan, Mridula Nambiar
<b>BI4113</b>	3	<b>BI6163</b>	3	Animal Physiology-II	7,11,13,21	Raghav Rajan, Nishikant Subhedar
<b>BI4123</b>	3	<b>BI6173</b>	3	Advanced Immunology	7,11,13,21	Satyajit Rath, Vineeta Bal

Course Code <i>BS- MS/ MSc / iPhD</i>	Credits <i>BS-MS/ MSc / iPhD</i>	Course Code <i>PhD</i>	Credits <i>PhD</i>	Course Title	Open to Semester	Coordinator / Instructor
<b>BI4153</b>	3			Undergraduate Research Experiments	7	Raghav Rajan, Gayathri Pananghat, Nagaraj Balasubramanian
<b>BI4313</b>	3			Semester Project	7	Sagar Pandit
<b>BI5114</b>	4	<b>BI6344</b>	4	Biostatistics	11,13,21	Ramana Athreya
<b>BI5513</b>	3			Lab Training	11	Raghav Rajan
<b>BI5713</b>	3			Lab Training	13	Raghav Rajan
<b>BI5723</b>	3			Lab Training	13	Raghav Rajan
<b>BI5733</b>	3			Lab Training	13	Raghav Rajan
		<b>BI6532</b>	2	Immunological Methods in Biology	11,13,21	Satyajit Rath
		<b>BI6542</b>	2	Reasoning with causal models	11,13,21	Pranay Goel
<b>CH1113</b>	3			Principles of Organic Chemistry	1	Amrita B. Hazra, Boopathy Gnanaprakasam
<b>CH2113</b>	3			Principles of Inorganic Chemistry	3	R. Boomi Shankar, Ramanathan Vaidhyanathan
<b>CH2243</b>	3			General Chemistry Practicals-II	3	Aloke Das, Arun Venkatanathan, Raghavendra Kikkeri, Sujit K. Ghosh, Shabana Khan
<b>CH3114</b>	4	<b>CH6114</b>	4	Physical Organic Chemistry	5,7,21,31,33,11,13	Hosahudya N. Gopi
<b>CH3124</b>	4	<b>CH6124</b>	4	Main Group Chemistry	5,7,21,31,33,11,13	Moumita Majumdar
<b>CH3134</b>	4	<b>CH6134</b>	4	Symmetry and Group Theory	5,7,21,31,33,11,13	Arun Venkatnathan, Srabanti Chaudhury
<b>CH3143</b>	3	<b>CH6144</b>	4	Self-Assembly in Chemistry	5,7,21,31,33,11,13	S. Sandanaraj Britto
<b>CH3154</b>	4	<b>CH6154</b>	4	Chemical Equilibrium and Kinetics	5,7,21,31,33,11,13	Jeetender Chugh
<b>CH3163</b>	3			Advanced Organic Chemistry Laboratory	5,7,31,11,13	Pinaki Talukdar
<b>CH3313</b>	3			Semester Project	5	Raghavendra Kikkeri
<b>CH4114</b>	4	<b>CH6164</b>	4	Organic Synthesis-II	7,21,31,33,11,13	Srinivas Hotha
<b>CH4124</b>	4	<b>CH6174</b>	4	Bioinorganic Chemistry	7,21,31,33,11,13	Debangsu Sil
<b>CH4134</b>	4	<b>CH6184</b>	4	Polymer Chemistry	7,21,31,33,11,13	M. Jayakannan
<b>CH4144</b>	4	<b>CH6194</b>	4	Statistical Thermodynamics	7,21,31,33,11,13	Arnab Mukherjee
<b>CH4153</b>	3			Advanced Physical Chemistry Laboratory	7,33	Pramod Pillai, Pankaj Mandal, Nirmalya Ballav
<b>CH4164</b>	4	<b>CH6314</b>	4	Bioorganic Chemistry and Chemical Biology	7,21,31,33,11,13	S.G. Srivatsan
<b>CH4173</b>	3	<b>CH6324</b>	4	Solid State Chemistry	7,21,31,33,11,13	Partha Hazra

<b>Course Code</b> <i>BS- MS/ MSc / iPhD</i>	<b>Credits</b> <i>BS-MS/ MSc / iPhD</i>	<b>Course Code</b> <i>PhD</i>	<b>Credits</b> <i>PhD</i>	<b>Course Title</b>	<b>Open to Semester</b>	<b>Coordinator / Instructor</b>
<b>CH4184</b>	4	<b>CH6334</b>	4	Electrochemistry	7,21,31,33,11,13	Nirmalya Ballav, Muhammed Musthafa
<b>CH4194</b>	4	<b>CH6344</b>	4	Fundamentals of Solution-State NMR Spectroscopy: Principles and Applications (NKN)	7,21,31,33,11,13	Jeetender Chugh
<b>CH4313</b>	3			Semester Project	7	Raghavendra Kikkeri
<b>CH4323</b>	3	<b>CH6364</b>	4	Environmental Chemistry and Sustainability	7,21,31,33,11,13	V.G. Anand
<b>CH5516</b>	6			Semester Project	33	Arnab Mukherjee
<b>DS3114</b>	4	<b>DS6114</b>	4	Bioinformatics	5,7,11,13,21	M.S. Madhusudhan
<b>DS3143</b>	3	<b>DS6124</b>	4	Parameter Estimation and Inverse Theory	5,7,21	Rahul Dehiya
<b>DS3154</b>	4	<b>DS6134</b>	4	Applied Mathematical Methods	5,21	Joy Merwin Monteiro
<b>DS3164</b>	4	<b>DS6164</b>	4	Numerical Analysis	5,7,31,33,21	Anindya Goswami
<b>DS4114</b>	4	<b>DS6144</b>	4	Mathematics of Network Algorithms	7,11,13,21	Prafullkumar Tale
		<b>DS6152</b>	2	Quantum Machine Learning	13,21	M.S. Santhanam
<b>DS3313</b>	3			Semester Project	5	Leelavati Narlikar
<b>DS4313</b>	3			Semester Project	7	Leelavati Narlikar
<b>EC1213</b>	3			Evolution of Earth and Life	1	Devapriya Chattopadhyay
<b>EC2113</b>	3			Introduction to Climate Science	3	Neena Joseph Mani
<b>EC2123</b>	3			Landscapes and their Evolution	3	Argha Banerjee
<b>EC3114</b>	4	<b>EC6114</b>	4	Numerical Computation	5,21	Suhas Ettammal
<b>EC3124</b>	4	<b>EC6124</b>	4	Physics of the Atmosphere	5,7,21	Neena Joseph Mani
<b>EC3134</b>	4	<b>EC6144</b>	4	Applied Mathematical Methods	5,21	Joy Merwin Monteiro
<b>EC3154</b>	4	<b>EC6164</b>	4	Sedimentology and Stratigraphy	5,21,31,11,13	Sudipta Sarkar
<b>EC3164</b>	4	<b>EC6174</b>	4	Earth and Planetary Materials	5,7,21,31	Shreyas Managave
<b>EC3174</b>	4	<b>EC6324</b>	4	Structural Geology and Tectonics	5,7,31,11,13	Durga Mohanty (SPPU, Pune), Shreyas Managave
<b>EC3183</b>	3	<b>EC6334</b>	4	Parameter Estimation and Inverse Theory	5,7,21,11,13	Rahul Dehiya



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<b>EC3194</b>	4	<b>EC6354</b>	4	Paleobiology	5,7,21,31,11,13	Devapriya Chattopadhyay
<b>EC3313</b>	3			Semester Project	5	Devapriya Chattopadhyay, Neena Joseph Mani, Arjun Datta
<b>EC3323</b>	3	<b>EC6374</b>	4	Hydrology	5,7,21,33,11,13	Argha Banerjee
<b>EC3334</b>	4	<b>EC6534</b>	4	Introduction to Interactive Spheres	21,31,11,13	Rahul Dehiya, Arjun Datta, Neena Joseph Mani, Argha Banerjee
<b>EC4114</b>	4	<b>EC6134</b>	4	Atmosphere and Ocean Dynamics	7,21	Suhas Ettammal
<b>EC4123</b>	3	<b>EC6364</b>	4	Sedimentology & Paleontology Lab	7,31,11,13	Alok Dave
<b>EC4134</b>	4	<b>EC6184</b>	4	Exploration Seismology	5,7,21	Rahul Dehiya
<b>EC4144</b>	4	<b>EC6194</b>	4	Tropical Meteorology	7,21	Suhas Ettammal, Sabin T.P. (IITM Pune)
<b>EC4153</b>	3	<b>EC6314</b>	4	Sequence Stratigraphy	7,21,33,11,13	Alok Dave
<b>EC4164</b>	4	<b>EC6344</b>	4	Igneous and Metamorphic Petrology	7,21,33,11,13	Raymond Duraiswami (SPPU, Pune), Shreyas Managave
<b>EC4173</b>	3	<b>EC6384</b>	4	Igneous and Metamorphic Petrology Lab	7,21,33,11,13	Raymond Duraiswami (SPPU, Pune), Shreyas Managave
<b>EC4313</b>	3			Semester Project	7	Devapriya Chattopadhyay, Neena Joseph Mani, Arjun Datta
<b>EC5516</b>	6			Semester Project	33	Devapriya Chattopadhyay
<b>TD1123</b>	3			Academic Communication Skills	1	Pooja Sancheti
<b>HS2123</b>	3			Introduction to HSS	3	Pushkar Sohoni, Anil Zankar, Bejoy K. Thomas, Chaitra Redkar, Shalini Sharma, Sara Ahmed, Pooja Sancheti, Venketeswara R. Pai
<b>HS3153</b>	3	<b>HS6164</b>	4	Economics and Public Policy	5,7,11,13,21	Bejoy K. Thomas
<b>HS3173</b>	3	<b>HS6183</b>	3	Disease and Discourse	5,11,13,21	Nishad Matange, Pooja Sancheti
<b>HS3263</b>	3	<b>HS6274</b>	4	History of Architecture in India	5,7,11,13,21	Pushkar Sohoni
<b>HS3213</b>	3	<b>HS6214</b>	4	Introduction to Paninian Grammar	5,7,11,13,21	Venketeswara R. Pai
<b>HS3234</b>	4	<b>HS6234</b>	4	Science as Narrative in Literature and Cinema	5,7,11,13,21	Anil Zankar
<b>HS3313</b>	3			Semester Project	5	Pushkar Sohoni
<b>HS3323</b>	3	<b>HS6324</b>	4	Philosophy of the Constitution of India	5,7,11,13,21	Chaitra Redkar

Course Code <i>BS- MS/ MSc / iPhD</i>	Credits <i>BS-MS/ MSc / iPhD</i>	Course Code <i>PhD</i>	Credits <i>PhD</i>	Course Title	Open to Semester	Coordinator / Instructor
<b>HS3333</b>	3	<b>HS6334</b>	4	People, Culture, and Health	5,7,11,13,21	Pushkar Sohoni, Hemant Apte
<b>HS4313</b>	3			Semester Project	7	Pushkar Sohoni
		<b>HS6114</b>	4	PhD Reading Course	21	Pooja Sancheti
<b>MT1113</b>	3			Calculus-I	1	Tejas Kalelkar, Haripada Sau
<b>MT2113</b>	3			Introduction to Probability	3	Moumanti Podder, Kaneenika Sinha
<b>MT2123</b>	3			Advanced Linear Algebra	3	Ayan Mahalanobis
<b>MT3114</b>	4			Rings and Modules	5,7,31,33	Rabeya Basu
<b>MT3124</b>	4			Real Analysis-II	5,7,31,33	Anisa Chorwadwala
<b>MT3134</b>	4			Point Set Topology	5,7,31,33	Amit Hogadi
<b>MT3144</b>	4			Ordinary Differential Equations	5,7,31,33	Divyang Bhimani
<b>MT3154</b>	4	<b>MT6164</b>	4	Graph Theory	5,7,31,33,21,22	Soumen Maity
<b>MT3164</b>	4			Numerical Analysis	5,7,31,33	Anindya Goswami
<b>MT3174</b>	4			Fields and Galois Theory	5,7,31,33	Supriya Pisolkar
<b>MT3184</b>	4			Differential Geometry and Lie Groups	7,31,33	Vivek Mohan Mallick
<b>MT3313</b>	3			Semester Project	5	Diganta Borah
<b>MT4114</b>	4			Algebraic Topology	7,31,33	Rama Mishra
<b>MT4124</b>	4			Functional Analysis	7,31,33	Mousomi Bhakta
<b>MT4134</b>	4	<b>MT6124</b>	4	Probability	7,31,33,21,22	Anup Biswas
<b>MT4144</b>	4			Representation Theory of Finite Groups	7,31,33	Chandrasheel Bhagwat
<b>MT4313</b>	3			Semester Project	7	Diganta Borah
<b>MT5724</b>	4			Semester Project	31,33	Krishna Kaipa
<b>MT4154</b>	4	<b>MT6174</b>	4	Mathematics of Network Algorithms	7,11,13,21,31,33	Prafullkumar Tale
	4	<b>MT6134</b>	4	Algebra-I	33,21,22	Manish Mishra
	4	<b>MT6144</b>	4	Analysis-I	33,21,22	Diganta Borah
	4	<b>MT6154</b>	4	Topology-I	33,21,22	Debargha Banerjee
	4	<b>MT6414</b>	4	Semester Project	22	Soumen Maity
<b>MT5516</b>	6			Semester Project	33	Krishna Kaipa
<b>TD1113</b>	3			Introduction to Computing	1	Sourabh Dube
<b>PH1113</b>	3			Introductory Mechanics	1	Sudarshan Ananth, Susmita Adhikari

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<b>PH1123</b>	3			Physics Lab-I	1	Surabhi Jaiswal, Bhas Bapat, Surjeet Singh, Vijayakumar Chikkadi
<b>PH2113</b>	3			Introductory Quantum Physics	3	Rejish Nath, Prasenjit Ghosh
<b>PH2123</b>	3			Mathematical Methods for Physics	3	Bijay Kumar Agarwalla, Sachin Jain
<b>PH3114</b>	4	<b>PH6114</b>	4	Electrodynamics-I	5,11,21	Ashish Arora
<b>PH3124</b>	4			Quantum Mechanics - I	5,11	Arijit Bhattacharyay
<b>PH3134</b>	4			Optics	5,11	Pavan Kumar G.V.
<b>PH3144</b>	4	<b>PH6134</b>	4	Electronics-I with Lab	5,11,21	Shivprasad Patil
<b>PH3153</b>	3	<b>PH6143</b>	3	Methods of Experimental Physics	5,7,11,13,21	Sunil Nair
<b>PH3163</b>	3			Mathematical Methods for Physics-II	5,7,11,13	Arka Banerjee
<b>PH3173</b>	3			Physics Lab-III	5,11	Ashna Bajpai
<b>PH3313</b>	3			Semester Project	5	Prasad Subramanian
<b>PH4113</b>	3	<b>PH6363</b>	3	Condensed Matter Physics-II	7,13,21	Mukul Kabir
<b>PH4123</b>	3	<b>PH6163</b>	3	Statistical Mechanics-II	7,13,21	Deepak Dhar
<b>PH4133</b>	3	<b>PH6373</b>	3	Quantum Field Theory-I	7,13,21	Diptimoy Ghosh
<b>PH4144</b>	4			Physics Lab-V	7,13	Shouvik Datta, Aparna Deshpande
<b>PH4154</b>	4	<b>PH6384</b>	4	Nuclear and Particle Physics	7,13,21	Seema Sharma
<b>PH4163</b>	3	<b>PH6393</b>	3	Astronomy and Astrophysics-I	7,13,21	Ramana Athreya
<b>PH4173</b>	3	<b>PH6513</b>	3	Fluid Dynamics	7,13,21	Apratim Chatterji
<b>PH4183</b>	3	<b>PH6523</b>	3	Gravitation	7,13,21	Suneeta Vardarajan
<b>PH4193</b>	3	<b>PH6533</b>	3	Physics at Nanoscales	7,13,21	Atikur Rahman
<b>PH4313</b>	3			Semester Project	7	Prasad Subramanian
<b>PH4323</b>	3	<b>PH6543</b>	3	Quantum Information	7,13,21	T.S. Mahesh
<b>PH5113</b>	3	<b>PH6353</b>	3	Advanced Classical Mechanics	7,11,13,21	Arun M. Thalapillil
<b>PH5513</b>	3			Semester Project	11	Prasad Subramanian
<b>PH5713</b>	3			Semester Project	13	Prasad Subramanian
		<b>PH6572</b>	2	A Topical Course on Superconductivity	13,21	Sudarshan Ananth, Ramakrishnan
		<b>PH6582</b>	2	Quantum Machine Learning	13,21	M.S. Santhanam
<b>SE4113</b>	3	<b>SE6113</b>	3	The Cognitive Basis of Science	7,11,13,21	Aparna Deshpande, G. Nagarjuna

Course Code	Credits	Course Code	Credits	Course Title	Open to Semester	Coordinator / Instructor
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<b>SE4123</b>	3	<b>SE6123</b>	3	Science and the World	7,11,13,21	Bhas Bapat, Anirban Hazra, Joy Merwin Monteiro

### January 2024 Semester

Semesters 6 and 8 BS-MS, Semester 2 and 4 iPhD, Semester 2 and 4 MSc, and Semester 2 PhD

Note: 2, 4, 6 and 8 refer to BS-MS Semesters; 12 and 14 refer to iPhD Semesters 2 and 4; 22 refers to PhD Semester 2, 32 and 34 refer to MSc Semesters 2 and 4 | Total of 147 courses, of which 5 are dual-coded courses across departments

Course Code	Credits	Course Code	Credits	Course Title	Open to Semester	Coordinator / Instructor
BS- MS/ MSc / iPhD	BS-MS/ MSc / iPhD	PhD	PhD			
<b>BI1213</b>	3			Introduction to Biomolecules	2	M.S. Madhusudhan, Kalika Prasad, Siddhesh S. Kamat
<b>BI2213</b>	3			Cell Biology	4	Nagaraj Balasubramanian, Thomas Pucadyil
<b>BI2223</b>	3			Physiology	4	Nishad Matange, Satyajit Rath, Nishikant Subhedar
<b>BI2233</b>	3			Genetics	4	Mridula Nambiar, Richa Rikhy
<b>BI3214</b>	4	<b>BI6214</b>	4	Animal Physiology-I	6,8,12,14,22	Nixon M. Abraham, Nishikant Subhedar
<b>BI3224</b>	4	<b>BI6224</b>	4	Introductory Immunology	6,8,12,14,22	Satyajit Rath, Vineeta Bal
<b>BI3234</b>	4	<b>BI6234</b>	4	Animal Behaviour	6,8,12,14,22	Raghav Rajan
<b>BI3244</b>	4	<b>BI6244</b>	4	From Planets to cells	6,8,12,14,22	Sudha Rajamani
<b>BI3254</b>	4	<b>BI6254</b>	4	Microbiology	6,8,12,14,22	Sunish Kumar Radhakrishnan, Gayathri Pananghat
<b>BI3264</b>	4	<b>BI6264</b>	4	Mathematical & Computational Biology	6,8,12,14,22	Collins Assisi, Suhita Nadkarni
<b>BI3274</b>	4	<b>BI6274</b>	4	Chemical Ecology	6,8,12,14,22	Sagar Pandit
<b>BI3284</b>	4	<b>BI6284</b>	4	Advanced Biochemistry-II	6,8,12,14,22	Thomas Pucadyil, Amrita B. Hazra
<b>BI3293</b>	3	<b>BI6293</b>	3	Ecology-II	6,8,12,14,22	Deepak Barua
<b>BI3424</b>	4	<b>BI6424</b>	4	Statistical Learning and Data Science	6,8,12,14,22	Pranay Goel
<b>BI3433</b>	3	<b>BI6433</b>	3	Evolution	6,8,12,14,22	Sutirth Dey
<b>BI3444</b>	4	<b>BI6444</b>	4	Genome Biology & Epigenetics	6,8,12,14,22	Kundan Sengupta, Krishanpal Karmodiya
<b>BI3613</b>	3			Lab/Theory Project	6	Chaitanya Athale

Course Code <i>BS- MS/ MSc / iPhD</i>	Credits <i>BS-MS/ MSc / iPhD</i>	Course Code <i>PhD</i>	Credits <i>PhD</i>	Course Title	Open to Semester	Coordinator / Instructor
<b>BI4613</b>	3			Lab/Theory Project	8	Chaitanya Athale
<b>BI4254</b>	4	<b>BI6454</b>	4	Biology and Disease	8,12,14,22	Mayurika Lahiri, Siddhesh S. Kamat
<b>BI5214</b>	4	<b>BI6464</b>	4	Literature Review	14,22	Saikrishnan Kayarat, Suhita Nadkarni, Nagaraj Balasubramanian, Nishad Matange
<b>BI5223</b>	3			Lab Training	12	Raghav Rajan
<b>BI5230</b>	10			Research Project	14	Raghav Rajan
<b>BI5245</b>	5			Research Seminar	14	Raghav Rajan
<b>BI6472</b>	2	<b>BI6472</b>	2	Design of Nervous Systems	12,14,22	Aurnab Ghose
<b>BI6482</b>	2	<b>BI6482</b>	2	Vaccines	12,14,22	Vineeta Bal
<b>BI4153</b>	3			Undergraduate Research Experiments	6	Krishanpal Karmodiya, Nixon M. Abraham, Mayurika Lahiri
<b>CH1213</b>	3			Principles of Physical Chemistry	2	Pramod Pillai, Angshuman Nag
<b>CH1223</b>	3			General Chemistry Practicals-I	2	S. Sandanaraj Britto, V.G. Anand, R. Boomi Shankar, Debangsu Sil, Ramanathan Vaidhyanathan, Partha Hazra, Prasenjit Ghosh
<b>CH2213</b>	3			Analytical Chemistry	4	M. Jayakannan
<b>CH2223</b>	3			Principles of Organic Chemistry-II	4	Ramakrishna G. Bhat
<b>CH2233</b>	3			Fundamentals of Molecular Spectroscopy	4	Pankaj Mandal
<b>TD2213</b>	3			Thermodynamics	4	Srabanti Chaudhury, Muhammad Musthafa O.T.
<b>CH3214</b>	4	<b>CH6214</b>	4	Quantum Chemistry	6,8,12,22,32	Anirban Hazra
<b>CH3224</b>	4	<b>CH6224</b>	4	Organic Synthesis-I	6,8,12,22,32	Boopathy Gnanaprakasam
<b>CH3234</b>	4	<b>CH6234</b>	4	Transition metal Chemistry	6,8,12,22,32,34	Sujit K. Kumar Ghosh
<b>CH4254</b>	4	<b>CH6244</b>	4	Structural Methods and Analysis	8,14,22,32,34	Pinaki Talukdar, S.G. Srivatsan
<b>CH4264</b>	4	<b>CH6254</b>	4	Advanced Molecular Spectroscopy	6,8,14,22,32,34	Aloke Das
<b>CH4274</b>	4	<b>CH6264</b>	4	Medicinal Chemistry	8,14,22,32,34	Harinath Chakrapani
<b>CH4224</b>	4	<b>CH6284</b>	4	Advanced Material Science	6,8,14,22,32,34	R. Boomi Shankar, Ramanathan Vaidhyanathan

<b>Course Code</b> <i>BS- MS/ MSc / iPhD</i>	<b>Credits</b> <i>BS-MS/ MSc / iPhD</i>	<b>Course Code</b> <i>PhD</i>	<b>Credits</b> <i>PhD</i>	<b>Course Title</b>	<b>Open to Semester</b>	<b>Coordinator / Instructor</b>
<b>CH4243</b>	3	<b>CH6294</b>	4	Organometallic Chemistry	8,14,22,32,34	Ramakrishna G. Bhat
<b>CH3613</b>	3			Semester Project	6	Angshuman Nag
<b>CH4613</b>	3			Lab Training/Theory Project	8	Angshuman Nag
<b>CH4284</b>	4	<b>CH6414</b>	4	Chemistry for Alternative Energy	8,14,22,32,34	Angshuman Nag, Muhammad Musthafa O.T.
<b>CH4214</b>	4	<b>CH6424</b>	4	Organotransition Metal Catalysis	8,14,22,32,34	Shabana Khan
<b>CH3253</b>	3			Advanced Inorganic Chemistry Laboratory	6,8,32	Moumita Majumdar, Nirmalya Ballav
<b>CH4233</b>	3	<b>CH6234</b>	4	Thermal Pericyclic and Photochemical Reactions	8,14,22,32,34	Hosahudya N. Gopi
<b>CH6432</b>	2	<b>CH6432</b>	2	Introduction to Machine Learning in Chemistry	14,22,32	Arnab Mukherjee
<b>DS3613</b>	3			Semester Project	6	Leelavati Narlikar
<b>DS4613</b>	3			Semester Project	8	Leelavati Narlikar
<b>DS4213</b>	3	<b>DS6213</b>	3	Natural Language Processing	6,8,12,14,32	Leelavati Narlikar, Manasi Patwardhan
<b>DS4223</b>	3	<b>DS6223</b>	3	Generalized Linear Models and their Applications	6,8,12,14,22,32,34	Leelavati Narlikar, Mousum Dutta
<b>DS4244</b>	4	<b>DS6244</b>	4	Bayesian Theory and Practice	6,8,12,14,22,32,34	Leelavati Narlikar
<b>DS3223</b>	3	<b>DS6273</b>	3	Causal Inference	6,8,12,14,22,32,34	Leelavati Narlikar, Tulasi Ram Reddy
<b>DS3214</b>	4	<b>DS6264</b>	4	Statistical Learning and Data Science	6,8,12,14,22	Pranay Goel
<b>DS4254</b>	4	<b>DS6284</b>	4	Stochastic Processes	8,22	Chandrasheel Bhagwat
<b>DS3234</b>	4	<b>MT6214</b>	4	Algorithms	6,8,22	Soumen Maity
<b>EC1223</b>	3			The Solid Earth	2	Arjun Datta
<b>EC2213</b>	3			Principles of Planetary Climate	4	Joy Merwin Monteiro
<b>EC2253</b>	3			Introductory Seismology	4	Arjun Datta
<b>EC2243</b>	3			Atmosphere and Ocean Chemistry	4	Gyana Ranjan Tripathy
<b>EC3214</b>	4	<b>EC6214</b>	4	Geo and Cosmochemistry	6,8,22,32	Shreyas Managave
<b>EC3224</b>	4	<b>EC6224</b>	4	Geophysical Fluid Dynamics	6,8,22	Suhas Ettammal
<b>EC3414</b>	4	<b>EC6294</b>	4	Geodynamics-1	6,8,22	Argha Banerjee

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<b>EC3243</b>	3			Analytical Geochemistry Lab	6,8,32	Gyana Ranjan Tripathy
<b>EC3253</b>	3			Introduction to Field Techniques	6,8,32	Sudipta Sarkar, Shreyas Managave
<b>EC3264</b>	4	<b>EC6234</b>	4	Physical Oceanography	6,8,22	Joy Merwin Monteiro
<b>EC3284</b>	4	<b>EC6264</b>	4	Satellite Data Analysis & Image Processing	6,8,32,22	Sudipta Sarkar
<b>EC3293</b>	3	<b>EC6274</b>	4	Isotope Geochemistry	6,8,32,22	Gyana Ranjan Tripathy
<b>EC4224</b>	4	<b>EC6424</b>	4	Climate Modeling	8,22	Neena Joseph Mani, Vinu Valsala (IITM Pune)
<b>EC4243</b>	3	<b>EC6284</b>	4	Geological Field Training	8,34,22	Devapriya Chattopadhyay, Alok Dave
<b>EC4254</b>	4	<b>EC6414</b>	4	Indian geology and resources	8,32,22	Alok Dave
<b>EC3613</b>	3			Semester Project	6	Rahul Dehiya
<b>EC4613</b>	3			Lab Training/Theory Project	8	Rahul Dehiya
<b>EC4262</b>	2			Research-1	32	Sudipta Sarkar, Devapriya Chattopadhyay
<b>HS3123</b>	3	<b>HS6134</b>	4	Evolution of Cinema	6,8,14,22	Anil Zankar
<b>HS3613</b>	3			Semester Project	6	Pushkar Sohoni
<b>HS4613</b>	3			Lab Training/Theory Project	8	Pushkar Sohoni
<b>HS3423</b>	3	<b>HS6414</b>	4	Understanding the Gandhian Tradition	6,8,14,22	Chaitra Redkar
<b>HS6264</b>		<b>HS6264</b>	4	Research Methods, Fieldwork, and Ethics	22	Chaitra Redkar, Anil Zankar, Bejoy K. Thomas, Shalini Sharma, Pooja Sancheti, Pushkar Sohoni, Venketeswara R. Pai
<b>HS3433</b>	3	<b>HS6424</b>	4	Introduction to Indian Writing in English: Prose and Poetry	6,8,14,22	Pooja Sancheti
<b>HS3283</b>	3	<b>HS6294</b>	4	Development of Mathematical Astronomy in India	6,8,14,22	Venketeswara R. Pai
<b>HS1223</b>	3			Science and Society	2	Pushkar Sohoni
<b>HS6114</b>		<b>HS6114</b>	4	PhD Reading Course	22	Pooja Sancheti
<b>HS3293</b>	3	<b>HS6434</b>	4	Science-ing Sex in Modern India	6,8,14,22	Pushkar Sohoni, Shrikant Botre
<b>HS3413</b>	3	<b>HS6444</b>	4	Introduction to Population Studies	6,8,14,22	Pushkar Sohoni, Hemant Apte

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<b>HS3114</b>	4	<b>HS6124</b>	4	Disasters and Society	6,8,12,14,22	Shalini Sharma
<b>HS3223</b>	3	<b>HS6224</b>	4	Development Studies: Concepts, Applications and Perspectives	6,8,14,22,32	Bejoy K. Thomas
<b>MT1213</b>	3			Calculus-II	2	Amit Hogadi, Haripada Sau
<b>MT1223</b>	3			Linear Algebra	2	Baskar Balasubramanyam, Mainak Poddar
<b>MT2213</b>	3			Group Theory	4	Rabeya Basu
<b>MT2223</b>	3			Real Analysis I	4	Anup Biswas
<b>MT2233</b>	3			Discrete Structures	4	Krishna Kaipa
<b>MT3214</b>	4			Complex Analysis	6,8,32,34	Vivek Mohan Mallick
<b>MT3224</b>	4			Algebraic Number Theory	6,8,32,34	Debargha Banerjee
<b>MT3234</b>	4			Measure Theory and Integration	6,8,32,34	Divyang Bhimani
<b>MT3244</b>	4			Calculus on Manifolds	6,8,32,34	Diganta Borah
<b>MT3254</b>	4	<b>MT6164</b>	4	Coding Theory	6,8,32,34	Prafullkumar Tale
<b>MT3264</b>	4	<b>MT6214</b>	4	Algorithms	6,8,32,34,22	Soumen Maity
<b>MT4214</b>	4	<b>MT6174</b>	4	Algebraic Geometry	8,32,34	Anupam Kumar Singh
<b>MT4224</b>	4	<b>MT6184</b>	4	Fourier Analysis	8,32,34	Kaneenika Sinha
<b>MT4234</b>	4	<b>MT6194</b>	4	Riemannian Geometry	8,32,34	Chandranandan Gangopadhyay
<b>MT4254</b>	4	<b>MT6324</b>	4	Stochastic Processes	8,32,34,22	Chandrasheel Bhagwat
<b>MT4264</b>	4	<b>MT6334</b>	4	Partial Differential Equations	8,32,34	Mousomi Bhakta
<b>MT4414</b>	4	<b>MT6424</b>	4	Topics: Local Class Field Theory	32,34,22	Supriya Pisolkar
<b>MT4294</b>	4	<b>MT6434</b>	4	Bayesian Theory and Practice	6,8,12,14,22	Leelavati Narlikar
<b>MT3273</b>	3	<b>MT6433</b>	3	Causal Inference	6,8,12,14,22,32,34	Leelavati Narlikar, Tulasi Ram Reddy
<b>MT5214</b>	4	<b>MT6234</b>	4	Algebra-II	22,34	Manish Mishra
<b>MT5224</b>	4	<b>MT6244</b>	4	Analysis-II	22,34	Anisa Chorwadwala
<b>MT5234</b>	4	<b>MT6254</b>	4	Topology-II	22,34	Rama Mishra
<b>MT3613</b>	3			Semester Project	6	Mousomi Bhakta
<b>MT4613</b>	3			Semester Project	8	Mousomi Bhakta
<b>MT5614</b>	4			Semester Project	32	Baskar Balasubramanyam
<b>MT5814</b>	4			Semester Project	34	Baskar Balasubramanyam
<b>MT6414</b>		<b>MT6414</b>	4	PhD Semester Project	22	Vivek Mohan Mallick



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<b>MT4423</b>	3	<b>MT6443</b>	3	Generalized Linear Models and their Applications	6,8,12,14,22,32,34	Leelavati Narlikar, Mousum Datta
<b>MT7218</b>	8			MSC Thesis	34	Baskar Balasubramanyam
<b>PH1213</b>	3			Introductory Electricity and Magnetism	2	Arka Banerjee, Sourabh Dube
<b>PH2213</b>	3			Classical Mechanics	4	Arijit Bhattacharyay
<b>PH2223</b>	3			Thermal & Statistical Physics	4	Mukul Kabir
<b>PH2233</b>	3			Physics Lab-II	4	Ashish Arora, Seema Sharma, Srinivasan Ramakrishnan, Ushasi Roy
<b>PH3214</b>	4	<b>PH6214</b>	4	Quantum Mechanics-II	6,12,32,22	T.S. Mahesh
<b>PH3244</b>	4			Physics Lab-IV	6,12	Ashna Bajpai, Shivprasad Patil
<b>PH3234</b>	4	<b>PH6264</b>	4	Statistical Mechanics-I	6,12,32,22	Bijay Kumar Agarwalla
<b>PH3224</b>	4	<b>PH6274</b>	4	Condensed Matter Physics-I	6,12,32,22	Surjeet Singh
<b>PH3264</b>	4	<b>PH6234</b>	4	Computational Physics	6,8,12,14,32,22	Apratim Chatterji, Prasenjit Ghosh
<b>PH3273</b>	3	<b>PH6243</b>	3	Electronics & Instrumentation	6,8,12,14,32,22	Umakant D. Rapol
<b>PH3253</b>	3	<b>PH6223</b>	3	Group Theory in Physics	6,8,12,14,32,22	Sreejith G.J.
<b>PH3613</b>	3			BS-MS Semester Project	6	Sachin Jain
<b>PH5613</b>	3			iPhD Semester Project	12	Sachin Jain
<b>PH4224</b>	4	<b>PH6254</b>	4	Atomic and Molecular Physics	8,14,22,34	Rejish Nath
<b>PH4233</b>	3			Physics Lab-VI	8,14	Aparna Deshpande
<b>PH4243</b>	3	<b>PH6283</b>	3	Advanced Gravitation	8,14,22,34	Suneeta Vardarajan
<b>PH4253</b>	3	<b>PH6293</b>	3	Quantum Optics	8,14,22,34	Shouvik Datta
<b>PH4263</b>	3	<b>PH6433</b>	3	Astronomy and Astrophysics-II	8,14,22,34	Prasad Subramanian
<b>PH4213</b>	3	<b>PH6443</b>	3	Cosmology	8,14,22,34	Susmita Adhikari
<b>PH4273</b>	3	<b>PH6423</b>	3	Non-linear Dynamics	8,14,22,34	M.S. Santhanam
<b>PH4283</b>	3	<b>PH6453</b>	3	Advanced Particle Physics	8,14,22,34	Arun M. Thalappillil
<b>PH4293</b>	3	<b>PH6463</b>	3	Physics of Soft Matter	8,14,22,34	Vijayakumar Chikkadi
<b>PH4413</b>	3	<b>PH6473</b>	3	Quantum Field Theory-II	8,14,22,34	Sunil Mukhi

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<b>PH4613</b>	3			Semester Project	8	Sachin Jain
<b>PH5213</b>	3			Semester Project	14	Sachin Jain
<b>PH6592</b>	2	<b>PH6592</b>	2	Introduction to the Physics of Living Systems	14,22,34	Ushasi Roy
<b>PH6612</b>	2	<b>PH6612</b>	2	Quantum Transport	14,22,34	Atikur Rahman
<b>PH6622</b>	2	<b>PH6622</b>	2	Communicating Science	14,22,34	Satishchandra Ogale
<b>SE4213</b>	3	<b>SE6213</b>	3	Pedagogy of Science	8,14,22	Supriya Pisolkar, Shamin Padalkar (TISS Mumbai, Guest Faculty)
<b>SE4223</b>	3	<b>SE6223</b>	3	The Role of Media, Models and Experiments in Science Education	8,14,22	Aparna Deshpande, G. Nagarjuna
<b>TD2223</b>	3			Data Analysis	4	Amit Apte



# News, Events, and Initiatives



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# CONFERENCES, SYMPOSIA, AND WORKSHOPS

Researchers at IISER Pune organise conferences and workshops that foster collaboration and academic exchange among the scientific community, both nationally and internationally.

## SCIENTIFIC CONFERENCES AND WORKSHOPS

### **Workshop on Geospatial Data Analysis**

April 10-14, 2023

**Organiser** Earth and Climate Science Department, IISER Pune

### **Celebrating Women in Mathematics**

May 12, 2023

**Organisers** Rabeya Basu, Mousomi Bhakta, Anisa Chorwadwala, and Math Club from IISER Pune

### **Quantum Technologies: Introduction, Materials and Devices**

July 10-14, 2023

**Organisers** IISER Pune and iHUB Quantum Technology Foundation, in collaboration with the Purdue Quantum Science and Engineering Institute, West Lafayette

### **Computational Approaches to Memory and Plasticity (CAMP) 2023**

July 11-25, 2023

**Organisers** Collins Assisi and Suhita Nadkarni (IISER Pune); Upinder Bhalla (NCBS, Bengaluru); Rishikesh Narayanan (IISc, Bengaluru); and Arvind Kumar (KTH Stockholm)

### **Emerging Materials 2023**

July 13-15, 2023

**Organisers** Angshuman Nag, Arnab Mukherjee, Muhammed Musthafa, Nirmalya Ballav, Pankaj Mandal, Partha Hazra, and Pramod Pillai from IISER Pune

### **Macromolecular Assemblies: Structure, Function, and Evolution**

August 2-4, 2023

**Organisers** Chaitanya Athale, M.S. Madhusudhan, Saikrishnan Kayarat, and Siddhesh Kamat (IISER Pune); Chandra Verma (BII, Singapore); Damien Devos (Universidad Pablo de Olavide, Spain); Raghavan Varadarajan (IISc, Bengaluru); and Shruthi Viswanath (NCBS, Bengaluru)

### **Exoplanet Conference at IISER Pune**

August 17-19, 2023

**Scientific Organising Committee** Vishal Gajjar (UC Berkeley/SETI Institute); Jayesh Goyal (NISER-Bhubaneswar); Ajit Kembhavi (PKC-IUCAA); Ravi Kopparapu (NASA Goddard); Dibyendu Nandi (IISER Kolkata); Shyama Narendranath (ISRO-Bengaluru); Manoj Puravankara (TIFR-Mumbai); Sivarani Thirupathi (IIA-Bengaluru); Sourav Chatterjee (TIFR-Mumbai); Gopal Hazra (IIT Kanpur)

**Local Organisers** Joy Monteiro and Sudha Rajamani (IISER Pune)

**Low-Dimensional Topology Conference**

September 20-29, 2023

**Organisers** Stefan Friedl (University of Regensburg); Radhika Gupta (TIFR, Mumbai); Tejas Kalelkar (IISER Pune); Mahan Mj (TIFR, Mumbai); Arunima Ray (Max Planck Institute for Mathematics, Germany)

**4th Indian Cancer Genome Atlas (ICGA) Conference**

October 6-8, 2023

**Organisers** ICGA Foundation; IISER Pune; Institute of Genomics & Integrative Biology (IGIB); Ashoka University; Persistent; Pune Knowledge Cluster (PKC); Prashanti Cancer Care Mission

**Organisers from IISER Pune** Prof. L.S. Shashidhara (NCBS Bengaluru and IISER Pune); Dr. Krishanpal Karmodiya, Dr. Kundan Sengupta, Dr. Mayurika Lahiri, Dr. Nagaraj Balasubramanian

**Mini-Symposium on Organometallic Chemistry and Catalysis**

November 3, 2023

**Organiser** Department of Chemistry, IISER Pune

**International Colloquium on Randomness, Geometry and Dynamics**

January 1-12, 2024

**Organisers** Anish Ghosh, Subhjit Goswami, Radhika Gupta, Mahan Mj, and Sabyasachi Mukherjee from TIFR Mumbai and Mainak Poddar from IISER Pune

**43rd Annual Conference of the Indian Association for Cancer Research**

January 19-22, 2024

**Organisers** Mayurika Lahiri (Chairperson); Kundan Sengupta (Secretary); Nagaraj Balasubramanian (Treasurer); Mridula Nambiar; Krishanpal Karmodiya; Siddhesh Kamat

**Upper Bhima Basin Stakeholder Workshop II**

February 23-24, 2024

**Organiser** Bejoy Thomas (IISER Pune)

**EMBO Satellite Meeting on DNA Damage and Repair**

February 17, 2024

**Organisers** Arnab Ray Chaudhuri (Erasmus University Medical Center, Rotterdam, Netherlands); Anjana Badrinarayanan (NCBS, Bengaluru); Dipanjan Chowdhury (Dana-Farber Cancer Institute, USA); Michela Di Virgilio (Max Delbrück Center, Germany); Birija Sankar Patro (Bhabha Atomic Research Center, Mumbai); and Kundan Sengupta (IISER Pune)

**Workshop on Group Theory 2024**

February 23-24, 2024

**Organiser** Anupam Singh (IISER Pune)

**Data Dynamics Summit**

March 15-16, 2024

**Organisers** Amit Apte; M.S. Santhanam; and Pranay Goel; Aanjaneya Kumar; Abhishek Narayan Gorti; Ajit Mahata; Bharathi Kannan; Harshini Tekur; Nisarg Vyas; Ritam Pal; Sayantan Majumdar; Shaunak Roy; Shreya Chakladar; Somashree Chakraborty; and Sreeram P.G. from IISER Pune

## IN-HOUSE DEPARTMENTAL SYMPOSIA

### **ChemSymphoria 2023**

December 18-20, 2023

**Organisers** Chemistry Department and Chemphilic Club, IISER Pune

### **BioConclave 2023-24**

February 1-2, 2024

**Organiser** Biology Department of IISER Pune

## NAMED LECTURES

### **Fifth Annual P.M. Mukhi Memorial Human Rights Lecture**

October 6, 2023

**Speaker** Dr. Suhas Palshikar, Professor (Retd.) of Political Science and Chief Editor, Studies in Indian Politics

**Title** Constitution and the court(s)

**Organiser** Humanities and Social Science Department, IISER Pune

### **Tenth Annual Homi Bhabha Memorial Public Lecture**

November 16, 2023

**Speaker** Prof. Sudeshna Sinha (IISER Mohali)

**Title** Harnessing chaos

**Organiser** Physics Department, IISER Pune

### **2024 K.S. Krishnan Memorial Lecture in Neuroscience**

February 26, 2024

**Speaker** Prof. Oliver Hobert (Columbia University and Howard Hughes Medical Institute)

**Title** Decoding the gene regulatory logic of neuronal cell type specification

**Organiser** Neuroscience Interest Group, IISER Pune

## INSTITUTE COLLOQUIA

### **The SPICMACAY cycle yatra from Kashmir to Kanyakumari - an inward journey**

by Prof. Kiran Seth, Founder–SPICMACAY and Professor Emeritus, Dept of Mechanical Engineering, IIT-Delhi

June 8, 2023

### **Climate change and our role**

by Dr. Mrutyunjay Mohapatra, Director General Meteorology, India Meteorological Department  
August 4, 2023

### **What was India's freedom struggle about? : Looking back from India @75**

by P. Sainath, Veteran Journalist and Author; Founder, People's Archive of Rural India

October 4, 2023

### **Can data science aid social science research?**

by Prof. Sonajharia Minz, Professor, School of Computer & Systems Sciences, Jawaharlal Nehru University, New Delhi

October 31, 2023

**Thinking about (Thinking about Science)**

by Prof. George Rose, Johns Hopkins University, U.S.A.

November 30, 2023

**From Academia to Industry: The HandyLab and GenePath story**

by Dr. Nikhil Phadke, Founder and Chief Scientific Officer at GenePath Diagnostics

January 23, 2024

**The Maratha Century**

by Dr. Uday S. Kulkarni, Surgeon Commander Indian Navy (Retd), Author, and Researcher in History

March 26, 2024

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*Research seminars hosted by the different departments of IISER Pune are not listed in this report. The institute also hosts several academic outreach events reaching out to external audiences such as students, teachers, and members of the public. These activities are described in the Outreach Activities chapter of this report.*  
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# NEWS AND EVENTS

## THIRTEENTH FOUNDATION DAY

April 15, 2023

The 13th Foundation Day of IISER Pune was celebrated with a Foundation Day Lecture by Prof. Sandip Trivedi, Distinguished Professor, Tata Institute of Fundamental Research, Mumbai. Prof. Trivedi spoke on the topic of the entanglement frontier. The then Director Prof. Jayant Udgaonkar shared updates and achievements from the institute with the IISER Pune community. Foundation Day Awards were presented to students, faculty, and staff in recognition of their excellence at work.

## PROF. SUNIL BHAGWAT TOOK OVER AS THE DIRECTOR OF IISER PUNE

April 22, 2023

Prof. Sunil S. Bhagwat took charge as the Director of IISER Pune in April 2023. Prior to joining IISER Pune, Prof. Bhagwat was at the Institute of Chemical Technology, Mumbai, and his research is in the areas of interfacial science and engineering. Prof. Bhagwat succeeds Prof. Jayant Udgaonkar, who led IISER Pune since 2017 and steered the institute through the pandemic years. Prof. Udgaonkar continues his association with IISER Pune as a faculty member in the Biology Department.



*IISER Pune expresses gratitude to Prof. Jayant Udgaonkar (left) for steering the institute between 2017-2023. Prof. Sunil Bhagwat (right) took charge as the Director of IISER Pune from April 22, 2023.*

## TENTH CONVOCATION OF IISER PUNE

May 31, 2023

In the 10th convocation of IISER Pune held on May 31, 2023, a total of 308 students received their degrees. This included 45 students graduating with PhD degree, 25 with Master's and PhD dual degrees, 14 with Master's degree, 207 with BS and MS dual degrees, and 17 with BS degree. Dr. Anil Kakodkar (Chairman, Rajiv Gandhi Science and Technology Commission and Former Chairman, Atomic Energy Commission) gave the convocation address.





Seventeen BS-MS students received their degrees with Distinction (CGPA >9). BS-MS student Mihir Neve received the institute gold medal. PhD students Manesh Prakash Joshi (Biology); Tariq Ahmad Sheikh (Chemistry); Sushant Saryal (Physics); and Saikat Panja (Mathematics) received the Xytel Best PhD Thesis Awards; and BS-MS students Avadhoot Sandeep Jadhav (Biology); Venkata Sai Sreyas Adury (Chemistry); Anuja Raorane (Earth and Climate Science); Chapke Rashmi Sanjayrao (Data Science); Shrijay Sutar (Humanities and Social Sciences); Ajaykrishnan E.S. (Mathematics); and Rhutwik Skanda (Physics) received the Xytel Best MS Thesis Awards.

## G20 EVENT: ONE-DAY SEMINAR ON ACCESSIBLE SCIENCE: FOSTERING COLLABORATION

June 16, 2023

IISER Pune hosted a one-day seminar on “Accessible Science: Fostering Collaboration” organised by the Department of Higher Education (Ministry of Education, GoI) in partnership with Elsevier and IISER Pune. This event was a precursor to the 4th G20 Education Working Group Meeting that took place later in Pune during June 19 to 22, 2023. A report titled, ‘The status and relevance of research collaborations for development, considering G20 nations’ was launched during the Inaugural Session. The event included talks on enhancing academic and research collaboration among education institutions in G20 countries and aligning academic research with United Nations Sustainable Development Goals. A panel discussion on identifying ways to improve interactions among members of the researcher community at the global scale was also part of the programme.



(Left) At the Inaugural Session of the 1-day seminar on “Accessible Science: Fostering Collaboration” at IISER Pune on June 16, 2023: (Left to Right) Prof. Sunil Bhagwat (Director, IISER Pune), Dr. Subhas Sarkar (Hon’ble Minister of State for Education), Shri Sanjay K. Murthy (Secretary, Higher Education, Ministry of Education), and Dr. Nick Fowler (Chief Academic Officer, Elsevier). (Right) Panel discussion held as part of the event

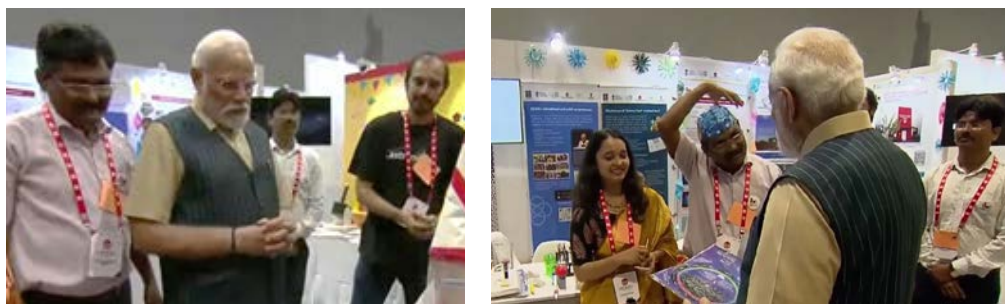
## IISER PUNE AT THE AKHIL BHARTIYA SHIKSHA SAMAGAM 2023

July 29-30, 2023

IISER Pune participated at the Akhil Bharatiya Shiksha Samagam (ABSS) held during July 29-30, 2023 at New Delhi. This event was jointly organised by the Ministry of Education and the Ministry of Skill Development & Entrepreneurship as part of the 3rd Anniversary of the National Education Policy-2020.



Team members from the Science Activity Centre, Ashok Rupner and Ankish Tirpude, represented IISER Pune at an exhibition stall at the event which highlighted the implementation of NEP 2020 at IISER Pune and demonstrated the use of low-cost hands-on activities in the teaching and learning of science and mathematics. IISER Pune Director Prof. Sunil Bhagwat and Dean Academics Prof. Girish Ratnaparkhi also participated at the 2-day event which included talks and panel discussions on thematic areas focused on building an equitable, inclusive, and plural society as envisaged by National Education Policy (NEP) 2020.



*Prime Minister of India Shri Narendra Modi who addressed the inaugural session at the event visited the stall where our members demonstrated activities that can be incorporated into the curriculum for better teaching and learning outcomes.*

Several dignitaries visited the stall by IISER Pune at the Samagam. Shri Dharmendra Pradhan (Hon'ble Education Minister, Government of India) Dr. Subhas Sarkar (Union Minister of State for Education, Government of India); Shri. Sanjay Kumar (Secretary, Department of School Education & Literacy Ministry of Education, Govt. of India); Shri. K. Sanjay Murthy (Secretary, Higher Education, Ministry of Education, Govt. of India); Shri. Abhay Jere (Vice Chairman AICTE & Chief Innovation Officer (CIO), Ministry of Education, Govt. of India); Dr. Anil Sahasrabudhe (Chairman of EC National Assessment and Accreditation Council Educational (NAAC)) were among some of the delegates who visited the stall.

## MOU WITH INDIA METEOROLOGICAL DEPARTMENT

August 4, 2023

A Memorandum of Understanding (MoU) was signed between IISER Pune and India Meteorological Department (IMD), Government of India, on August 4, 2023. The main objective of this MoU is to bring together the complementary expertise of the two institutions to advance our understanding of extreme events, improve human resources in the field of weather and climate and to generate socially and scientifically useful knowledge about Indian climate. The MoU would facilitate development of joint research projects and mentoring of students as well as participation in training and workshops.



*At the signing of the MoU between IISER Pune and IMD: (Left to Right): Dr. Gyana Ranjan Tripathy (Chairperson of the Department of Earth and Climate Science, IISER Pune); Dr. Mrutyunjay Mohapatra (Director General of Meteorology, IMD); Prof. Sunil S. Bhagwat (Director, IISER Pune); and Dr. K.S. Hosalikar (Head, IMD Pune)*

## 2023 INDUSTRY CONCLAVE

August 5, 2023

IISER Pune hosted the 2023 Industry Conclave on August 5, 2023 with ~180 participants consisting of industry experts, researchers and science professionals. This gave an opportunity for the institute to showcase its research and outreach work to industry leaders, and to seek avenues for closer engagements.

## HINDI FORTNIGHT CELEBRATIONS

September 14-29, 2023

As part of Hindi Fortnight, the following competitions were held at the institute: Hindi essay writing (Topic: India's contribution to space research), poetry writing, solo singing, and knowledge of Hindi words and translation. Winners of the competitions were given prizes and certificates.

## GOLD MEDAL TO IISER PUNE TEAM AT IGEM-2023 SYNTHETIC BIOLOGY COMPETITION

November 5, 2023

A team of undergraduate students from IISER Pune won a gold medal at the 2023 iGEM synthetic biology competition, as announced during iGEM's Grand Jamboree event held during November 2-5, 2023 in Paris.



They were the only team from India to bag a spot in the Top 10 undergraduate teams. The team also won the Best Education Award. The team has been nominated for Best Climate Crisis Project, Best Integrated Human Practices, and Best Presentation Award from

among 400+ teams across the world. The award ceremony took place on November 5, 2023.

Working at the laboratories of the institute between February to October 2023, the IISER Pune team had carried out a project on developing Jatropha oil-based sustainable aviation fuel using the yeast as the model system. The team consisted of 14 BS-MS students who were mentored by 5 PhD students. Prof. Saikrishnan Kayarat (IISER Pune) was the primary PI for the team and Dr. Mridula Nambiar (IISER Pune) and Dr. Mehmet Berkmen (New England Biolabs) guided the team as secondary PIs.

## SPECIAL ACHIEVEMENTS BY IISER PUNE MEMBERS

### IISER Pune Faculty Member Prof. Bhas Bapat's contribution to the Aditya-L1 Mission

The Aditya-L1 spacecraft of the Indian Space Research Organisation (ISRO) was launched on September 2, 2023. Prof. Bhas Bapat, faculty member from the Physics Department of IISER Pune, contributed in a major way to the design and implementation of the Solar Wind Ion Spectrometer (SWIS) sub-system of ASPEX, which is one of the seven payloads ferried to the L1 point. Prof. Bapat has been involved with this work since his earlier tenure at Physical Research Laboratory, Ahmedabad and continues to be part of the team.



Prof. Bapat's area of research is experimental atomic and molecular physics. This research involves manipulation and detection of charged particles and photons to unravel atomic and molecular reactions. The expertise in instrumentation emerging from research in his former group has enabled the development of the Solar Wind Ion Spectrometer (SWIS) sub-system.

### Yashkalyani National Vidnyan Prasar Puraskar 2023 to Ashok Rupner

Ashok Rupner (Senior Technical Officer at the Science Activity Centre of IISER Pune), received the Yashkalyani National Vidnyan Prasar Puraskar 2023 from the Yashkalyani Sanstha (NGO). This award is as much a recognition of Shri Rupner's work in science outreach and service to society as it is for the concerted efforts the outreach teams have been putting in year after year to take science and mathematics education beyond the campus.



### Diplomate certification to Dr. N. Krishnaveni Jayakumar



Dr. N. Krishnaveni Jayakumar (Senior Technical Officer at the National Facility for Gene Function in Health and Disease of IISER Pune) received a Diplomate certification from the Indian College of Laboratory Animal Medicine (ICLAM). The certification process involves rigorous training and assessment of skills in laboratory animal medicine and management. Dr. Jayakumar is among the first awardees from India to receive the Diplomate certification of ICLAM.

### NATIONAL SCIENCE DAY 2024

February 28, 2024

National Science Day is celebrated in India every year on February 28th to commemorate the discovery of the Raman Effect by Sir C.V. Raman. It is a day to promote scientific temper and create awareness about the importance of science in our daily lives.



Smt. Indrani Balan Science Activity Centre on campus organised Science Day celebrations at IISER Pune and at the Pimpri-Chinchwad Science Park, by conducting events like talks, interactions with scientists, demonstrations of hands-on activities and experiments, daytime astronomy, science quiz, and many more for the general public. Outreach teams on campus and IISER Pune research students and staff participated in this day-long public engagement event. Over 9,000 people participated in this celebration at IISER Pune, and over 3,000 people participated at the Science Park.

## ALUMNI CONNECT EVENT

January 6, 2024

An alumni connect event was held on January 6, 2024 at IISER Pune. The event brought together our alumni, and current students and faculty members. Alumni were invited to participate either in-person or online. The programme included short talks by some of our alumni followed by a Q/A session, and a discussion session about the Alumni Association.



## THEME-BASED EVENTS

The Institute celebrated the following events during the year: World Environment Day 2023 (June 5, 2023); World Blood Donor Day (June 14, 2023); International Day of Yoga (June 21, 2023); Independence Day (August 15, 2023); Swachhata Pakhwada (September 1-15, 2023); Swachhta Hi Seva Campaign (September 15-October 2, 2023); National Unity Day (Rashtriya Ekta Diwas) and Vigilance Awareness Week (October 30 to November 5, 2023); Constitution Day (November 26, 2023); National Voters' Day (January 25, 2024); and Republic Day (January 26, 2024). These events were coordinated by the Administration section of the Institute with support from student club members and other members from the institute.

# INTERNATIONAL RELATIONS

I SER Pune's international partnerships are centered on the institute's research and teaching mandate to foster the exchange of ideas across the globe. The institute hosts delegations, builds partnerships, and offers international student and scholar services through its International Relations Office.

A total of 29 collaborations were pursued and one Memorandum of Understanding (MoU) was renewed during 2023-24. Described below are some of the activities carried out during the year.

## MOU WITH UNIVERSITY OF GLASGOW, U.K.

February 15, 2024

MoU was renewed with the University of Glasgow, U.K., in the presence of Principal and Vice-Chancellor Prof. Sir Anton Muscatelli, and senior colleagues from the University of Glasgow's College of Medicine, Veterinary Medicine and Life Sciences and School of Education. The purpose of the MoU is to develop academic and research collaborations and exchanges.



## VISIT BY LORD MAYOR OF THE CITY OF LONDON AND DELEGATION

February 14, 2024

The institute hosted a delegation led by Lord Mayor for City of London Michael Mainelli with officials from the City of London Corporation, British Deputy High Commission U.K. in India, and the British Council India. Common interests in science, education and outreach and ways to strengthen collaborations were discussed.



## VISIT BY U.K. MINISTER OF STATE FOR SCIENCE, TECHNOLOGY AND INNOVATION AND DELEGATION

July 6, 2023

IISER Pune hosted a delegation with U.K. Minister of State for Science, Technology and Innovation George Freeman. During the visit, Phase 4 of UKIERI, U.K.-India Education and Research Initiative, was announced to strengthen U.K.-India bilateral collaborations in education and research and for supporting young researchers.



## VISIT BY U.K. MINISTER OF STATE AT THE DEPARTMENT OF EDUCATION ALONG WITH DELEGATION

June 21, 2023

A delegation from the U.K. with Minister of State at the Department of Education Nick Gibb and Alison Barrett (Country Director India) from British Council visited the campus and interacted with members from the iRISE Project hosted at IISER Pune.



## BIOSANTEXC, AN ENS-IISER PARTNERSHIP PROJECT

May 23-25, 2023

Launched in 2022, the Franco-Indian BIOSANTEXC project aims to foster scientific collaboration in life sciences and health. Funded by the French Ministry of Europe and Foreign Affairs and the Ministry of Higher Education and Research, the initiative is coordinated by ENS de Lyon through the ENS-IISER partnership. It includes 11 main partners—France's four Écoles Normales Supérieures (ENS), six Indian Institutes of Science Education and Research (IISERs), and four additional research institutes across both countries. BIOSANTEXC seeks to create a network of excellence through joint Master's and Doctoral programmes.

The official kick-off event for the project was held at IISER Pune during May 23-25, 2023, and featured 29 talks fostering scientific discussions and long-term cooperation. An official consortium agreement for the BIOSANTEXC project was signed at IISER Pune with partners across France and India in the presence of the Consul General of France (Mumbai).



## VISITORS TO IISER PUNE AMONG THE G20 DELEGATES



Visit by delegation from Oman with Minister of Higher Education, Research and Innovation Prof. Rahma Al Mahrouqi  
June 21, 2023



Visit by Mr. Stefaan Hermans (Director and the Head of Delegation for European Union)  
June 23, 2023



Visit by UNICEF Global Director for Education Mr. Robert Jenkins and Education Specialist Sunisha Ahuja  
June 22, 2023



# PARTNERSHIPS AND ENDOWMENTS

**T**hrough the Offices of the Dean for Research and Development and the Dean for International Relations and Outreach, the institute engages with the industry partners towards building collaborations, supporting young researchers, and nurturing capacity building programmes.

## PARTNERSHIPS WITH INDUSTRIES AND ACADEMIC ORGANISATIONS

IISER Pune signed 21 agreements / amendments / MoU during FY 2023-24 with industries and academic organisations through the R&D Office towards the purpose of research collaborations, data use, non-disclosure agreements, etc. Consultancy grants of Rs 51.82 lakhs were received in FY 2023-24 for 3 new and 5 existing consultancy projects.

## ENDOWMENTS

IISER Pune continues to receive support from our well-wishers for our research endeavours, educational initiatives, and collaborative projects. This reflects the trust placed by our donors on our unwavering dedication to excellence in science, research and education.

IISER Pune signed 19 agreements / amendments / MoU during FY 2023-24 with corporate and individual donors through the Outreach and Endowments Office towards collaboration for research and outreach activities supported by CSR funding and philanthropic donations. A total of 26 collaborative activities, including ongoing and new activities, were implemented during 2023-24.

### 1. SUPPORT FOR RESEARCH ACTIVITIES

#### 1.1 Rahul Bajaj Endowed Chair Professorships

Dr. Mousomi Bhakta (Associate Professor, Mathematics), Dr. Thomas Pucadyil (Professor, Biology) and Dr. Pinaki Talukdar (Professor, Chemistry) continued their research work as Rahul Bajaj endowed Chair Professors and also embarked on new scientific avenues.

- Dr. Bhakta is credited with 5 papers during 2023-2024, delivered invited talks at the annual conference of Indian Women in Mathematics (IISER Bhopal, July 2023) and two special sessions at the 13th AIMS conference. She is also conferred with the DST Swarnajayanti Fellowship during this period.
- Dr. Talukdar published 7 papers and delivered 12 talks at national and international forums during 2023-2024.
- Dr. Pucadyil published one each of a research paper, review article, and commentary article. He delivered 10 talks at national and international forums during the period.

#### 1.2 Validation of proof of concept for low-cost breast cancer diagnostics test using indigenous resources for affordable access across India.

Supported by Athen Health Technology Pvt. Ltd., this project aimed to develop low-cost fluorescent labeled probes to detect ERBB2/HER2 gene amplifications for early breast

cancer diagnosis in India. With 12-15% of the global population showing significant ERBB2/HER2 amplification, and even higher rates in Indian patients, there is an urgent need for diagnostics. Transcriptomics data indicate increased ERBB2 gene transcripts in breast, esophageal, and stomach cancers. Immunoblotting confirmed ERBB2/HER2 overexpression in SKBR3 breast cancer cells. The study also suggests the role of lamin A/C in regulating epigenetic marks in breast cancer. The probes successfully detected ERBB2/HER2 in cancer cell lines and patient tissue samples. FISH-based technology enables rapid, affordable breast cancer diagnostics. The project is led by Prof. Kundan Sengupta (IISER Pune) and Dr. Madhura Kulkarni (Centre for Translational Cancer Research, a joint venture of Prashanti Cancer Care Mission & IISER Pune).

### **1.3 Moths as research and educational tool for Biodiversity and Climate Change studies**

Moths are an excellent resource for education and research due to their diversity, ease of identification, ecological importance, global presence, economic significance, abundance, and variety of colors and shapes. To leverage this, Dr. Ramana Athreya's group initiated a moth monitoring programme with several key components. Following a study, the team identified and procured components for a Raspberry Pi-based 3D imaging system to obtain detailed images of reference moth specimens which will be used to develop an AI/ML tool for automated species identification. Supported by CSR funds from Bartleby Technologies Pvt. Ltd., the project has generated extensive data on hundreds of thousands of moths across India, which can be updated annually.

## **2. INFRASTRUCTURE SUPPORT**

### **2.1 Tree plantations to increase diversity of native species and develop the RET garden (rare, endangered and threatened species) on IISER campus**

The CSR funding from Brose India Automotive Systems Pvt. Ltd. (2021-2024) has significantly enhanced biodiversity efforts on the IISER Pune campus. The plantation of >250 native trees in two regions of campus – namely, the teak circle and the Rare, Endangered, and Threatened (RET) plantation area – has been carried out with 98% overall rate of survival.

Over the past 3 years, Brose's support allowed us to source, plant and maintain a large diversity of trees that are native to the Western Ghats, one of the 'world's eight 'hottest hotspots' of biological diversity'. Some of these trees are extremely rare and fall within the International Union for Conservation of Nature (IUCN)'s endangered and vulnerable categories species from the Western Ghats. For example, Red Sandalwood (*Pterocarpus santalinus*) is a slow-growing Endangered category tree which is known for its use in crafting top-quality musical instruments, Sita Ashok (*Saraca asoca*) and Chandan (*Santalum album*) are Vulnerable category trees with several traditional uses of their bark and wood, Raldhoop (*Canarium strictum*) is a rare tree in the Western Ghats forests whose trunk exudes a blackish resin which has a very pleasant smell, and other tree species such as Undi (*Calophyllum inophyllum*) and Wild jackfruit (*Artocarpus hirsutus*) that are endemic to Western Ghats (WG) and whose fruits, bark and wood are widely used by tribal communities.

Walkways have been developed in the (RET) plantation area which is called "Western Ghats Arboretum". It has informational signage to encourage our community members and visitors to learn about the trees and about the importance of local endemic and rare species. These efforts have resulted in a high tree cover at IISER Pune with improved shade and increased number of bird sightings, attracting butterflies, bees, and other pollinators, which contributes to the sustenance of biodiversity. The long-term gains of this initiative are immense – while the immediate IISER Pune community benefits from the green cover, shade, fruits, and

flowers, several native species of trees receive a safe space to propagate, thus boosting the biodiversity of flora and fauna in our city.

## **2.2 P.M. Mukhi Memorial Human Rights Lecture**

Prof. Sunil Mukhi provided a corpus endowment to the Institute for conducting an annual lecture named after his father Justice P.M. Mukhi (former Judge, Bombay High Court). The department of Humanities and Social Sciences of IISER Pune will be the focal point for conducting this well-established annual P.M. Mukhi Memorial Human Rights Lecture series. The fifth annual P.M. Mukhi Memorial Human Rights lecture was held on Friday, October 6, 2023 wherein Dr. Suhas Palshikar Professor (Retd.) of Political Science and Chief Editor, Studies in Indian Politics, delivered a talk on 'Constitution and the Court(s)'.

## **2.3 Centre for Water Research**

The Centre for Water Research at IISER Pune, established in 2020 and formally launched in March 2021 with an endowment from Dr. Sara Ahmed, has continued its work in research, training, outreach and community engagement to bring together expertise in fundamental sciences, social sciences and humanities to the study of water. Completed research projects include 'Observation and modelling of the water cycle in Chandra and Upper Alaknanda Basins' and developing a curriculum based on pedagogical tools for middle school students to reimagine just, resilient and equitable water futures - 'Water Classrooms' ([www.waterclassrooms.in](http://www.waterclassrooms.in)).

The CWR is conducting a Water Audit on IISER Pune Campus (Instrumentation and Data Analysis, Behavioural Survey, and Water Quality Tests). In addition, the centre organised a dialogue 'Social Accountability for Oceans and Coastal Commons' in March 2023 at IISER Pune, which focused on exploring frameworks for deepening social accountability for coastal and ocean commons. Research training included supervising PhD students at IISER Pune and undertaking research collaborations with students from IHE-Delft Institute for Water Education, and Srishti Manipal Institute of Art, Design and Technology on topics related to 'Traditional Water Technologies in India' and 'Land is created by water: The Architecture of an Aqueous Terrain'.

The Living Waters Museum (LWM) hosted at CWR, offered fellowship grants to facilitate scholarship to build dialogues through visual stories around water in Kolkata and Goa - 'The Living Waters of Kolkata' and 'Goa Water Stories'. Their latest project AQUAMUSE, supported by the Water and Development Partnership Programme at IHE Delft, brings together partners from three river basins: the Volta in Burkina Faso, the Blue Nile (Egypt, Ethiopia and Sudan), and the Ganga-Sundarbans. The project envisions a future where water museums, physical and digital, are not only unique repositories of our liquid heritage, but equally play a role in reconnecting communities to water in all its dimensions through education, public outreach and the arts. LWM is only one component of this large grant; as part of the project, the Science Media Centre at IISER Pune is also involved in producing vidcasts on water and heritage practice, in addition to organising a roundtable for environmental journalists in November 2024. CWR Water Talks series, an outreach effort, focused on the rubric of 'Traditional Water System Designs' and hosted guest lectures by speakers from diverse disciplinary backgrounds. Several research papers, articles, reports, books were published, and CWR members were invited to present their research work at various conferences, academic and public forums in India and abroad.

### 3. SUPPORT FOR STUDENT WELFARE ACTIVITIES

#### 3.1 Financial assistance for economically weaker students

During the academic year 2023-2024, the Institute provided support to 217 students for monthly subsistence needs, covering financial assistance for, food, tuition fees, travel to conferences, and boarding at IISER Pune. The financial support to these students from the Economically Weaker Section was possible through CSR funding and philanthropic donations received from multiple corporates and individuals, salient ones are as follows:

- The Infosys Foundation provided partial tuition fee assistance to 42 students and assisted 4 students with full tuition fee support for BSMS degree. They also offered a full tuition fee waiver to 1 Integrated PhD student. Infosys foundation travel grant provided travel assistance to 38 students for conference travel.
- Integrated Decisions and Systems India Pvt Ltd (IDeaS) supported 20 students with full tuition fee assistance, along with providing financial assistance to 6 students belonging to economically weaker sections.
- Mr. Narendra Kale-IISER Pune Meritorious Girl Students Scholarship awarded 5 girl students with scholarships for boarding expenses at IISER Pune.
- The Shraman Foundation supported 33 students with partial semester fees. They also provided one student with visual disability, an i-PAD as a learning tool.
- Trimurti Fabricators Ltd. provided financial support to 8 students.
- Twenty Twenty Interior Design Software (India) Pvt. Ltd. provided financial assistance to 15 students.
- Xytel India Pvt. Ltd. Contributed towards partial semester fee support for 26 economically weaker students.

#### 3.2 IISER Pune - Xytel Ltd. Best Thesis Award

In the reporting period, 11 of our exceptional students were recognised for their innovative research in various disciplines by the thesis evaluation committees and were declared as the winners of the 'IISER Pune - Xytel Ltd best thesis award 2023'. The award was given out to the students during the 9th Convocation held on May 31, 2023.

#### 3.3 TCS Research Scholars Programme

TCS Foundation is implementing the TCS Research Scholars Program (TCS-RSP) which provides scholarships to full-time registered PhD scholars. This is open for PhD scholars of top 100 institutes in India. Ms. Devosmita Sen, PhD scholar from Earth and Climate Science Department was selected under the 17th cycle of TCS RSP. During the reporting period of FY 2023-2024, Ms. Sen continued her research work 'Assessing the Physiological Responses of Regional Indian Forest Ecosystems to Climate Stressors', under the guidance of her supervisor, Dr. Joy Merwin Monteiro, Assistant Professor, Earth and Climate Science and Data Science (Joint).

### 4. SUPPORT FOR OUTREACH ACTIVITIES

#### 4.1 'IISER Pune - Praj Industries Ltd' Mimamsa 2023-2024

Mimamsa science quiz is one of IISER Pune's flagship events as a celebration of science in partnership with Praj Industries. This partnership has helped scale up the competition to new heights. In this 16th edition held in 2023-2024, the Mimamsa team has embraced the online mode completely for conducting prelims, which has greatly increased the reach. The 2024 edition of Mimamsa introduced Earth Sciences as a fifth subject. The Mimamsa 2024 witnessed a great success with participation of over 5000 participants. During the 4-day grand main event, the Mimamsa team organised various events such as Sci-Con, an in-house science fest, workshops and talks from external colleges and organisations, demonstrations in cubing, astronomy, and a special LIGO India stall. Additionally, the Inter-school Science

Exhibition Competition (ISEC) provided young students a platform to showcase their innovative models, fostering creativity and scientific exploration. The 16 finalists from the top four teams had the opportunity to visit Matrix, the R&D Center of Praj Industries Ltd. The Mains round of Mimamsa involved tough competition between final four teams from IISc Bengaluru, IIT Bombay, IIT Delhi, and IIT Kanpur. After all the extremely challenging rounds, IIT Bombay emerged victorious.

#### **4.2 Molecular Biology training programmes for everyone**

With the support from Praj Industries Ltd. and KK Nag Pvt. Ltd., the team continued organising molecular biology workshops for school, undergraduate (Bachelors) and postgraduate (Masters) students in the year 2023-2024. During the reporting period, the team conducted 76 workshops and catered to 773 students, where they learned about an assortment of techniques including isolation of DNA and RNA, PCR, AGE, PAGE, Western Blotting, TA cloning, qPCR, Dot ELISA etc. The overall rating the workshops received was 4.7 out of 5. The team also conducted a special workshop on TA cloning specifically tailored for industrial scientists from Praj Matrix. Further, during the National Science Day (NSD) celebrations on the campus, the team presented one interactive talk and demonstration activity for ~200 students.

#### **4.3 STEM Ready**

The STEM Ready project is a combined initiative of IISER Pune and Tata Technologies to enhance tinkering ecosystems in schools. This year, 214 teachers from government and government-aided schools benefited from a series of five-day STEM workshops. Special tinkering workshops were conducted for teachers equipped with tinkering labs, while student workshops impacted over 3,500 students and 466 accompanying teachers. Additionally, STEM labs were established in four schools. Complementing these core activities were supplementary initiatives such as Teachers' Day workshops, online STEM resources, and YouTube sessions, catering to a diverse audience of educators and online users. These online activities have benefitted over 1,83,188 virtual beneficiaries. The project culminated in the celebration of National Science Day with an open-day event at IISER Pune, engaging over 6,500 students, 300 teachers, and 3,000 visitors, achieving a total of 9500 beneficiaries.

The scope of the STEM Ready project was extended further to establish a community tinkering centre in Pimpri Chinchwad Municipal Corporation (PCMC) area. While the construction of a community tinkering centre was underway, the project team conducted hands-on tinkering workshops for ~200 school teachers from the PCMC region along with demonstrations for Science Park visitors. Special events were also conducted; all these activities benefitted over 8500 individuals which exceeded the initial target of 6000 beneficiaries.

#### **4.4 STEM for Teachers: Capacity Building of 40 Science and Mathematics teachers from schools in Nashik district through a STEM subject learning workshop**

"STEM for Teachers," a project in collaboration with Winjit Technologies, aims to build the capacity of science and mathematics teachers in Nashik district. The project included a three-day workshop and two online sessions, benefiting 40 teachers. Designed to enhance teachers' knowledge and skills through hands-on STEM activities, the workshops aligned with the National Education Policy (NEP 2020).

The IISER Pune team tailored the content by reviewing state and CBSE board textbooks, emphasising the use of low-cost, readily available materials. Teachers created their own activity kits during the workshops, which were later used in classrooms, reaching over 5,000 students. The project's success is evident from video feedback and photos showing teachers conducting STEM activities in their classrooms and school assemblies.

#### **4.5 Self-sustaining biodiversity conservation through tribal livelihoods in Arunachal Pradesh**

The Eaglenest Biodiversity Project was initiated in 2003 to motivate the local community (Bugun tribe) to lead the conservation efforts in Eaglenest Wildlife Sanctuary and surrounding areas. This globally significant biodiversity hotspot has seen IISER Pune scientists driving knowledge-based bird tourism, supporting Bugun conservation economically.

In 2023, HCLFoundation awarded IISER Pune Rs. 25 lakhs through the HCLTech Grant for pioneering rural development work. The grant, led by Dr. Ramana Athreya, expanded the project to include moth ecotourism, to augment livelihoods opportunities for Bugun community. A team of 4 youths from the Singchung (Bugun) area received on-the-job training and carried out all the field work. The team trained local eco-guides and sampled moth communities across 13 sites at elevations from 200 to 3000 m ASL, recording over 25,000 moths.

This comprehensive database, expected to include over 750 species, is the largest of its kind in India, offering a valuable resource for researchers and tourists. The project continues to boost local skills and livelihood opportunities in ecotourism and research.

# OUTREACH ACTIVITIES

IISER Pune believes that the benefits of high-quality science education and infrastructure should not be restricted to members of the institute. As an attempt to spread the excitement of science and to make the expertise and facilities at IISER Pune available to the science and education community, IISER engages in several outreach activities. These encompass social outreach in the local community, capacity building for teachers, making and popularising simple science toys, and effectively communicating scientific research through various media.

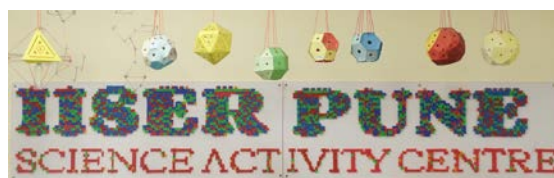
## **The outreach activities are carried out via several channels at IISER Pune:**

These include Smt. Indrani Balan Science Activity Centre, the Science Media Centre, and capacity building projects such as iRISE, MS-DEED, and Molecular Biology Workshops. Together, these initiatives have reached about 2.73 lakh teachers, students, and science enthusiasts during 2023-24.

## **SMT. INDRANI BALAN SCIENCE ACTIVITY CENTRE (SAC)**

Smt. Indrani Balan Science Activity Centre was established as a part of the Center of Excellence in Science and Mathematics Education in August 2017 and develops innovative science toys with easily available material, to give students a hands-on flavour of the subject. The SAC generates educational resource material for students and teachers, aimed at improving conceptual understanding of topics from the curriculum.

Web link: <https://www.iiserpune.ac.in/engage/outreach-and-training/science-activity-centre>



## **WEDNESDAY SCHOOL VISITS AND SUNDAY ONLINE SESSIONS**

During the year 2023-24, the SAC team coordinated the visits of a total of ~10,700 students and teachers from over 130 schools, colleges, and institutes to IISER Pune campus. The visitors are provided information on the research and academic activities of IISER Pune, and are given a campus tour and demo of hands-on science and math activities. Initiated during the COVID-19 pandemic and on since, the Sunday online sessions completed 14 episodes in 2023-24 and received over 1,85,000 views.

Webinars playlist:

[https://youtube.com/playlist?list=PLNsl4FmzN\\_wka0IRUQsWfOm27lcRqYKMg](https://youtube.com/playlist?list=PLNsl4FmzN_wka0IRUQsWfOm27lcRqYKMg)

## PARTICIPATION IN NATIONAL-LEVEL PUBLIC OUTREACH EVENTS

During the year 2023-24, the SAC team participated at the following national-level public outreach events.

1. **Akhil Bhartiya Shiksha Samagam-2023** in New Delhi, July 29-30, 2023: The Honourable Prime Minister Shri Narendra Modi, who addressed the inaugural session at the event, visited the IISER Pune stall, where SAC members demonstrated science and math activities that can be incorporated into the curriculum for better teaching and learning outcomes. About 7,000 visitors, mainly school students and teachers, visited IISER Pune's stall during the event. Many students and educators got an opportunity to try out some of the science toys displayed at the stall.




*With Prime Minister Shri Narendra Modi, at the Akhil Bhartiya Shiksha Samagam 2023 at Bharat Mandapam, Pragati Maidan, in New Delhi*

2. **G20 Event:** Exhibition on Foundational Learning, Digital Education, Research, and the Future of Work held at Savitribai Phule Pune University (SPPU), Pune, June 17-22, 2023: Here, the SAC team presented information about IISER Pune and the SAC's efforts in science, education, and research to international delegates from G20 countries, guests, students, teachers, and members of the public. About 18-20,000 members visited the stall.
3. **CPSE Roundtable Exhibition** hosted by the Department of Public Enterprises, Government of India, at Pragati Maidan, New Delhi, September 25-26, 2023: The Outreach and Endowment team showcased the institute's impactful CSR outreach projects to central public sector enterprises exploring collaborative opportunities in STEM education. The team interacted with delegates from various organisations such as ONGC, GAIL, NTPC, and other PSUs and with ~600 visitors providing information on the institute outreach efforts and initiatives.
4. **10th National Level Exhibition and Project Competition (NLEPC)** of Inspire MANAK in New Delhi, October 9-11, 2023: This is a national-level exhibition and project competition organised by the Department of Science and Technology, Govt of India for school children. The SAC team was invited to this event to demonstrate their innovative activities for school students and their mentors. The team reached out to over 3100 participants during this exhibition.
5. **India Science Festival (ISF)**, IISER Pune campus, January 20-21, 2024: The IISER Pune campus was a venue for this public engagement event focusing on science, technology and innovation. The SAC participated in this festival and conducted a Tangram competition in which over 270 members of the public participated.



## PUBLIC OUTREACH EVENTS

The following events were held at IISER Pune campus some of which are in-person with visitors from schools and colleges in and around Pune, and a few others were held online on the SAC's YouTube Channel.

1. **Zero Shadow Day** occurs twice a year in places located between the Tropic of Cancer and the Tropic of Capricorn. On these special days, the Sun passes directly overhead at noon, casting no shadow on the vertical objects. In collaboration with student-led Aakashganga Astro Club, the SAC team conducted a zero-shadow day observation event on May 13, 2023. Over 440 students and 20 teachers benefited from this event.
 
2. September 5 of every year is celebrated in India as **Teachers' Day** to honour Dr. Sarvepalli Radhakrishnan, a former President and esteemed scholar. An in-person one-day workshop on the topic of "Implementing NEP 2020: By the Teachers for the Teachers" was organised on this occasion. Attended by a group of 80 teachers, this workshop featured five teachers sharing their experiences related to the national education policy. An online session led by Shri Arvind Gupta was organised; this saw participation from 7,278 members.
3. Celebrated on November 14 to honour Jawaharlal Nehru's birthday, **Children's Day** raises awareness about children's rights and welfare. To mark this day, on November 11, 2023, Dr. Vidula Mhaskar from Garware Balbhavan gave a popular talk on "toy stories." She demonstrated how to create educational toys from everyday materials to over 5,200 students who joined this online session. [https://www.youtube.com/watch?v=hau\\_dr9\\_bAI&t=77s](https://www.youtube.com/watch?v=hau_dr9_bAI&t=77s)
4. **National Science Day** is celebrated in India on February 28 each year to mark the discovery of the Raman Effect by Indian physicist Sir C. V. Raman on February 28, 1928, which won him the Nobel Prize in Physics in 1930. The SAC team organised Science Day celebrations at IISER Pune and at Pimpri-Chinchwad Science Park on February 28, 2024, by conducting events like talks, interactions with scientists, demonstrations of hands-on activities, experiments designed by doctoral students and IISER Pune staff, daytime astronomy, science quiz, and many more for the general public. Over 9,000 people participated in this celebration at IISER Pune, and over 3,000 people participated at the science park.



*Glimpses from the National Science Day celebration at IISER Pune (February 28, 2024)*

## OUTREACH ACTIVITIES FOR OTHER INSTITUTES

The Science Activity Centre conducted STEM workshops for the following institutions.

1. The SAC team organised a 2-day summer internship camp at Saraswati Educational Society's Gurukul school, which follows the NCERT curriculum and emphasises experiential learning. The camp included STEM activities and tool handling, where 26 students designed experiments and prototypes. (May 18-19, 2023)
2. The SAC team members conducted a session on fun with hands-on science and mathematics at the Summer School for women students at International Centre for Theoretical Sciences (June 4, 2023).
3. The SAC hosted 100 girl students from various Jawahar Navodaya Vidyalayas from four districts of Maharashtra (Pune, Ahmednagar, Sangli, and Raigad) for a 2-day science promotion activity at IISER Pune. On March 4, 2024, the SAC team hosted 93 students from Kaveri group of schools to participate in Kaveri Inspire Internship Camp. Lab and hands-on STEM sessions and interactions with scientists were part of these programmes. (September 26-27, 2023).

## ACTIVITIES WITH IISER PUNE STUDENTS CLUBS

IISER Pune has various clubs that are run by student groups. The Mimamsa Club conducts various quizzes; the Astronomy Club, called Akashganga, conducts events to popularise astronomy among the student community; the Math Club conducts activities for math enthusiasts such as the celebration of Pi Day and math challenges; the Science Club conducts lectures and demonstrations of science activities for the public, the Disha Club works with in the area of education of underprivileged school students, and the iGEM Club works on the popularisation of biology-related activities. In collaboration with these clubs, the SAC team has conducted outreach activities with schools and college students by arranging lectures, demonstrations, and science model-making competitions. During the 2023-24 academic year, over 510 students and 31 teachers have benefited from these activities.

## EMINENT VISITORS TO THE SCIENCE ACTIVITY CENTRE

Some of the eminent personalities who visited the Science Activity Centre during 2023-24 include Dr. Subhas Sarkar (Union Minister of State for Education, Government of India); Ad. Nitin Thakare (Secretary, Maratha Vidhya Prasarak Samaj, Nashik); Mr. Sandeep Pandey (Ramon Magsaysay Awardee and Founder of Asha for Education); Prof. P.K. Burma (Professor from Delhi University); Prof. Alok Sinha (National Institute of Plant Genome Research, New Delhi); Dr. Pravin Tupe (Director, PCMC Science Park); Dr. Anil Kakodkar (former Atomic Energy Commission Chairman and Secretary, Gol); Shri. K. Sanjay Murthy (Secretary, Higher Education, Dept. of Education, Gol); Shri Sanjay Kumar (Secretary, Department of School Education and Literacy, Ministry of Education, Gol); Dr. Nirmaljeet Singh Kalsi (NCVET Ministry of Skill Development and Entrepreneurship, Gol); Prof. Suman Kundu (Director, BITS Pilani, Goa); Shri Ranjit Singh Deol (Secretary of School Education and Sports, GoM); Dr. Rahma Bint Ibrahim Al Mahrooqi (Minister for Higher Education, Oman); Mr. Stefaan Hermans (Director and the Head of Delegation for EU); Mr. George Freeman (Minister of State Department for Science and Innovation, U.K.); Dhananjai Mohan (Chairman of Uttarakhand Biodiversity Board); Adv. Sandeep Kadam (Secretary, Pune Zilla Shikshan Prasarak Mandal, Pune); Shri. B. Venkateswaran (Deputy Commissioner Navodaya Vidyalaya Samiti); Dr. Milind Nikumbh (Vice-Chancellor of Maharashtra University of Health Sciences, Nashik); Dr. Lilly Raines and Dr. Kunal Gupta (American Chemical Society); Prof. H.C. Verma (Padma Shri awardee and science communicator); Prof. Suresh Gosavi (Vice-Chancellor SP Pune University); Prof. Dhande (Former Director, IIT Kanpur); Prof. Pramod Kale

(Former Project Director, ISRO); Dr. Anil Patil (Former Chairman of Rayat Shikshan Santha); Shri. Dhiren Mathur (Director General, CAG Auditor); Prof. Binay Panda (JNU, New Delhi); and Prof. Michael Mainelli (Lord Mayor of London, U.K.).

#### CSR PROJECTS IMPLEMENTED BY THE SAC IN 2023-24

1. **Tata Consulting Engineers (TCE) Project** – STEM workshop for Teachers: The “STEM Workshop: Vigyaan for Promoting STEM Education” project was initiated by the SAC with Tata Consulting Engineers during the previous years. On June 30, 2023, the SAC successfully completed this project by conducting a three-day online refresher course. A total of 61 teachers participated in the course, and over 6,000 students benefited from teachers trained under this project this academic year.
2. **Project with Winjit Technologies for capacity building of science and mathematics teachers from schools of Nashik district through STEM Subject learning workshop:** Under this 4-month project (October 18, 2023, to February 17, 2024), the SAC team conducted workshops in Nashik for selected school teachers from Nashik District at Maratha Vidya Prasarak Samaj during November 23-25, 2023. During the workshop, teachers made their own activity STEM education kits, which they have used in their classroom teaching. Over 4,000 students have benefited from these activity kits.



*Teacher's workshop at MVP Samaj, Nashik, on November 23-25, 2023*

3. **STEM Ready Project:** This 3-year STEM Tinkering project funded by Tata Technologies under its CSR Initiative was launched during the previous year (2022-23). The project involves training teachers through 5-day staggered workshops and setting up tinkering labs in select government and government-aided schools in the Pune region. As an extension of this project, work is underway to set up a STEM Tinkering Community Center at the Pimpri Chinchwad Science Park in Pune. A Sunday Science series has also been initiated by the SAC team at the Science Park. Additional details related to the STEM Ready project have been given in the Partnerships and Endowment Chapter of this annual report.

Through the activities conducted during 2023-24, the Science Activity Centre has reached a total of 2,68,007 members including students, educators, officials, and members of the public. The YouTube channel of the SAC houses all the online programmes conducted so far. The channel has been subscribed to by 92.1K people with over 5.6 million views.

<https://www.youtube.com/@IISERPuneScienceActivityCentre/videos>

## SCIENCE MEDIA CENTRE

The Science Media Centre (SMC) at IISER Pune is actively involved in the activities of Science communication to share science through innovative strategies. During 2023-24, the SMC has been involved in the following activities:



### EXPLORING SCICOMM PROJECT

The SMC has completed a project in collaboration with the University of West England - Bristol, UK, that delves into the practice of science communication in India and U.K. The following activities were part of the project for the IISER Pune contingent:

- 2 Roundtables with Science Communicators reflecting on their own work to develop content for an upcoming course on scicomm
- 8 Student Fellows developed 4 exciting scicomm projects under the mentorship of members of the Science Journalists' Association of India
- 3 podcasts: on the topics of Fact Checking, History of Science Journalism in India; and Rural Science Journalism in India
- 2 public talks by members of the Science Communication Unit, UWE Bristol, for the IISER Pune community on topics in Science Communication.
- Similarly, Dr. Shalini Sharma and Vivek Kannadi, were invited to give talks at UWE Bristol.

This project was funded by the British Council Global Partnership Grant to co-develop inclusive science communication courses in collaboration with UWE, Bristol, Nature India, the Association of British Science Writers, and the Science Journalist Association of India.



### STUDENT ENGAGEMENT PROGRAMME

SMC's Student Engagement Programme is set up to train and mentor the students of IISER Pune in science communication through various media. Students are first invited to workshops and a select few continue as student interns at the centre.

- A total of 5 workshops were conducted on topics ranging from visual designs, 3D illustrations, and animations for science communication, life history interviews, and documentary production for BS-MS and PhD students.
- These workshops aimed at having a work-integrated learning approach and were outcome-based. Students made their own scientific illustrations, designs, and documentary scripts by the end of each workshop.
- Around 80 students attended these workshops, and 6 of them are working at SMC as part of the ongoing science communication projects.

The SMC also conducted a workshop during the Indian Science Festival 2024 called 'ARchitects of the Unknown' exploring scicomm through Augmented Reality. It was attended by around 50 participants of various age groups and professional backgrounds.



## ORIGINAL PRODUCTIONS



Over the past year, the SMC has produced 3 episodes of SciTalk@SMC with Prof. Anil Kakodkar, Prof. Ajay Sood, and Prof. K.N. Ganesh. The production of a documentary on Dr. Bibha Chowdhuri in collaboration with some faculty and students of IISER Pune and experts in high energy and particle physics is in progress.

## SUPPORTING OUTREACH ACTIVITIES



The SMC has been documenting the iRISE project and showcasing its impact in the domain of STEM teacher training through videos and posters. The SMC also extends support to the Science Activity Centre for the Sunday Live series and during National Science Day activities, and has supported the production of a video for Molecular Biology Workshops coordinated by Prof. Sutirth Dey.

## MOOC COURSES

SMC has produced 25 courses till now for the National Program on Technology Enhanced Learning (NPTEL). The following courses are currently under production: Enzyme Biochemistry by Dr. Siddhesh S. Kamat, IISER Pune; Cognitive Basis of Science Education by Prof. G Nagarjuna, IISER Pune; and Polymathic Nature of Biology by Dr. Collins Assisi, IISER Pune.

## FACILITATION OF INSTITUTE ACTIVITIES

- SMC has documented over 115 events through photography, videography, and live broadcasting for the IISER Pune administration and various departments and centres in the institute.
- Covering events for organisations like AIC SEED, I-HUB Quantum Technology Foundation, S&T Digital, National Research Development Organization, and Agharkar Research Institute.
- 2 Research Communication videos: for Dr. Arun Venkatanathan and the ECS department.
- 2 artworks: 1 journal cover art for Dr. Shabana Khan and 1 Logo Design for an upcoming SAC facility.

## MS-DEED PROJECT

The Maharashtra State Development of Educators and Enhancement in Delivery (MS-DEED) Programme is a close collaboration between IISER Pune and the Maharashtra State Faculty Development Academy (MSFDA) - Centre for Multi-disciplinary Curriculum & Pedagogy under the Department of Higher and Technical Education, Government of Maharashtra. The MS-DEED team has been reaching out to higher education institutes and faculty members across Maharashtra with formal collaborations with universities, autonomous colleges, and educational organisations.



During the year, the MS-DEED team conducted 13 Level-1 Introductory workshops for undergraduate teachers with 964 participants and 2 Level-2 Master Trainer workshops with 96 participants. Participants completing the intensive Master Trainer programme are involved in training other educators.

The activities conducted during the online and in-person Level-1 workshops focus on active learning, defining learning outcomes, inquiry-based teaching, assessment methods etc., followed by subject-wise breakout sessions focusing on the subject-specific pedagogies and activities. Participants are also engaged in performing various pre- and post-workshop activities.



Level-2 workshops are conducted over the course of 10-12 days when the participants undergo rigorous training consisting of various sessions. There are 40-50 sessions in total that introduce the participants to different topics in sciences and education, which is helpful in the implementation of an active teaching-learning process. Some of the sessions are common and held for the entire cohort of participants, and some are subject-specific. The participants are divided into groups according to the subject that they teach. Adopting digital pedagogy, assessment planning and strategies, and training the participants to become master trainers to conduct short workshops in their own regions are some of the themes the workshops focus on.



The overall themes that sessions conducted by the MS-DEED team during Level-1 and Level-2 workshops focus on the teaching-learning process, role of creativity in science, subject-specific sessions, digital pedagogy; assessment planning and strategies, and training the trainer.

The team initiated Student-Teacher integrated workshops to promote experiential learning and reached 204 students and 36 teachers through these new workshops. An innovative 'Assessment: Purpose and Strategies for Learning' workshop was also added to the pool this year. A new Master Trainer Fellowship is being introduced by the team for reaching out to MS-DEED alumni who are taking the learnings from the programme to classrooms and peers.

The MS-DEED team contributed to other IISER capacity building activities including an introductory workshop on effective teaching-learning for IISER Pune doctoral students and Science Activity Centre programmes.

The MS-DEED team has reached over 3500 teachers from 385 colleges across 36 districts of Maharashtra since inception in 2021.

## IRISE PROJECT

 The Inspiring India in Research, Innovation, and Stem Education (iRISE) is a programme designed to encourage innovation in young minds, develop educators & teachers to encourage India's next generation's affinity to science, and support science professionals through sturdy industry-academia collaborations. Under iRISE, the four proposed interventions are the Teachers' Development Strand (TDS) for school education, Early Career Research Development Strand (ECR) for STEM PhD scholars, Thought Leadership Forum for bringing together academia and industries for policy deliberations and CxO forum to promote innovation culture in industries.

Under the Teachers' Development strand of iRISE, science and mathematics teachers are being trained in inquiry and activity-based learning to be innovation champions across multiple states of India. The programme has been initiated in four states - Maharashtra, Bihar, Uttarakhand, and Jharkhand.



For the year 2023-24, under the Teachers' Development strand the iRISE team conducted 6 regional workshops for over 400 teachers, developed 136 master trainers (Innovation Champions) at IISER Pune campus and 44 district-level cascade workshops reaching over 2523 teachers directly and indirectly to around 69,000 students. Under the

Early Career Research Development Strand, the team reached more than 600 PhD scholars and post-doctoral researchers through 12 workshops. iRISE Recognition Awards have been instituted for teachers who have demonstrated outstanding commitment to cultivating a culture of innovation in their region.

So far, the iRISE team has done 16 regional workshops (3-day workshop) for over 1600 teachers, developed 450 master trainers (Innovation Champions) at the IISER Pune campus (10-day residential workshop) and 96 district-level cascade workshops (3-day) reaching over 5600 teachers directly and around 2 lakh students. Of the total participants, 65% are from rural districts, and 38% are female.

## MOLECULAR BIOLOGY WORKSHOPS

The primary aim of these workshops is to train students in basic and advanced techniques of Molecular Biology. This training is also useful for those working in inter-disciplinary areas (e.g. chemical biology), where some molecular biology techniques are often used. These are paid workshops that are conducted at two levels—at basic level for school and college students, and at advanced level, for third year BSc, MSc and PhD students.

Molecular Biology is a vital and dynamic field in the 21st century, enhancing our understanding of life's processes and serving as the foundation for biotechnology applications in medicine and conservation. The motivation behind initiating this programme is that despite significant investments in research and education, expensive and time-consuming methods often limit bachelor's and master's students in India to mere observations of techniques like PCR and cloning, preventing them from connecting theory to practice. As a result, many first encounter these techniques during projects or jobs, typically with minimal supervision, leading to varying levels of success. These workshops aim to bridge this gap by providing hands-on training in both basic and advanced molecular biology techniques. Participants gain practical skills and insights, empowering them to think critically and approach the field with a deeper understanding of the concepts. The workshops conducted in 2023-24 received funding support from Praj Industries Ltd and KK Nag Pvt. Ltd.



During the reporting period of 2023-24, the MolBio Workshop team conducted 76 workshops and catered to 773 students. Of these, 7 workshops were organised free of cost for students from economically weaker sections. Participants learned about an assortment of techniques including isolation of DNA and RNA, PCR, AGE, PAGE, Western Blotting, TA cloning, qPCR, Dot ELISA etc. The overall rating the workshops received was 4.7 out of 5. The team also conducted a special workshop on TA cloning specifically tailored for industrial scientists from Praj Matrix. Further, during the National Science Day (NSD) celebrations on the campus, the team presented one interactive talk and demonstration activity for ~200 students.

## SOCIAL OUTREACH

Social outreach activities are conducted by voluntary organisations at the institute run primarily by the IISER Pune student community in association with faculty coordinators and volunteers. Disha is a student run social outreach organisation at IISER Pune and works towards making education accessible for children from underprivileged and marginalised communities from nearby localities.

Prutha is a green initiative by IISER Pune students that works to create awareness about issues related to the environment and to promote a clean campus. The group is involved in organising nature walks, clothes donation drives, and activities around management of waste.

Information on these student-led social outreach activities, along with several other initiatives by the student community, is given in the *Student-led Activities* chapter of this report.



# STUDENT-LED ACTIVITIES

**T**he large range of community activities on campus at IISER Pune are directed and driven by our energetic students. These activities engage not only the student community, but also staff, faculty and community members alike, and span the range of art to quizzing to astronomy.

## ACTIVITIES CONDUCTED THROUGH STUDENT CLUBS

Clubs such as Aroha, Art, Astro, Dance, Disha, Drama, Hindi, Kaleidoscope, Kalpa, Karavaan, Literary, Marathi, Maths, Mimamsa, Quiz, Satrangi, Science, SPICMACAY, Sports, and Yoga clubs conducted activities in the year 2023-24. Some of these activities are described below.

**Navarasa**, the dance club of IISER Pune brings together the community through vibrant performances for Republic Day, Karavaan, and many more such events.

Activities during the year:

- Navarasa Showcase, a 30 min ensemble during the annual student fest Karavaan held in March 2024
- Organised a Ballet Demo by choreographer and teacher Ms Olena Bublyk in October 2023
- Coordinated the conducting of Kathak and salsa classes on campus

The **Quiz Club**'s main mission is to preserve and share the hobby of quizzing within IISER Pune and with the rest of Pune.

Activities during the year:

- Monday Night Quizzes (MNQs) on Mondays at 9 PM during the semester with a different theme each week; Fresher's Quiz, the Erdős Quiz as part of Pi Day in collaboration with Maths Club
- Cynosure Open Quiz, as part of Karavaan in March 2024

**Aroha** is the music club of IISER Pune

Activities during the year:

- Cultural programmes for Independence Day and Republic Day celebrations
- Open Mics as a platform for IISER community to showcase their musical talents
- Aroha Showcase for Karavaan 2024
- Let's Talk Music (LTMs) sessions at introducing the audience to an expansive view of the facets of a particular aspect or type of music

**Disha** is an independent voluntary social organisation of IISER Pune students. Through its programmes, it is involved in the education of children who belong to socio-economically disadvantaged communities.

Activities during the year:

- Spread the Smile programme held in Vettele and Chas villages with sessions on astronomy, the solar system and eclipses, microscopes, menstrual health, and vaccinations
- Abhyasika volunteers teach students from socio-economically disadvantaged backgrounds living in Lamanvasti. Volunteers spend about an hour about three times a week teaching children
- Mindspark sessions engaged students with fun activities and demonstrations
- Organised talks via the Talk for Twenty series

**Yogen, the Yoga Club** works towards spreading awareness regarding yoga, health and wellbeing.

Activities during the year:

- Events as part of the International Day of Yoga (IDY 2023) along with Sports Club: A 10-day free yoga workshop, asana competition, T-shirt designing, bicycle rally
- Organised regular sessions of Mindfulness Meditation for 4 months followed by Vipassana meditation and Zumba sessions for 3 months
- Organised Fit India Week along with Sports Club and a kite-flying event on the theme of “Vaisudhava Kutumbakam”
- Organised a 5k marathon with the theme of “Run for Peace & Harmony”; 13 winners were awarded prizes; and events like Yotsi Yoga series and Bee You Personality Development series as part of the yearly activity of the club



**Aakashganga**, the IISER Pune Astro Club, caters to the astronomy and astrophysics enthusiasts and amateur astronomers at IISER Pune fostering a greater interest and understanding of the wonders of the universe.

Activities during the year:

- Learning sessions on astronomy; Talks on topics like astrophotography, solar science, cosmology, and astronomy throughout the year
- Stargazing event in partnership with Foliage Outdoors during February 2-3, 2024
- On the occasion of the National Science Day (February 28, 2024), organised day-time astronomy session in collaboration with the IISER Pune’s Smt. Indrani Balan Science Activity Center. Activities included Demonstration of how a telescope works; Viewing Sunspots through solar viewer (projecting sun); Horizontal and Equatorial Sundial; Size scale model of solar system; and Distance scale model of solar system

The **Science Club** organises events and talks on the latest events in science and on the lives and careers of eminent personalities in academia.

Activities during the year:

- Conducted discussion sessions with alumni
- Hosted ‘Know Your Professor’ series to offer an opportunity to learn about the career paths of the scientists and to promote interactions between professors and students outside of the classroom setting
- Organised ‘Know Your Courses’ sessions to familiarise students with their coursework
- Organised Nobel Evening talks
- Produced the Science club magazine titled *Helicase* for the year 2023-24

The **Maths Club** aims to promote a deep regard for mathematics through fun-filled activities.

Activities during the year:

- Organised Integration Bee event on August 26, 2023 with over 120 participants battling for the crown of ‘Grand integrator’.
- Set up information stall during National Science Day where simple demonstrations and games were used to exhibit elegant and profound ideas in mathematics.
- ‘Merch design contest’ was held with the winning designs to be printed on t-shirts and sold as official Maths Club merchandise
- On the occasion of National Mathematics Day on December 22, 2023, the birthday of Srinivasa Ramanujan, Sudoku competition was held in the last week of December 2023 with over 150 participants comprising students, faculty and administrative staff
- Axiomathica, a rigorous mathematics exam, was conducted for the first time with UG, PG and PhD students as participants from colleges around Pune. The event was well received

with close to 50 participants.

- Hosted a game show in collaboration with Karavaan on January 27, 2024 with close to 50 participants
- International Mathematics Day (also known as Pi Day) was celebrated from March 9-14, 2024 with various outreach activities for school students, insightful talks by distinguished mathematicians, a treasure hunt, some mathematical games and many more events.



**SPIC MACAY IISER Pune** The Society for the Promotion of Indian Classical Music And Culture Amongst Youth (SPIC MACAY) at IISER Pune is committed to bringing the best of Indian classical music, dance, and art to the campus. With a significant student engagement, this organisation started in 1977 by Dr. Kiran Seth (IIT Delhi) has created opportunities for students to engage with artists across the country. SPICMACAY coordinated the following concerts during 2023-24

Activities during the year:

- Astarāga, an evening concert featuring Hindustani vocalist Manjusha Kulkarni-Patil (June 2, 2023)
- Sitar Sargam, a concert featuring sitar maestro Purbayan Chatterjee (September 2, 2023)
- Kathak lecture-demo by Benares gharana Kathak dancer Shri Rudra Shankar Mishra (September 1, 2023)
- Yakshagana concert featuring the Idagunji Yakshagana Mandali (October 9, 2023)
- Sarod Recital by Pandit Partho Sarothy (February 11, 2024)
- Swaranjali, a Bansuri Recital by Pandit Ronu Majumdar (March 1, 2024)



**Prutha** is IISER Pune's environmental club that works towards making life off and on campus more sustainable.

Activities during the year:

- The Prutha MarketPlace Whatsapp group promotes reusability where people can sell their old stuff to people who can use them. This initiative helps curb mass consumption and reduce items that might otherwise end up in landfills.
- Organised a Mula River Cleaning Drive in collaboration with the Jeevit Nadi Foundation as a part of the Swachhata Hi Seva Mission (October 1, 2023).
- Organised a tree-planting event on October 13, 2023 as part of the Ministry of Education initiative. Planted native trees with the goal of conserving local biodiversity.

The **Sports Club** organises and coordinates sports activities throughout the year on campus. It plays a crucial role in promoting physical fitness, teamwork, and a healthy lifestyle among students, faculty, and staff.

Activities during the year:

- Organised the Research Premier League (RPL) 2023: During May 2023, the research institute High Energy Materials Research Laboratory (HEMRL) conducted Season-1 of RPL at the IISER Pune cricket ground. Teams from different research institutes (IISER Pune, CSIR-NCL,

HEMRL, and ARAI) participated in this tournament. The IISER Pune team secured second position in this tournament.



- Organised a bicycle rally on June 3, 2023 on the occasion of the World Bicycle Day.
- Organised a 10-day yoga workshop along with the Yogen Club at IISER Pune as part of observing the International Day of Yoga (June 21). Also conducted competitions in asanas, meditation, and suryanamaskar, treasure hunt, a 5k marathon, T-shirt designing and speech competitions. Winners were felicitated with cash prizes and certificates.
- Celebrated National Sports Week (August 21-29, 2023) with the motto "Sports as an enabler for an inclusive and fit society" by organising indoor and outdoor games, as well as fun activities, to encourage participation and to motivate a healthier lifestyle for the entire IISER Pune community.
- A large team of players from IISER Pune participated at the 10th Inter-IISER Sports Meet (ISM) hosted by IISER Thiruvananthapuram during December 23-29, 2023. The IISER Pune contingent secured 5th position overall.



- Organised a 5k run on the occasion of observing the Run for Unity and Vigilance-2023 initiative on the occasion of Rashtriya Ekta Diwas on October 31, 2023; competitions as part of the Fit India Week during December 1-6, 2023 along with fitness assessment through a mobile app; and a cricket exhibition match between students vs faculty & staff.
- Initiated Kreedajung 2024 in January 2024, an Intra-IISER Pune Sports fest – IISER Badminton League, Basketball League, Tennis League, Football League, Volleyball League, Table Tennis League, Kho-Kho League, Kabaddi League.
- Organised cricket matches as part of the IISER Premiere League through month of April 2024

The **Cubing Club** was initiated during 2023-24 to spread the joy of solving the Rubik's Cube to everyone.

Activities during the year:

- Organised three competitions affiliated with the World Cube Association (WCA): IISER Pune Winter Open 2024, Indian Nationals FMC 2023, and FMC 2024 (part of a worldwide event)
- Organised cubing workshops: one in coordination with the Science Activity Centre (SAC) for children of campus residents, and two workshops at beginner and intermediate-level for students on campus

The **Hindi Club** aims to celebrate the cultural depth and linguistic beauty of the Hindi language and instill a profound appreciation for the Hindi language and its literature among the younger generation.

Activities during the year:

- Coordinated Hindi Pakhwada, a fortnight of Hindi-language based competitions celebrating the Hindi language during September 1-14, 2023. Language and literature-based activities such as Nibandh Lekhan, Shayari Lekhan, Kavita Lekhan, Kahani Lekhan and Antakshari events were held. Award winners were handed out prizes on the Republic Day. Winners included Pranav Maheshwari for Nibandh Lekhan, Hitendra Kumar for Kahani Lekhan, Rachit Pratham for Kavita Lekhan, Apoorva Naik for Shayari Lekhan, and Mohit Purushottam Mantri's group for the first place in Antakshari.
- Observed Parakram Diwas 2024 on January 23, 2024 through an "Open Mic" event and the movie "Netaji Subhas Chandra Bose: The Forgotten Hero" was screened to honour the 127th birth anniversary of Netaji Subhash Chandra Bose.
- On Republic Day (January 26, 2024), students representing the club presented poetry and speeches in Hindi on stage.



**IISER Pune's Film Club, Kaleidoscope**, aims to build a general appreciation for the filmmaking medium through both consumption and making of movies.

Activities during the year:

- Kaleidoscope hosts biweekly film screenings chosen by coordinators or student polls, often centered around a common theme or genre. Films by a chosen director are showcased along with analysing their style, cinematography, and direction
- Organised theatre trips for new releases, including Barbenheimer and Killers of the Flower Moon.
- Launched the Filmmaking Division, completed four short films, with three submitted to IICM's Short Film competition. Workshops on screenwriting, editing, and camerawork were held for students interested in filmmaking.
- For Independence Day and Muktiparv, the club invited local directors to screen their documentaries and discuss social issues.

### Mimamsa Science Quiz

Prelims: January 28, 2024; Mains: March 28-31, 2024

Mimamsa is a national level undergraduate science competition with the objective of promoting critical thinking among students across colleges in India. The team, comprising of IISER Pune students, dedicates itself to year-long question making sessions to create a remarkable experience for all participants. Since the year 2020, partnership with Praj Industries helped scale up the competition to greater heights.



Over 1430 teams with a total of over 5000 participants across India registered this year in the span of two months. The Prelims round was held on January 28, 2024, online, on the CodeTantra platform proctored by several of our volunteers. The top four teams that made it to the final Mains round were IISc Bengaluru, IIT Bombay, IIT Delhi and IIT Kanpur. The grand Mains event took place from March 28-31, 2024, in a four-day battle of wits as the top 16 participants contested valiantly for the Mimamsa 2024 title and trophies. After all the extremely challenging rounds, namely, Deep Thoughts, a Brief Thought and a Rapid Fire, IIT Bombay emerged victorious.

Lastly, this edition also saw the continuation of the grand Sci-Con started by the Mimamsa 2023 team. The event saw stalls and interactive displays set up by various clubs and a lab from IISER Pune, and an attendance of many high school students, several amongst them participating in the Inter School Science Exhibition Competition (ISEC).

### **Karavaan Annual Festival**

March 1-3, 2024

Karavaan is IISER Pune's annual socio-cultural festival, which serves as a platform to celebrate and showcase the diversity present within the institute's community. Karavaan 2024 was a year-round event that culminated in March, with a series of activities aimed at fostering unity, creativity, and social engagement among the students, faculty, and staff. Throughout the year, multiple pre-event activities were organised, including the 'Back to School' event and 'Halloween Night,' which saw robust participation from the community. These events featured performances, showcases, and competitions such as open mic sessions and cosplay contests, which demonstrated the creative talent of the students. Additionally, various food stalls offering a diverse range of cuisines added to the festive atmosphere.

The main event of Karavaan 2024 introduced IISER Pune's first-ever prom night, aimed at promoting companionship and camaraderie. The subsequent days featured a wide variety of activities, including an Art Bazaar showcasing handcrafted items and a CV Showcase providing a platform for performing arts. Evening events were dedicated to musical and dance performances, with notable contributions from Spicmacay, Aroha, Navarasa, and external artists such as DJ Swattrex, the Xenial Secret, and Bollywood singer Shashwat Singh. These performances were complemented by the availability of food and beverage outlets, enhancing the overall festival experience.

Karavaan continues to serve as an important platform for community building within IISER Pune. By fostering collaboration, participation, and healthy competition, the festival enables members of the community to expand their social networks and engage with broader societal opportunities.



# Support Structure

Support Structure and Facilities 150



# SUPPORT STRUCTURE AND FACILITIES

IISER Pune has set up institutional policies and procedures to facilitate smooth functioning of the institute and to coordinate activities on the campus. Matters related to general administration, finance, human resource management, IT requirements, procurement of equipment and consumables, civil, electrical and other engineering infrastructure are all handled by qualified staff members in consultation with institutional committees. The institutional committees are comprised of teaching and non-teaching staff members with a dual purpose: to oversee all support systems and to develop and implement plans to support future needs of the institute.

The **Administration** section takes care of recruitment to regular positions and of personnel under various research projects; maintains personal records, service books, and Annual Performance Appraisal Reports; and facilitates security, housekeeping, and transport services.

The **Finance and Accounts** section handles preparation of budget estimates, monitoring of expenses under various account heads, internal audit of payments and disbursements, preparation of the Annual Accounts, and interaction with the audit team of CAG (Comptroller and Auditor General of India).

The **Purchase** section of the institute looks after the indigenous and import procurement required for the entire institute. The purchase section finalises the service contracts and maintenance contracts. The procurement process is managed through the Government eMarket (GeM) and Central Public Procurement Portal (CPPP).

The offices of the Dean Graduate Studies and Dean Doctoral Studies constitute the **Academic** section that handles all aspects pertaining to the student admission process, timetable and classroom requirements, conducting of exams, and maintaining of student records.

The campus is connected through a dedicated internet leased line of 10 Gbps National Knowledge Network and a 1 Gbps BSNL line for uninterrupted internet access. The institute has a centrally managed indoor and outdoor dual band campus wide Wi-Fi access network, high speed wired local area network along with perimeter IT security protection. The **Information Technology (IT) section** manages setting up, upgradation and operations of these facilities along with hosting critical infrastructure services such as IT security, email, website, DNS, Eduroam, iisERP, latest state of the art computer laboratories, virtual reality laboratory, facial recognition based attendance system, and recruitment as well as admissions software. The team also manages institute machines, local area network, voice over internet phones (VoIP), VPN services for users, audio-video equipment during on campus events, and supports the IT related operations at the auditorium, GH & convention center, classrooms, seminar halls, lecture halls and e-classrooms.

The IT section continues to provide system and scientific application support for the National Supercomputing Mission funded PARAM Brahma supercomputing facility of peak computing power 1.7 PF hosted at the institute on a 24x7 basis. This facility has helped many researchers of the institute as well as other institutes to successfully carry out their compute-intensive research in the areas of High Performance computing, Artificial Intelligence, Deep Learning, Machine



Learning, and Big Data from a location of their choice. Advanced HPC users from other institutes across the country avail the services of the supercomputing facility on a pay-as-you-use model.

IT section has facilitated installation of a state of the art Artificial Intelligence facility of peak computing capacity of 1 PF along with 3 PB storage, especially for applications related to Data Science, AI, ML etc. IT team provides system as well as application level support for the high performance computing clusters and parallel file system based storage hosted in multiple data centers aggregating 3.1 PF along with 5 PB storage for various scientific and research applications in the areas of computational biology, particle physics, astrophysics, computation chemistry, materials modelling, molecular dynamics, nanoparticles, cryptography, seismology, climate science, etc.

The IISER Pune campus has world-class infrastructure for teaching, research, housing and recreational facilities for students and employees. IISER Pune campus is GRIHA 4 star rated green and energy efficient campus. The physical infrastructure consists of Main Laboratory Building, Lecture Hall Complex, Animal House Facility, Guest House-cum-Convention Centre, students' hostels with central dining facility and on-campus housing for employees. Further common amenities include outdoor sports facilities, an indoor sports complex, shopping facility, daycare, wellness clinic and pharmacy. The **Engineering** section handles all construction activities on the campus along with maintenance and upkeep.

Working at the interface of research and administration, the **Research Administration and Development Integration Office (RADIO)** is envisaged to further the research progress of IISER Pune through support in the following areas: garnering research funding; forging national and international partnerships; bringing in endowments; engagement through research communications via print and online media including annual report, institute website and social media portals; and actively engaging with various stakeholders in government and private bodies, alumni, and members of the public.

**Srinivasa Ramanujan Library** is an integral part of academic and research work on campus. It supports the teaching, learning, research, and other scholarly activities of the institute with over 32000 print documents, 4000 online journals, 5 online databases, over 6000 e-books and 2000 theses and dissertations in its collection. Library facilitates access to electronic, print, and multimedia resources and provides essential online information and research support services. Library has added 1304 purchased books during 2023-24, out of which 241 are Hindi books. 30 gratis books have also been added to its collection in the last financial year. A large part of the journals and online resources' subscription is through e-ShodhSindhu – a national consortium for higher education e-resources formed by the Ministry of Education (MoE), Govt. of India, and 'IISER Library Consortium'. Library services are completely automated with all the required software tools and the circulation kiosk is integrated with RFID technology and a biometric user authentication system.

The library provides various research support services such as Faculty Research Profiles, Assistance to Open Access Publishing, Bibliometrics and Scientometrics Analysis, Plagiarism Checking Service, Current Awareness Service, Document Delivery Service, Inter Library Loan, Author Workshops, Orientation, Training, and Digital Literacy Programmes. The library also provides access to various essential research tools such as Web of Science, Scifinder Scholar, MathScinet, Derwent Innovation, Grammarly, Turnitin, Cambridge Structural Database, and ChemDraw. The Library has been actively engaged in designing and delivering need-based information services. Library also supports user community with their academics by providing off-campus access to e-resources through 'Remote Access Portal'.

Digital Repository (DR) (<http://dr.iiserpune.ac.in:8080/xmlui/>) has been set up to preserve and provide instant access to the scholarly output of IISER Pune faculty, students, staff, and others associated with the institute. It serves as a platform for the IISER Pune community to share their research work with the wider community. Metadata of the PhD records available in the repository is also integrated with the National Digital Library of India. Library also deposits full-texts of PhD theses to Shodhganga national repository in addition to hosting them on DR. There are 2000 theses and dissertations, 5500 scholarly publications and over 500 other scholarly resources in DR. A total of 206 full-text MS theses, 77 full-text PhD theses, metadata of 550 scholarly publications have been added to DR during the year.

Library enrolled as an institutional member of Jaykar Knowledge Resource Centre, Savitribai Phule Pune University to benefit our users with access to wider collections learning resources. Library has good number of braille books in its collection and also enrolled as an institutional member of Sugamya Pustakalaya, DAISY Forum of India, New Delhi to provide access to over 6 lakhs audio books to people with print disabilities. The library has been actively promoting reference and information services both in person and over the campus network using the library website and institute email. The total number of documents issued to our users during the year was 16746. Library has been taking an active part in availing benefit of resource sharing with other major libraries throughout India through Inter Library Loan and Document Delivery Services. Library receives a number of requests from faculty and students for getting books and non-subscribed research papers from other libraries. To meet these requests, library has managed to provide 354 publications and 11 books. Also, delivered 123 papers to other libraries in reciprocation in the last financial year.

Staff members of the library have coordinated one day precursor event to the G20 Education Working Group Meeting in Pune under the Ministry of Education, Gol., in association with Elsevier on “**Accessible Science: Fostering Collaboration**” focusing on enhancing academic and research collaboration among educational institutions in G20 countries on June 16, 2023 at IISER Pune.

Library celebrated “**Library Week**” during November 6-10, 2023. As part of the celebration, Treasure Hunt, Online Quiz, Open Book Quiz, Book Exhibition, Author Workshop and training session on SciFinder-n were organized for the user community. Book Talk in association with students-run Literary Club was also organized. Students, staff and faculty members have actively participated in all the events and won prizes. Highest user award based on number of print books checked-out during Jan-Dec 2022 was given to Mr. Krushna Shewale.



(Left) Book Exhibition organised on November 8, 2023; (Right) Book Talk organised on November 9, 2023

Library has organised one day outreach programme on “**INFLIBNET Services and ORCID for Scholarly Communities**” sponsored by INFLIBNET Centre at IISER Pune on January 19, 2024. This event was hosted with a prime objective of empowering faculty, library and

information science professionals, researchers, scientists, and scholars with valuable insights and knowledge about the ORCID and scholarly services offered by the INFLIBNET Centre. Over 100 participants have actively participated and benefitted from this programme.



*'Outreach programme on 'INFLIBNET Services and ORCID for Scholarly Communities' organised on January 19, 2024*

As part of the institute's National Science Day celebrations on February 28, 2024, library has made poster presentations on various library services, information resources and visitor membership options to the participating students from schools and colleges, and researchers from universities.

**Living on campus:** Along with on-campus accommodation for students and employees, the IISER Pune campus houses a wellness clinic with a 24x7 ambulance service, a daycare facility, dining hall, gym, and indoor and outdoor sports facilities including basketball court, football field and cricket grounds. The campus is green with increasing tree cover each year. Student clubs such as Disha, Prutha, and SPICMACAY@IISER offer volunteering opportunities for engaging with the community within and beyond the campus through educational, cultural, and environment awareness programmes.

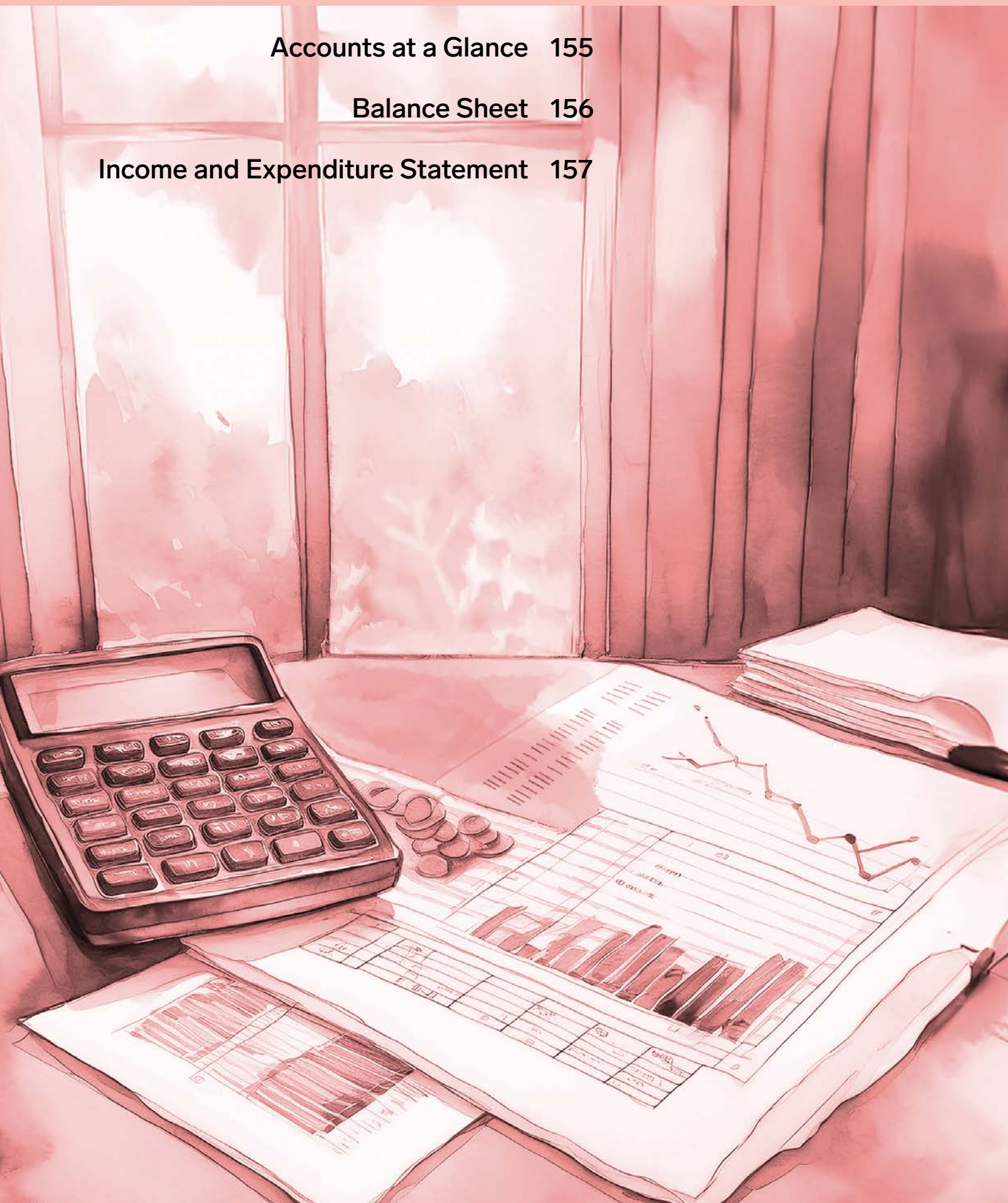
.....  
*The infrastructure and facilities on the campus cater to 138 regular faculty members; 23 visiting, emeritus and guest faculty; 52 fellows and project scientists, and post-doctoral research associates; 135 non-teaching staff members; 1866 students (506 PhD, 166 Integrated PhD, 45 MSc, and 1149 BS-MS); and 107 research and management staff recruited through extramural projects. The numbers are as of March 31, 2024.*  
 .....

# Accounts at a Glance

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# ACCOUNTS AT A GLANCE

The Annual Accounts of the Institute were approved by the Finance Committee and the Board of Governors during its meeting held on May 24, 2024. The annual audit for the Financial Year 2023-24 was carried out during June 6-27, 2024. The balance sheet and the income and expenditure statement for the Financial Year 2023-24 are given in the following pages.

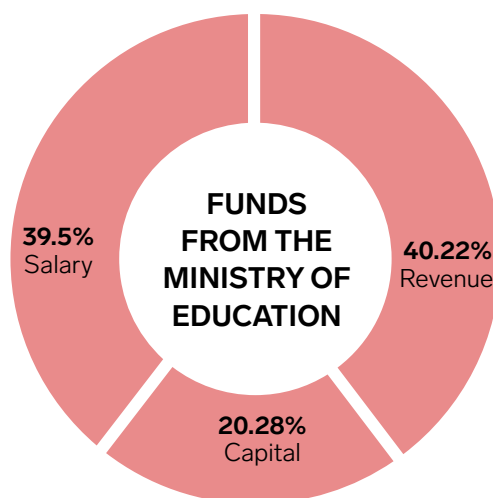
## FUNDS RECEIVED FROM THE MINISTRY OF EDUCATION

During the Financial Year 2023-24, IISER Pune received an amount of ₹173.75 crores from the Ministry of Education under the budget heads revenue, capital, and salary. The break-up across the three budget heads is as below.

**Revenue** ₹69.89 crores

**Capital** ₹35.23 crores

**Salary** ₹68.63 crores



## CORPUS

The cumulative corpus fund as on March 31, 2024 from the Internal Revenue generated is ₹100.90 crores. The Institute generated an amount of ₹1.32 crores during the Financial Year 2023-24 from internal receipts.

## EXTRAMURAL GRANTS

A number of research projects receive support from extramural grants through individual competitive research grants that faculty members have secured. During the Financial Year 2023-24, a total of ₹99.02 crores have been received by / assigned to the Institute via extramural grants. New grants initiated during the Financial Year 2023-24 are listed in the *Appendix* section of this report.

## ENDOWMENTS

Some of the activities at IISER Pune are supported through endowments from corporate organisations. During the financial year 2023-24, ₹4.12 crores was received via endowments. Details are given in the *Partnerships and Endowments* chapter of this report.

# BALANCE SHEET

as on March 31, 2024

Amount in ₹

Sources of Funds	Schedule	Current Year 2023-24	Previous Year 2022-23
Corpus / Capital Fund	1	731,24,45,488	710,22,27,165
Designated / Earmarked / Endowment Funds	2	39,44,13,197	38,32,01,453
Current Liabilities & Provisions	3	87,36,77,667	64,01,41,204
Secured Loans - HEFA Loan	3 D	30,23,11,795	12,43,57,909
<b>Total</b>		<b>888,28,48,147</b>	<b>824,99,27,730</b>

Application of Funds	Schedule	Current Year 2023-24	Previous Year 2022-23
<b>Fixed Assets</b>	4		
Tangible Assets		618,30,59,043	590,23,43,277
Intangible Assets		6,73,66,208	6,33,64,256
Capital Works-In-Progress		3,74,30,956	13,26,89,924
<b>Investments From Earmarked / Endowment Funds</b>	5		
Long Term		-	-
Short Term		37,67,65,493	35,69,78,446
<b>Investments - Others</b>	6	182,17,93,460	149,66,11,494
<b>Current Assets</b>	7	25,85,19,005	15,93,32,692
<b>Loans, Advances &amp; Deposits</b>	8	13,79,13,980	13,86,07,636
<b>Total</b>		<b>888,28,48,147</b>	<b>824,99,27,730</b>

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Contingent Liabilities and Notes to Accounts 24

For and on behalf of IISER Pune

sd/-  
CA. Vasundhara Laad  
Jt. Registrar (F & A)

sd/-  
Col. G. Raja Sekhar (Retd.)  
Registrar

sd/-  
Prof. Sunil S. Bhagwat  
Director

Place: Pune | Date: May 6, 2024

# INCOME AND EXPENDITURE STATEMENT

For the year ended March 31, 2024

Amount in ₹

Particulars	Schedule	Current Year 2023-24	Previous Year 2022-23
<b>INCOME</b>			
Academic Receipts	9	10,45,54,886	10,36,01,182
Grants/Subsidies	10	138,44,44,224	120,81,78,000
Income from Investments	11	2,03,02,756	1,13,45,630
Interest Earned	12	-	-
Other Income	13	6,50,99,787	9,41,41,125
Prior Period Income	14	6,38,077	4,98,16,451
<b>Total (A)</b>		<b>157,50,39,731</b>	<b>146,70,82,388</b>
<b>EXPENDITURE</b>			
Staff Payments & Benefits ( <i>Establishment Expenses</i> )	15	68,21,82,328	63,29,20,952
Academic Expenses	16	16,46,83,160	17,46,31,781
Administrative and General Expenses	17	37,98,29,440	31,67,69,759
Transportation Expenses	18	54,36,650	56,03,853
Repairs & Maintenance	19	13,09,53,043	12,36,99,445
Finance Costs	20	1,20,18,110	40,82,656
Depreciation	4	47,09,93,544	44,49,17,243
Other Expenses	21	13,69,351	5,23,446
Prior Period Expenses	22	26,91,607	20,53,798
<b>Total (B)</b>		<b>185,01,57,234</b>	<b>170,52,02,934</b>
<b>Balance being excess of Income over Expenditure (A-B)</b>		<b>(27,51,17,503)</b>	<b>(23,81,20,546)</b>
Transfer to Corpus Fund (9+11+13)		(18,99,57,429)	(20,90,87,938)
Transfer to Capital Fund (Depreciation)		47,09,93,544	44,49,17,243
Transfer to Capital Fund (Loss on Asset disposal)		(16,46,270)	(7,33,938)
Over Utilization of Grant in Aid for Revenue Exps (Schedule 3C)		-	-
Under Utilization of Grant in Aid for Revenue Exps (Schedule 3C)		-	-
<b>Balance being surplus/deficit carried to Institute Corpus Fund</b>		<b>75,64,882</b>	<b>(15,57,303)</b>
Significant Accounting Policies	23		
Contingent Liabilities and Notes to Accounts	24		

For and on behalf of IISER Pune

sd/-  
CA. Vasundhara Laad  
Jt. Registrar (F & A)

sd/-  
Col. G. Raja Sekhar (Retd.)  
Registrar

sd/-  
Prof. Sunil S. Bhagwat  
Director

Place: Pune | Date: May 6, 2024

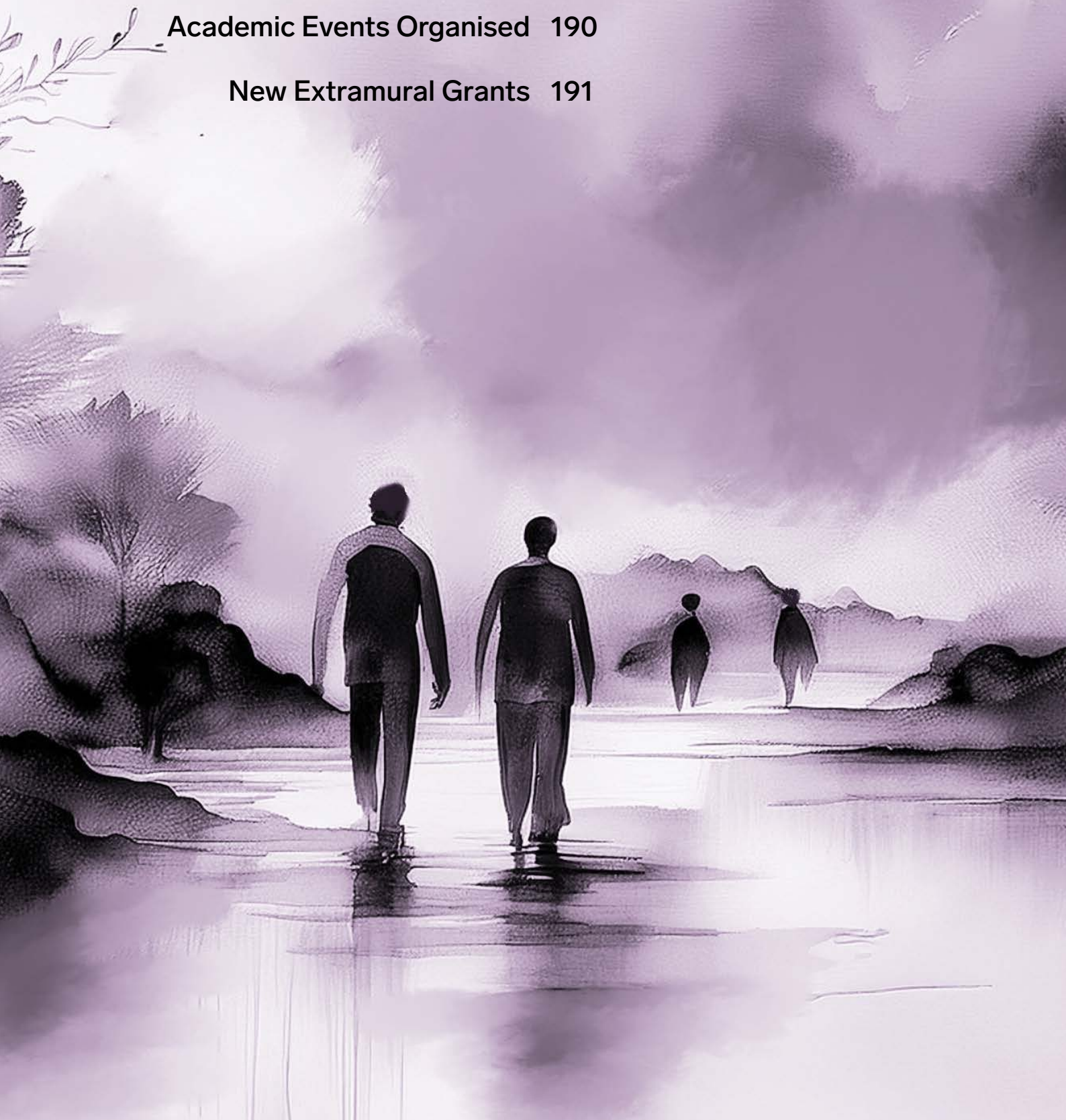
# Appendix

**Publications in 2023 159**

**Invited Lectures 184**

**Academic Events Organised 190**

**New Extramural Grants 191**





## PUBLICATIONS IN 2023

The list has been generated from the information shared by institute members with our campus Library and, additionally, includes papers sourced from the Web of Science database with authors having IISER Pune as their primary affiliation. The names of authors with IISER Pune affiliation are in all-caps.



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- 535.** ANAND, ABHISHEK; Pu, Songyang; SREEJITH, G. J., 2023, Torus geometry eigenfunctions of an interacting multi-Landau-level Hamiltonian, *Physical Review B*, 107(19), 195126. <https://doi.org/10.1103/PhysRevB.107.195126>
- 536.** MANNA, SANDIPAN; SREEJITH, G. J., 2023, Thermal Drude weight in an integrable chiral clock model, *Physical Review B*, 108(05), 054304. <https://doi.org/10.1103/PhysRevB.108.054304>
- 537.** Kudo, Koji; Sharma, A.; SREEJITH, G. J.; Jain, J. K., 2023, Exactly solvable Hamiltonian for non-Abelian quasiparticles, *Physical Review B*, 107(11), 115163. <https://doi.org/10.1103/PhysRevB.107.115163>
- 538.** Kudo, Koji; Sharma, A.; SREEJITH, G. J.; Jain, J. K., 2023, Candidate local parent Hamiltonian for the  $3/7$  fractional quantum Hall effect, *Physical Review B*, 108(03), 085130. <https://doi.org/10.1103/PhysRevB.108.085130>
- 539.** Dabholkar, Bhupen; Ran, Xiaoxue; Rong, Junchen; Yan, Zheng; SREEJITH, G. J.; Meng, Zi Yang; Alet, Fabien, 2023, Classical fully packed loop model with attractive interactions on the square lattice, *Physical Review B*, 108(12), 125112. <https://doi.org/10.1103/PhysRevB.108.125112>
- 540.** SREERAM, P. G.; Modak, Ranjan; Aravinda, S., 2023, Witnessing quantum chaos using observational entropy, *Physical Review E*, 107(06), 064204. <https://doi.org/10.1103/PhysRevE.107.064204>
- 541.** BHATTACHARJEE, DEBESH; SUBRAMANIAN, PRASAD; Nieves-Chinchilla, Teresa; Vourlidas, Angelos, 2023, Turbulence and anomalous resistivity inside near-earth magnetic clouds, *Monthly Notices of the Royal Astronomical Society*, 518(1), 1185-1194. <https://doi.org/10.1093/mnras/stac3186>
- 542.** BHATTACHARJEE, DEBESH; SUBRAMANIAN, PRASAD; Vourlidas, Angelos; Nieves-Chinchilla, Teresa; Thejaswi, Niranjana; Sachdeva, Nishtha, 2023, Characterizing the specific energy and pressure in near-Earth magnetic clouds, *Astronomy & Astrophysics*, 669. <https://doi.org/10.1051/0004-6361/202243603>
- 543.** De, Songshaptak; Maitra, Writasree; Rentala, Vikram; THALAPILLIL, ARUN M., 2023, Deep learning techniques for imaging air Cherenkov telescopes, *Physical Review D*, 107(08), 083026. <https://doi.org/10.1103/PhysRevD.107.083026>
- 544.** MOHD, ALI; VARDARAJAN SUNEETA, 2023, Generalized entropy in higher curvature gravity and entropy of algebra of observables, *Physical Review D*, 108(06), 066017. <https://doi.org/10.1103/PhysRevD.108.066017>
- 545.** MOHD, ALI; VARDARAJAN, SUNEETA, 2023, Note on the action with the Schwarzschild at the stretched horizon, *Physical Review D*, 107(10), 104064. <https://doi.org/10.1103/PhysRevD.107.104064>
- 546.** YADAV, YASHARTH; Elumalai, Pavithra; Williams, Nitin; Jost, Juergen; Samal, Areejit, 2023, Discrete Ricci curvatures capture age-related changes in human brain functional connectivity networks, *Frontiers in Aging Neuroscience*, 15. <https://doi.org/10.3389/fnagi.2023.1120846>
- 547.** ZODAGE, ANIKET; Allen, Rosalind J.; Evans, Martin R.; Majumdar, Satya N., 2023, A sluggish random walk with subdiffusive spread, *Journal of Statistical Mechanics: Theory and Experiment*, 2023(03), 033211. <https://doi.org/10.1088/1742-5468/acc4b1>



- 548.** SOHONI, PUSHKAR, Dept. of Humanities and Social Sciences, 2023, Taming the oriental bazaar: Architecture of the market-halls of Colonial India, (1st ed.) Routledge India, <https://doi.org/10.4324/9781003079774>
- 549.** Latif, Riyaz; SOHONI, PUSHKAR, Dept. of Humanities and Social Sciences, 2023, Sultanate Ahmadabad and its monuments: The city of Muzaffarids (Ahmad Shahis), Primus Books, <https://primusbooks.com/medieval-history/sultanate-ahmadabad-and-its-monuments-the-city-of-muzaffarids-ahmad-shahis-by-riyaz-latif-and-pushkar-sohoni>
- 550.** Murty, M. Ram; SINHA, KANEENIKA, Dept. of Mathematics, 2023, An introduction to the circle method, Volume 104 of Student Mathematical Library, American Mathematical Society, <https://bookstore.ams.org/view?ProductCode=STML/104>





## BOOK CHAPTERS

- 551.** SEN, SUCHARITA; DODAMANI, ANANYA; NAMBIAR, MRIDULA, Dept. of Biology, 2023, Emerging mechanisms and roles of meiotic crossover repression at centromeres, Elsevier B.V., In Current Topics in Developmental Biology, Volume 151, pp 155-190. <https://doi.org/10.1016/bs.ctdb.2022.06.003>
- 552.** Vidya, T. N. C.; DEY, SUTIRTH; Prasad, N. G.; Joshi, Amitabh, Dept. of Biology, 2023, The Darwinian core of evolutionary theory and the extended evolutionary synthesis: similarities and differences, Springer Nature, In Evolutionary Biology: Contemporary and Historical Reflections Upon Core Theory, pp 271-328. [https://doi.org/10.1007/978-3-031-22028-9\\_17](https://doi.org/10.1007/978-3-031-22028-9_17)
- 553.** Vidya, T. N. C.; DEY, SUTIRTH; Prasad, N. G.; Joshi, Amitabh, Dept. of Biology, 2023, Why evolution is bigger than all of us: a reply to Smocovitis, Springer Nature, In Evolutionary Biology: Contemporary and Historical Reflections Upon Core Theory, pp 335-339. [https://doi.org/10.1007/978-3-031-22028-9\\_19](https://doi.org/10.1007/978-3-031-22028-9_19)
- 554.** GHOSH, MOUSHAKHI; KHAN, SHABANA, Dept. of Chemistry, 2023, Silylene coordinated coinage metal complexes: An itinerary of their utilities, Elsevier B.V., In Advances in Inorganic Chemistry, Volume 81, pp 279-303. <https://doi.org/10.1016/bs.adioch.2022.06.001>
- 555.** Das, Ritima; Saikia, Utpal; SAHA, GOKUL KUMAR, Dept. of Earth and Climate Science, 2023, The crust and upper mantle structure beneath the Bangladesh and its effects on seismic hazard, Springer Nature, In Geohazards, pp 39-50. [https://doi.org/10.1007/978-981-99-3955-8\\_3](https://doi.org/10.1007/978-981-99-3955-8_3)
- 556.** GAIKWAD, AJINKYA; MAITY, SOUMEN, Dept. of Mathematics, 2023, Parameterized complexity of the Th+1-free edge deletion problem, Springer Nature, In Fundamentals of Computation Theory: 24th International Symposium, FCT 2023, Trier, Germany, September 18-21, 2023, Proceedings, pp 221-233. [https://doi.org/10.1007/978-3-031-43587-4\\_16](https://doi.org/10.1007/978-3-031-43587-4_16)



## BOOK REVIEW

- 557.** SANCHETI, POOJA, Dept. of Humanities and Social Sciences, 2023, Insurgency: the art and the freedom struggle in India and the Artist by Vinay Lal (Roli Books, 2022), Tidewater Learning Foundation, The Beacon. <http://dr.iiserpune.ac.in:8080/xmlui/handle/123456789/7572>
- 558.** SANCHETI, POOJA, Dept. of Humanities and Social Sciences, 2023, Recovering May Price: a longitudinal reading of Amitav Ghosh's The Shadow Lines, Johns Hopkins University Press, ariel: A Review of International English Literature, 54(1), 103-129. <http://dr.iiserpune.ac.in:8080/xmlui/handle/123456789/7574>



## CONFERENCE PAPERS

- 559.** Krithika, R.; Malu, V. K. Kutty; Sharma, Roohani; TALE, PRAFULLKUMAR, Dept. of Mathematics, 2023, Parameterized complexity of biclique contraction and balanced biclique contraction, Dagstuhl Publishing, 43rd IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2023). <https://doi.org/10.4230/LIPLcs.FSTTCS.2023.8>

# INVITED LECTURES

*At conferences/workshops and at colleges/universities/institutes/outreach*

## Nixon Abraham

Title: Olfaction under stress, Sri Ramachandra Institute of Higher Education and Research, Chennai, February 26, 2024 • Title: Olfactory representation in health and disease: Circuits to behavior, Colorado University, U.S.A. December 1, 2023 • Title: Sense of smell under stress: Neural circuit mechanisms, Indian Academy of Neuroscience meeting on Brain: Chemistry to Cognition, October 6, 2023 • Title: Sense of smell in health and disease, Max Planck Institute for Medical Research, Germany, August 4, 2023 • Title: Olfaction in health and disease, TU Dresden, Germany, July 27, 2023 • Title: Probing sense of smell: Current challenges and future prospects, Indian Neurobehaviour Group, May 18, 2023 • Title: Multimodal olfaction in health and disease, Words Worth Society Lecture Series, Inter University Centre for Biomedical Research & Super Speciality Hospital, Mahatma Gandhi University, Kerala May 16, 2023

## Sudarshan Ananth

Title: Classifying all 3-particle vertices in  $d=4$ , Chennai Mathematical Institute, Chennai, July 31, 2023

## Amit Apte

Title: KAM theory: A finite-dimensional perspective, Kolmogorov Symposium, International Centre for Theoretical Sciences (ICTS)-Tata Institute of Fundamental Research (TIFR), Bengaluru, April 25, 2023 • Title: Statistical modelling of Indian monsoon rainfall, Perspectives in Nonlinear Dynamics, IIT Madras, Chennai, August 1-4, 2023 • Title: Dynamical models and data for complex systems: An earth science perspective, Workshop on Open and FAIR data ecosystem, India International Centre (IIC), New Delhi, September 11-13, 2023

## Baskar Balasubramanyam

Title: P-adic adjoint L-functions for Hilbert modular forms, Number Theory Seminar, University of Caen, France, October 13, 2023; University of Lille, France, October 12, 2023

## Nirmalya Ballav

Title: Facing the interface: what happens when two electrically insulating metal-organic materials meet? Emerging Materials, IISER Pune, Pune, July 13-15, 2023 • Title: Hetero-structured thin films of coordination polymers, International Conference on Molecular Organized Films (ICOMF 18), Frankfurt University, Germany, August 21-25, 2023

## Argha Banerjee

Title: Himalayan Cryosphere under warming, and feedback processes, National Conference on Himalayan Cryosphere, Indian Institute of Science, Bengaluru, November 23, 2023

## Debargha Banerjee

Title: Two results on Eisenstein homology and cohomology groups of Bianchi three folds, IIT Kanpur, February 19, 2024 • Title: The Eisenstein cycles and Manin-Drinfeld properties, International Centre for Theoretical Sciences (ICTS), Bengaluru, September 20, 2023; MPIM Bonn Max Planck Institute for Mathematics, Germany, June 14, 2023

## Rabeya Basu

Title: On completion of unimodular rows, Symposium on Non-associative algebras, University of Haute Alsace Laboratoire de Mathématiques, Informatique et Applications, Mulhouse France, October 2023 • Title: Linear Algebra, K-Theory and Projective Modules, 38th Annual Conference of the Ramanujan Mathematical Society organised by IIT Guwahati, December 22-24, 2023

## Mousomi Bhakta

Invited to give two talks in two different special sessions in the 13th AIMS Conference on Dynamical Systems, Differential Equations and

Applications, Wilmington, NC, U.S.A., June, 2023 • Invited speaker in Annual conference of Indian Women in Mathematics, IISER Bhopal, July, 2023 • Invited speaker in Inaugural meeting of Asian and Oceanian women in mathematics, ICTS-TIFR, Bengaluru, April, 2023

## Arijit Bhattacharyay

Title: Coordinate-dependent diffusion,  $it\hat{o}$  distribution and possible new physics, International conference on Mathematical Modeling, Department of Mathematics, Bharathiar University, Coimbatore, January 27-28, 2023 • Title:  $It\hat{o}$ -process, its physical meaning and applications to small stochastic systems, Maths in Academia and Industry symposium, Department of Mathematics, IISER Pune, March 2, 2024

## Anup Biswas

IISER TVM Frontier Symposium in Mathematics 2024, IISER TVM, February 2, 2024

## Gnanaprakasam Boopathy

Title: Enabling continuous-flow catalysis for the macrocyclisation, 4th Flow Chemistry and Natural Products Symposium, NIPER-Kolkata, Kolkata, December 18-19, 2023

## Apratim Chatterji

Title: Modelling molecular systems, and its application to physics of chromosomes, Workshop on Soft Matter and driven systems, Savitribai Phule Pune University, Pune, March 22, 2024 • Title: DNA-polymer topology mediates segregation and organization of E.coli chromosomes in slow and fast growth, Simulations of Physical and Biological systems, Symposium-JNU, March 1, 2024 • Title: Entropy driven organization: DNA-polymer topology mediates segregation and organization of E.coli chromosomes in slow and fast growth, 3DS colloquium, Dassault systems, February 27, 2024 • Title: Topology mediated organization of polymer segments in confined cylinders, and its application to understand bacterial chromosome organization, Colloquium, Chemical Engineering, IIT Jodhpur, October 14, 2023 • Title: Entropy driven organization: Polymer topology mediates chromosome organization in bacterial cells, CECAM workshop on Ring Polymers dynamics, (CECAM: European Center for Atomic and Molecular Advanced Computations), Monash University-Prato Center, Italy, June 14-16, 2023; Visit and talks at ENS-Lyon-France, Uni-Montpellier-France, Uni. of Duesseldorf, Uni. of Mainz, Germany, Research Center, Juelich (Germany) in summer using: CNRS-ENS-Biosantex grants for personnel exchange and collaboration with France, June 2023; Plenary speaker at conference on Condensed Matter, Materials Science and Statistical Physics (CMMSSP-2023), Presidency College, Kolkata, April 28-29, 2023

## Devapriya Chattopadhyay

Technical Talks: Title: The present-day distribution of marine bivalves of Indian shelf: An interplay of the past and the present, Molluscs of South Asia Conference, Bengaluru, December 12, 2023 • Title: Shell chronicles: Exploring deep time through seashell fossils, Science Gallery Bangalore, Bengaluru, October 14, 2023 • Title: Looking back to see the future: A long journey with seashells, Christ College (Autonomous), June 21, 2023 • Title: Drilling predation and other interactions: When, who and how much? Biotic Interaction In Deep Time (BITE) workshop, FAU GZN Erlangen, Germany, May 9, 2023

Outreach Talks: Title: From exploration to conservation: Careers in Earth Science in the present and future, S & T Digital's conference on Careers in Science and Technology (CST 24), IISER Pune, Pune, February 3, 2024

## Srabanti Chaudhury

Title: Understanding the mechanisms of catalysis by analyzing dynamics of chemical reactions on single nanocatalysts, Commonwealth Meeting, Trinidad and Tobago, May 24, 2023 • Title: Simple discrete state

stochastic approaches to probe reaction dynamics in chemical and biological processes, Physical Chemistry Symposium, IISc Bengaluru, July 3, 2023 • Title: Uncovering the molecular mechanism and the role of heterogeneity in cooperative communications on single nanocatalysts, Emerging Materials, IISER Pune, July 13, 2023 • Title: Microscopic mechanism of macromolecular crowder-assisted dna capture and translocation through biological nanopores, Theoretical Chemistry Symposium, IIT Chennai, December 7, 2023; Inter IISER Chemistry Meet, IISER Kolkata, February 23, 2024 • Title: Role of macromolecular crowding in biological processes – a discrete state stochastic approach, Stochastic and Nonlinear Dynamics in Chemistry and Biology, SNBNCBS (S. N. Bose National Centre for Basic Sciences), Kolkata, January 4, 2024 • Title: Discrete state stochastic approaches to probe reaction dynamics on individual nanocatalysts, 4th Frontiers Symposium in Chemistry, IISER Thiruvananthapuram, January 19, 2024; Modern Trends in Chemical Sciences, IIT Tirupati, February 16, 2024; ACS Spring Meeting, New Orleans, U.S.A., March 18, 2024

### Anisa Chorwadwala

Talks at Conferences/Workshops: Title: Optimisation of a mixed Steklov-Dirichlet Eigenvalue, International Conference on Women in Pure and Applied Mathematics, SRM University AP, Andhra Pradesh, January 1-5, 2024; Women in Maths Symposium of the 38th Annual Conference of the Ramanujan Mathematical Society, IIT Guwahati, December 22-24, 2023; Department of Mathematics, Punjab University, Chandigarh, December 15, 2023 • Three Analysis lectures, IWM Winter School, Punjabi University, Patiala, December 18-27, 2023 • Colloquium Title: A glimpse of the isoperimetric problems and the story of Queen Dido, Department of Mathematics, Institute of Infrastructure, Technology, Research And Management. (IITRAM), Ahmedabad, July 10, 2023

Panel Discussions: Panel at the international conference on Women in Pure and Applied Mathematics, SRM University AP, Andhra Pradesh, January 1-5, 2024 • Panel for Women in Mathematics, the Indian story and Inaugural meeting of Asian-Oceanian Women in Mathematics (AOWM), International Centre for Theoretical Sciences (ICTS), Bengaluru, April 24-28, 2023

### Aloke Das

Invited Faculty Poster Presentation Title: A comprehensive overview of the conformational studies of peptides in condensed and gas phases, Physical Chemistry Symposium 2023, Indian Institute of Technology Kanpur, October 29-31, 2023 • Title: Sequence-dependent folding motifs of the secondary structures of small peptides, International Conference on Structure and Dynamics: Spectroscopy and Scattering (SDSS-2023), Indian Association for the Cultivation of Science (IACS) Kolkata, October 5-8, 2023 • Title: Probing the secondary structures of Gly-Pro and Pro-Gly peptides in the gas phase as well as condensed phase, Asian Spectroscopy Conference 2023 (ASC-2023), Atama Kogen Resort, Belnatio, Niigata, Japan, September 3-6, 2023 • Title: Sequence-dependent folding motifs of peptides: A comprehensive picture from condensed and gas phase studies, 25th International Conference on Horizons in Hydrogen Bond Research (HBOND-2023), University of Bologna, Italy, September 11-15, 2023 • Title: Sequence-dependent folding motifs of peptides containing glycine and proline residues, Conference on Sustainability & Interdisciplinarity in Chemical Sciences (SICS-2023) on the occasion of the 60th Foundation Day Celebration of Indian Photobiology Society, IISER Kolkata, July 13-15, 2023

### Shouvik Datta

IISER-Purdue University, Joint Workshop & Conference, IISER Pune, July 10-14, 2023. • Title: Quantum Photonics - A perspective from Physics + our Research Directions, ATAL Faculty Development Programme for Engineers, R V Engineering College, Bengaluru, December 18, 2023 • Invited to International Conference on Functional Materials (ICFM) 2024, IIT Kharagpur (could not attend) • Invited to Quantum condensed MATter (QMAT-23) at National Institute of Science Education and Research (NISER) Bhubaneswar, Odisha, November 27-30, 2023 (could not attend); Attended MRS Fall Meeting, 2023 at Boston

### Sutirth Dey

Title: What cost dispersal evolution? Lessons from the humble fruitfly, on July 22, 2023, IISER Pune Max Planck Partner Group Kick-off Workshop, IISER Pune, July 19-22, 2023 • Title: Matter of size: How population size affects bacterial adaptation, IISER Pune Bioconclave, organised by the Bio Department, IISER Pune, February 1, 2024 • Title: What cost dispersal evolution? EOBU@25, on Feb 17, 2024, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru, February 16-17, 2024

### Deepak Dhar

Title: Hard rotors on a d-dimensional lattice, Web colloquium, TIFR Center for Applied Mathematics, Bengaluru, April 25, 2023; Colloquium, IIT Kanpur, July 4, 2023; Colloquium, IISER Bhopal, July 8, 2023 • Title: Hard rigid rotors on a d-dimensional lattice, introductory lecture to NIUS students, Homi Bhabha Center for Science Education, Mumbai, July 11, 2023 • Title: An introduction to self-organized criticality, plenary lecture at 'Perspectives in Non-linear Dynamics', IIT Madras, Chennai, August 1, 2023 • Title: My random walk in Statistical Physics, Boltzmann medal lecture at the conference Statphys 28, Tokyo, August 9, 2023 • Title: 200 years of phase transition studies, inaugural lecture in the Spectrum series, Manipal University, Jaipur, September 11, 2023 • Guest Lecture Series interview by Rishi Dalal in the Shastra festival, IIT Madras, Chennai, January 5, 2024 • Title: Uses and abuses of statistics, Invited Guest lecture at the Technovanza Festival, Veermata Jijabai Technological Institute, Mumbai, January 13, 2024; Inaugural address for the 6th IEEE Conference on Emerging Smart Computing and Informatics, All India Shri Shivaji Memorial Society's Institute of Information Technology, Pune, March 5-7, 2024 • Title: Entropy, Invited guest lecture to students, MIT World Peace University, Pune, January 18, 2024; Invited online lecture in the Prof. SVM Satyanarayana Memorial Lecture series, January 21, 2024 • Title: Nationalism, Guest lecture at Annual Day, Amrita Vidyalayam, Nigdi, Pune, January 20, 2024 • Title: A new approach to the equation of state of hard spheres, invited talk given at INSA meeting for launching the portal SWATI, February 11, 2024

### Sourabh Dube

Title: Experimental particle physics: A primer, six lecture series, Fergusson College, Pune, July 4-8, 2023 • Title: What research means to me as an adult, Keynote talk at 2nd International Conference on Research Frontiers in Sciences-2023, G.H. Rasoni College, Nagpur, July 22, 2023 • Title: Analogies, visualizations, and humor in the class, MSDEED Level2 workshop, Pune, November 27, 2023 • Title: Vishwache sarwat chote tukde, Talk on particle physics in Marathi on National Science Day 2024, IISER Pune, Pune, February 28, 2024

### Sreejith G.J.

Title: Results on quasiparticle pinning and entanglement spectra using variational wavefunctions DTP Seminar, TIFR Mumbai, July 13, 2023 • Title: Disorder pinning of a composite fermion quasiparticle and FQH plateau transitions, JQI Seminar, University of Maryland College Park, U.S.A., November 9, 2023 • Title: Some new results on FQH transitions, Emergent Phenomena in Quantum Hall Systems, Nanyang Technological University, Singapore, January 5, 2024 • Title: STM in FQHE, Physics Department Seminar, IIT Kanpur, February 21, 2024; Physics Department Seminar, Saha Institute of Nuclear Physics, Kolkata, March 11, 2024

### Sujit K. Ghosh

Title: Sustainability & Interdisciplinarity in Chemical Sciences, Inter IISER-NISER Chemistry Meet, IISER Kolkata, February 23-25, 2024 • 9th Asian Conference on Coordination Chemistry (ACCC9), Bangkok, Thailand (Keynote Speaker), February 19-22, 2024 • AFMSA Conference, Shiv Nadar University, Delhi-NCR, February 9-10, 2024 • Ashoka University, February 12, 2024 • Institut für Chemie, Humboldt-Universität zu Berlin, July 31, 2023 • Department of Chemistry and Chemical Biology, TU Dortmund, Germany, August 20, 2023 • Cluster of Excellence "Unifying Systems in Catalysis", Technical University Berlin, August 23, 2023 • Faculty of Science, Van't Hoff Institute for Molecular Sciences, University of Amsterdam, August 18, 2023 • Department of Chemistry, University of Stavanger, Norway, August 4, 2023

**Rejish Nath Gopinathan Rejani**

International Raman conference on Light and matter physics, Raman Research Institute, Bengaluru, August 16, 2023 • Title: Doubly dipolar Bose gas, Raman Research Institute, Bengaluru, February 23, 2024

**Anindya Goswami**

Mathematics Research Seminar, Dept. Math, IISER Bhopal, January 15, 2024 • Refresher Course "Statistics in Finance" Resource person for 6 hours of lectures, Dept. Statistics, SPPU, Pune, December 8, 2023 • Mathematics Research Seminar, IISER Thiruvananthapuram, December 6, 2023 • IINMM at NISER Bhubaneswar, September 30, 2023 • Dnyanetu .... Bridging gaps, P.E.S. Modern College of Engineering, September 12, 2023 • Prof. Vasudeva Murthy Memorial Lecture, Mahindra University, Hyderabad, May 11, 2023

**Partha Hazra**

Title: Engineering TADF, mechanochromism, and second harmonic up-conversion properties in regioisomeric substitution space, in the conference arranged by IIT Patna, March 2, 2024 • Title: Spectroscopic insights of newly designed emissive organic smart materials, Birla Institute of Technology & Science, Pilani, BITS, Hyderabad, July 7, 2023 • Title: Design, synthesis and optical properties of emissive organic materials, Visvesvaraya National Institute of Technology VNIT Nagpur, April 12, 2023 • Title: Triplet exciton harvesting in novel organic luminogens for new generation OLED applications, National Institute of Technology NIT Patna, November 28, 2023

**Tejas Kalelkar**

An algorithm to recognise hyperbolic knots, Research seminar, IISER Mohali, Mohali, May 12, 2023 • Algorithms to recognise knots, Geometry seminar, University of Virginia, Charlottesville, U.S.A., August 3, 2023 • Teaching mathematics as an unfinished story, Maharashtra State Development of Educators and Enhancement in Delivery (MS-DEED) Programme, IISER Pune, Pune, November 23, 2023 • Algorithms to recognise knots, Low-dimensional Topology conference, IISER Pune, Pune, September 29, 2023

**Kalika Prasad**

Plenary speaker at the 33rd International Conference on Arabidopsis Research (ICAR2023) Chiba, Japan, June 6, 2023 • Enza Zaden Research & Development, Company at B.V. Netherlands, March 23, 2023 • Plant biology seminar series at University of Pennsylvania, U.S.A., February 16, 2023 • UCAM Morphogenesis Seminar Series at Cambridge University, January 30, 2023

**Krishanpal Karmodiya**

Title: Chronobiology of mosquitoes olfaction: understanding the differential molecular rhythm and perireceptor events of diurnal and nocturnal mosquitoes, 15th Conference of Vectors and Vector Borne Diseases, organised by NAVBD in collaboration with Goa University and ICMR-National Institute of Malaria Research, Field Unit, Goa, February 15-17, 2023 • Title: The many paths to artemisinin resistance in *Plasmodium falciparum*, International Meeting and Workshop: Indo-French Workshop on Infectious Diseases, International Centre For Genetic Engineering And Biotechnology (ICGEB), New Delhi, August 24, 2023 • Title: Phase separation and epigenetic control: exploring PfHP1's role in modulating virulence genes in *P. falciparum*, 8th meeting of the Asian Forum for Chromosome and Chromatin Biology (ACM-2023), Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru, November 4-6, 2023 • Title: Genomics in pathogen surveillance: shaping the future of medicine, Chief Guest for the valedictory function of the Orientation-cum-Selection Camp (OCSC) for the International Biology Olympiad (IBO) 2023, Homi Bhabha Centre for Science Education (HBCSE-TIFR), Mumbai, June 11, 2023

**Saikrishnan Kayarat**

EMBO Workshop on Bacterial morphogenesis, survival and virulence 2023, Goa • Biological Transactions: From Molecules to Organisms 2023, IISc Bengaluru

**Shabana Khan**

Title: N-Heterocyclic silylene supported copper(I) aryl complexes: Bond activation to catalysis, The 9th Asian Conference on Coordination

Chemistry (ACCC9), Bangkok, Thailand, February 19-22, 2024 • Title: N-Heterocyclic silylene-copper(I) aryl complex: access to versatile Cu(I) synthons, ACS-MEA Regional Conference, New York University Abu Dhabi, February 4-7, 2024; International conference on Modern Trends in Inorganic Chemistry (MTIC-XX), IISc Bengaluru, December 14-17, 2023 • Title: Cyclic(alkyl)(amino)carbene stabilized gold nanoparticles and their catalytic application in CO<sub>2</sub> reduction, 3rd International Conference on Main-group Molecules to Materials (MMM III), IIT Hyderabad, December 9-11, 2023 • Title: Cyclic(alkyl)(amino)carbene stabilized gold nanoparticles: synthesis and catalytic application, 8th International Conference on Advanced Nanomaterials and Nanotechnology at Centre for Nanotechnology, IIT Guwahati, November 29-December 1, 2023 • Title: Silylene metal complexes: bonding to catalysis, Women in Science Conference (WiSC@IITK-2023), Modern Trends in Chemical and Biological Sciences, IIT Kanpur, October 6-7, 2023

**G.V. Pavan Kumar**

Title: Optothermal trapping, OMC2023, Optics & Photonics International Congress, Yokohama, Japan, April 2023 • Title: Optothermal trapping and Brownian Dynamics, Physics Department, Tokyo University, Japan, April 2023; Okinawa Institute of Science and Technology (OIST), Japan, April 2023; Physics Department, Osaka University, Japan, May 2023 • Title: Optothermal trapping and dynamics PHOTONICS23, IISc, Bengaluru, July 2023 • Title: Hot Brownian Dynamics in a trap, SLM2023 School and Workshop on Soft and Living Matter, ICTS, August 2023

**Mayurika Lahiri**

Title: TopBP1 is required to maintain genome stability: overexpression leads to breast tumorigenesis, Speak your Science (SyS), NCCS, Pune, February 9, 2024 • Title: DNA damage and repair, Bio Wissen, IISER Tirupati, January 27, 2024 • Title: DNA damage response mechanisms & genome instability, World Cancer Research Day, St. Xavier's College, Mumbai, September 23, 2023 • Title: TopBP1 is required to maintain genome stability: Overexpression in non-tumorigenic breast epithelial cells lead to transformation with a TP53 mutation, International Conference on Cancer Biology: Molecular Mechanisms, Genomics and Novel Therapeutics, IIT Madras, Chennai, September 14-16, 2023

**Soumen Maity**

Title: Parameterized Algorithms, Frontier Symposium in Data Science 2024, IISER Thiruvananthapuram, February 9-10, 2024

**Moumita Majumdar**

Title: Cationic Germanium compounds: New feats in the field of Lewis acid catalysis, 17th International Conference on the Coordination and Organometallic Chemistry of Germanium, Tin and Lead, Wellington, New Zealand, August 28-September 2, 2023; Annual Convention of Chemists, Indian Chemical Society, New Delhi, December 22-23, 2023 (Endowment Lecture) • Title: The chemistry of the Germanium(IV) di-cations, Future Oriented Research Conferences and Exhibitions, Kathmandu, Nepal, September 28-October 1, 2023 • Title: The chemistry of electron-deficient cations, Women in Science, IIT Kanpur, October 6-7, 2023 • Title: The chemistry of the Germanium(IV) di-cations, International Conference on Organometallic Chemistry and Catalysis, Goa, October 30-November 2, 2023 • Title: Chemistry of the cationic main-group compounds, Chemical Research Society of India, Birla Institute of Technology And Science (BITS) Pilani, February 1-4, 2024 (Bronze Medal Lecture)

**Shreyas Managave**

Title: Sulfur isotopes in the food chain, Low-temperature Geochemistry Meet, 2023, IISER Pune, April 22, 2023 • पंखावरून खादय आणि अधविस शोधण्याची पद्धत, ३६ वे महाराष्ट्र पक्षमिति संमेलन, सांगली, २३ डिसेंबर २०२३ (A method of finding food and habitat from the feather, 36th Maharashtra Bird Meet, Sangli, December 23, 2023)

**Suhita Nadkarni**

Title: Neuromodulation in the hippocampus, Brain, Behaviour & Society Conference, National Brain Research Centre, Manesar, December 13-15, 2023 • Title: Energy-information prescription for synapses, International Conference on Computational Neuroscience and Bilingualism, Birla Institute of Technology and Science, Pilani (BITS) Goa Campus, October 6-7, 2023; 32nd Annual Computational Neuroscience Meeting,

Leipzig, Germany, July 18-19, 2023 • Title: How to build a synapse from the ground up, Vigyan Jyoti conclave, IISER Pune, Pune, September 27, 2023

#### Angshuman Nag

Title: Molecular design of noncentrosymmetric, chiral and stable hybrid perovskites, International Conference on Advances in Photovoltaic Materials and Devices (APMD 23): organised by S&T Digital (Virtual), June 2-4, 2023 • Title: Layered hybrid perovskites: molecular design and optoelectronics, Institute Colloquium, S.N. Bose National Centre for Basic Sciences (SNBNCBS) Kolkata, April 21, 2023 • Title: Layered 2D hybrid perovskites: molecular design and optoelectronics, Nanax10 conference: Institute of Science and Technology Austria, July 3-7, 2023 • Title: Nanoscale interface within a hybrid perovskite crystal for optoelectronics, Beilstein Nanotechnology Symposium on Nanocrystal Surfaces and Defects, Rüdeshheim, Frankfurt, Germany, October 17-19, 2023; International Conference on Advanced Nanomaterials and Nanotechnology (ICANN 2023), IIT Guwahati, November 29-December 1, 2023; International Conference on Optoelectronic and Bio Inspired nanomaterials, IIT Roorkee, December 2-4, 2023 • Title: Perovskite semiconductor nanocrystals for optoelectronics, National Online Symposium On Nobel Prize in Chemistry 2023, Institute of Chemical Technology (ICT), Bhubaneswar Campus, November 21, 2023 • Title: Reversible melting of 2D hybrid perovskite crystals at low temperatures, Hybrid Perovskite, Indian Association for the Cultivation Science, December 21-23, 2023 • Title: Molecular design of 2D hybrid perovskite semiconductor, Jawaharlal Nehru Centre For Advanced Scientific Research (JNCASR), Bengaluru Winter School, December 3-9, 2023 • Title: Optoelectronics of perovskite semiconductors, Raman Memorial Conference - 2024, Savitribai Phule Pune University, March 1-3, 2023

#### Mridula Nambiar

Title: Diversity among cohesin complexes: Roles in DNA repair and chromosomal segregation, 46th All India Cell Biology Conference (AICBC2024), Tata Memorial Centre Advanced Centre for Treatment, Research & Education in Cancer (ACTREC), Mumbai, January 10-12, 2024 • Title: Mechanisms of chromosome segregation during cell division, St. Joseph's College, Irinjalakuda, Kerala, January 6, 2024 • Title: Cohesins at centromeres - distinct roles in recombination and chromosomal segregation during cell division, 92nd Annual Meet of the Society of Biological Chemists, Birla Institute of Technology and Science (BITS) Pilani, Goa Campus, December 18-20, 2023 • Differential roles of recombination and cohesion in chromosomal segregation during meiosis, MEI-India, Online, September 22, 2023

#### Muhammed Musthafa O.T.

Title: Electricity from acid-base reaction, National Conference on Physics of Materials & Materials based Device Fabrication 2023 (NCPM-MDF-2023), November 25-26, 2023 • Title: Electrified interface: challenges and opportunities, One day conference on electrochemistry, Department of Applied Chemistry, Cochin University of Science and Technology, Kochi, Kerala, March 5, 2024

#### Pramod P. Pillai

Title: Visible-light photocatalysis with Quantum Dots, In Emerging Trends in Photodynamics and Photocatalysis (ETPP-2024), IISER Mohali, March 26-28, 2024 • Title: Plasmonically active self-assembled nanostructures, In Emerging Trends in Supramolecular Science and Technology (ETSST 2024), SRM University, Andhra Pradesh, March 7-8, 2024 • Title: Light-matter interactions at nanoscale leading to chemical change, In Advances in Nanomaterials and Molecules: From Spectroscopy to Bioimaging (NaMoSBio), IISER Kolkata, January 12-14, 2024; Department of Chemistry, Sacred Heart College, Kochi, December 8, 2023; Department of Chemistry, Cochin University of Science and Technology (CUSAT), Kochi, December 7, 2023; Commonwealth Scientific and Industrial Research Organisation (CSIRO), Newcastle, Canberra, Australia, December 4, 2023 • Title: The impact of surface ligands in regulating nanoparticle chemistry, In CompFlu-2023, IIT Madras, December 18-20, 2023 • Title: Chemistry with thermoplasmonics, In Fluorescence Chemical Society - Satellite Meeting on ATOS Materials in Focus, Shimla, December 15-17, 2023 • Solar energy conversion and utilization with nanomaterials, International Conference on Advanced Materials and Nanotechnology for Green

and Sustainable Future (ICAGS-2023), Maharajas College, Kerala, December 5-6, 2023 • Light-matter interactions with surface engineered nanomaterials, Global Innovative Centre for Advanced Nanomaterials (GICAN), Newcastle, Callaghan, Australia, December 4, 2023 • Visible-light photocatalysis with surface engineered nanomaterials, In 12th Asian Photochemistry Conference (APC), Melbourne, November 27-December 1, 2023

#### Gayathri Pananghat

Title: Cytoskeletal filaments that sculpt a helical bacterial cell, International Conference on Molecular and Cellular Electron Tomography, All India Institute of Medical Sciences, New Delhi, April 22, 2023 • Title: Membrane remodelling dynamics of the bacterial actin MreB from Spiroplasma, a helical cell wall less bacterium, Graduate School of Frontier Biosciences, Osaka University, Japan, July 18, 2023 • Title: Membrane remodelling by a bacterial actin MreB, Webinar on Chemistry and Biochemistry around the proteins, organised by the Society of Biological Chemists, Mumbai Chapter, July 29, 2023 (online webinar) • Title: A brief overview of Structural Biology, Nirma University, Ahmedabad, October 31, 2023 • Title: Structural insights into mechanism of cell polarity oscillations in *Mycococcus xanthus*, 50th National Seminar on Crystallography (NSC 50), CSIR-Institute of Microbial Technology, Chandigarh, November 26, 2023 • Title: Mechanistic insights into GTP dependence and kinetic polarity of the bacterial tubulin FtsZ, Regional Centre of Biotechnology, Faridabad, December 20, 2023 • Title: Shape determination in a cell wall less helical bacterium Spiroplasma, National Symposium on Recent Trends in Biology, organised by the Department of Zoology, Savitribai Phule Pune University, Pune, March 23, 2024

#### Mainak Poddar

Title: Logarithmic connections on algebraic principal bundles, Topology Geometry Session, IISER-NISER Mathematics Meet 2023, NISER Bhubaneswar, September 30, 2023 • Title: Logarithmic connections and symmetries of bundles, Colloquium, Department of Mathematics and Statistics, IIT Kanpur, October 12, 2023 • Title: Generalized complex geometry of some principal bundles, Workshop cum Conference on Interactions in Several Complex Variables, IISER Pune, December 14, 2023 • Title: The Mathematics of neural networks, Keynote address, ICRMDSS 2023, Tripura University, Tripura, December 21, 2023

#### Moumanti Podder

Popular talk at ICTS Summer School for Women in Mathematics and Statistics, International Centre for Theoretical Sciences (ICTS), TIFR, Bengaluru, June 8, 2023 • Title: A non-parametric method for structural break detection in financial data, 6th International Conference on Econometrics and Statistics, Waseda University, Tokyo, August 2, 2023 • Title: Bond percolation games and their generalizations on rooted Galton-Watson trees, IISER-NISER Math Meet, National Institute of Science Education and Research (NISER) Bhubaneswar, September 29, 2023 • Title: Combinatorial games on random premises, their connections with percolation, probabilistic automata and statistical mechanics, Indian Academy of Sciences' (IASc) 89th Annual Meeting, Birla Institute of Technology (BITS) Pilani, Goa, November 3, 2023 • Title: On the ergodicity of a class of 1-dimensional probabilistic cellular automata with size-3 neighbourhoods, invited to organise a symposium on probability, and give a talk at Ramanujan Mathematical Society's 38th Annual Conference, Indian Institute of Technology (IIT) Guwahati, December 22-24, 2023 • Title: Percolation games on rooted Galton-Watson trees, Asia Pacific Rim Meeting of the Institute of Mathematical Statistics, University of Melbourne, Melbourne, January 5, 2024 • Title: Graph Nim games on graphs with 4 edges, Games at Mumbai 2024 conference, Indian Institute of Technology (IIT) Bombay, January 22, 2024 • Title: A learning model on the rooted regular tree, Challenges in Networks conference, ICTS-TIFR, Bengaluru, January 29, 2024

#### Thomas Pucadyil

Title: Regulatory mechanisms in membrane fission and their relevance to physiology, Society of Biological Chemists, Birla Institute of Technology and Science (BITS) Goa, Goa, December 20, 2023; BSBE Symposium, IIT Kanpur, December 9, 2023; TIFR Hyderabad, December 13, 2023; Integrative Multiscale Modeling in Biomolecular and Soft Matter Systems, IISc, Bengaluru, November 28, 2023;

National Centre for Biological Sciences, Bengaluru, September 4, 2023 • Title: Membrane fission: insights from reconstituting organelle form and chemistry, National Seminar on Recent Trends in Biology, Department of Zoology, Savitribai Phule Pune University, Pune, March 23, 2023; Department of Biochemistry, IISc, Bengaluru, March 30, 2023 • Title: Mechanistic analysis of membrane fission and discovery of novel fission proteins, Shiv Nadar University, Delhi, October 12, 2023; Biophysical Society Meeting on Membrane Fusion and Budding, Estes Park, Colorado, U.S.A., September 25, 2023; Indian Biophysics Society Meeting, National Centre for Biological Sciences, Bengaluru, March 27, 2023 • Title: Membrane remodelling to maintain organelle homeostasis, Organellar Biology and Membrane trafficking meeting, National Brain Research Centre, Manesar, Gurugram, Haryana, October 11, 2023

#### Sunish Radhakrishnan

Title: Search, sense and colonise: Signalling strategies for bacterial survival and proliferation, Indo-German Conference on Cell Cycle and Cilia, IISc Bengaluru, April 5, 2023 • Title: A transcriptional interplay ensures the production flagellated offsprings in bacteria, Conference: 21st Transcription Assembly Meeting, IISER Bhopal, July 24-26, 2023

#### Sudha Rajamani

Title: Introduction to Astrobiology and search for life beyond Earth, National Science Day 2024, Pimpri Chinchwad Science Park and Tarangan, Pune, February 26-28, 2024 • 1st Symposium on Genesis and Evolution of Organics in Space, Indian Institute of Space Science and Technology (IIST), Thiruvananthapuram, January 18-20, 2024 • Title: Protocell interaction dynamics: Implications for the survival of the 'fittest'? Career Opportunities in Astrobiology, A Career Guidance talk for MSc in Astrobiology and Space Science Program, organised by the Amity Centre of Excellence in Astrobiology (ACoEA), Amity University, Mumbai, August 1, 2023 • Title: Tales of select protocellular systems, Molecular Origins of Life, Munich (MOM) Online Conference, June 20-22, 2023 • Title: The astrobiological narrative of life's origin, Special talk organised by Pune Knowledge Cluster, Pune, May 4, 2023 • Title: The origins of life and its early evolution, The Centro De Astrobiología (CAB, CSIC-INTA), Spain, April 28, 2023

#### Raghav Rajan

Title: Introductory notes before the zebra finch song: A feature, a bug or a distraction, Understanding Behaviour 2023 (conference), IISER Kolkata, June 27-30, 2023 • Title: Using songbirds to understand how the brain initiates complex movement sequences, IIT Bombay, November 10, 2023

#### R. Boomi Shankar

Title: Organic and hybrid ferroelectrics for piezoelectric energy harvesting applications, Department of Chemistry, Wrocław University of Science and Technology, Poland, September 11, 2023 • Title: Ferroelectric materials based on amino-P(V) scaffolds for piezoelectric energy harvesting applications, VI Polish-Lithuanian-Ukrainian Meeting on Physics of Ferroelectrics, Jan Długosz University, Częstochowa, Poland, September 11-15, 2023 • Title: Molecular ferroelectric materials and their piezoelectric nanogenerators supported by amino-P(V) cations, Department of Chemistry, Saarland University, Germany, October 9, 2023 • Title: Enabling methodologies for rational design of complex systems, Indo-German Workshop-2023, Julius Maximilian University of Würzburg, Würzburg, Germany, October 11-13, 2023 • Title: Ferroelectric materials and their piezoelectric nanogenerators supported by main group scaffolds, 3rd International Conference on Main Group Molecules and Materials, Hyderabad, December 8-11, 2023 • Title: Ferroelectricity in framework solids and octahedral metal-ligand cages, Global Virtual Symposium: Metal-Organic Frameworks and Nanoclusters, ACS Spring 2024, March 18-22, 2024 • Organic and hybrid ferroelectrics for piezoelectric energy harvesting applications, The Department of Chemistry, Goa University, Goa, March 21, 2024

#### Umakant Rapol

Part of Indian Delegate for discussion in 'India-Uk Quantum Technologies working group session', Imperial College London, November 9-10, 2023 • Panel member in discussions in '3rd young Scientists congress', Sochi Russia, November 28-30, 2023 • Panel Member in 'The National Quantum Science and Technology Symposium (NQSTS)', New Delhi,

December 14-15, 2023 • Invited lecture in Quantum Sensing 'Structured Training Program on Quantum Technology & Communication, ISRO-SAC, Ahmedabad, March 18-20, 2024 • Panel member in discussion in 'Quantum in India: Navigating Forward to Scale', organised by IBM India, Bengaluru, April 13, 2023 • Discussions on quantum sensing and metrology in 'Workshop on Quantum Technology', organised by Applied Materials, New Delhi, January 23, 2024 • Discussions in 'Stakeholder meeting on Atomic Clocks and Quantum Navigation', IIT Tirupati, Tirupati, August 21, 2023 • Delivered a talk on Ion trap quantum computing, 'Workshop on Quantum Accelerated Computing', organised by Centre for Development of Advanced Computing (C-DAC) Pune, Pune, December 5-6, 2023

#### Girish Ratnaparkhi

Title: The VAPB social network in ALS: A versatile influencer at ER-membrane contact sites, Cellular and Animal Models for Rare Genetic Diseases conference, Manipal Academy of Higher Education (MAHE), Manipal, January 18-20, 2024

#### Richa Rikhy

Title: Mitochondrial morphology dynamics regulate gastrulation in *Drosophila* embryogenesis, European *Drosophila* Research Conference, Lyon France, October 22, 2023 • Title: Mitochondrial fusion in neural stem cell differentiation in *Drosophila* development, MRC Mitochondria Biology Unit seminars, Cambridge, U.K., October 18, 2023 • Title: Mitochondrial fusion in neural stem cell differentiation in *Drosophila* development, Indian *Drosophila* research conference, IISER Thiruvananthapuram, December 6, 2023

#### Pooja Sancheti

Title: Lessons from feminist theory for the discourse of science, Event and Host: "Women's Studies and Women's Movements: Challenges and Resilience", Indian Association of Women's Studies (IAWS) XVII National Conference, September 7-10, 2023 • Lecture (co-presented with Dr. Nishad Matange) on multidisciplinary approaches to designing syllabi, Maharashtra State Faculty Development Academy (MSFDA), Pune, March 6, 2024 • 3 hour workshop on CV and SOP writing, Symbiosis School for Liberal Arts (SSLA), Pune, October 29, 2023 • Conducted HSS-specific pedagogic practices as part of the "Introduction to Effective Teaching Learning" course organised by IISER Pune, September 16 and 23, 2023 • Lecture-workshop on registers in science communication for the Science Activity Centre, IISER Pune, July 18, 2023

#### Britto Sandanaraj

Title: Directed chemical evolution of artificial proteins, International Chemical Biology Conference, Michigan, U.S.A., October 2023

#### M.S. Santhanam

Title: Glimpses of chaos, localisation and interactions, Conference on Nonlinear Dynamics in STEM, IIT, Hyderabad, June 5-7, 2023 • Title: Glimpses of chaos, localisation and interactions, International Conference on Nonlinear Science & Applications (CNSA), IIT, Bhubaneswar, October 12-14, 2023 • Title: Quantum computing: Opportunities and challenges, Physics Department, Shree Mata Vaishnodevi University, Katra, Jammu, November 23, 2023 • A set of lectures on "Dynamics on complex networks", ACM Workshop on Networks, Ahmedabad University, Ahmedabad, December 14-17, 2023 • Title: Chaos and quantum correlations: Lessons from chaotic models, National Workshop on Quantum Technologies, Benaras Hindu University, Varanasi, March 1-2, 2024 • Title: Data and quantum advantage: The promise and gaps in quantum machine learning, Data Dynamics Summit 2024, IISER Pune, March 15-16, 2024

#### Haripada Sau

Title: A constrained Ando dilation problem, The 34th International workshop on operator theory and its applications, University of Helsinki, Finland, July 31-August 4, 2023

#### Srivatsan Seergazhi Gopalan

Title: Probing replicative DNA synthesis in real time and 3D using functionalized nucleotide analogs, Recent Advances in Cryo-EM and Chemical Biology (RACE-CB), IIT Bombay, March 7-9, 2024 •

Organic Chemistry Conference (OCC) organised by National Organic Symposium Trust (NOST), Bhubaneswar, India (Chairperson), February 29-March 3, 2024 • Title: Probing pathogenic nucleic acid motifs using functionalized nucleoside toolbox, Indo-German Workshop 2023, Julius-Maximilians University of Würzburg, Germany, October 11-13, 2023 • FORCE-IICS 2023, Kathmandu, Nepal (Chairperson), September 28-October 1, 2023 • Title: Probing nucleic acid structure and function using functionalized nucleoside toolbox, GRK 2039-Lauterbad, Germany, June 21-23, 2023

#### Kaneenika Sinha

Title: Basics of algebraic number theory (in preparation for the Chebotarev density theorem), Inclusive paths in explicit number theory, University of British Columbia Okanagan Campus, Kelowna, British Columbia, Canada, July 2-15, 2023 • Title: Two perspectives in number theory: Explicit and probabilistic, Plenary talk at the Inter IISER-NISER Mathematics Meet, National Institute of Science Education and Research (NISER) Bhubaneswar, September 29-October 1, 2023 • Title: Sums of Hecke eigenvalues: Explicit and probabilistic methods, Discussion Meeting in Analytic Number Theory, Indian Statistical Institute, Kolkata, January 8-12, 2024

#### Pushkar Sohoni

Title: The Great Marathi inscription in the great temple at Thanjavur, Humanities and Social Sciences Seminar, IISER Pune, February 29, 2024 • Title: Church Walk: St. Mary's Church, Heritage walk for the Indian National Trust for Art and Cultural Heritage (INTACH), Pune Chapter, February 24, 2024 • Moderator for the panel 'British Raj: Memsahibs and Officers' with Vipul Datta and Ipsita Nath, History Literature Festival, Gokhale Institute of Politics and Economics, Pune, February 11, 2024 • Moderator for the conference Conservation and Management of Built Heritage in Maharashtra organised by the Directorate of Archaeology and Museums Maharashtra, Mumbai, January 9, 2024 • Title: Royal umbrellas forever: Maratha funerary memorials, Conference Expanding Dimensions of Research in Maratha History organised by Chhatrapati Shahu Maharaj Research Centre for Studies of Maratha History, Shivaji University, and Directorate of Archaeology and Museums Maharashtra, Kolhapur, December 22, 2023 • Discussant for the roundtable panel Quit India! Decolonizing South Asian Archaeology in Theory or Practice? Annual Conference of the American Council for South Asia, Madison WI, October 21, 2023 • Title: Maratha temples: Revitalising worship with old and new forms, in the series The Indian Temple, organised by Jnanapravaha, Mumbai, October 4, 2023 • Title: Markers of modernity: Colonial market halls, for the Museum Society of Mumbai, September 6, 2023 • Title: The history of Ahmadnagar, for the lecture series on the Nizam Shahi Kingdom of Ahmadnagar, organised by the Mumbai Research Centre of the Asiatic Society of Mumbai, July 7, 2023 • Title: The architectural history of Ahmadnagar, for the lecture series on the Nizam Shahi Kingdom of Ahmadnagar, organised by the Mumbai Research Centre of the Asiatic Society, July 6, 2023 • Title: Islamic archaeology and architecture, Maharashtra's Cultural Heritage, Archaeology, and Museums: A Retrospective and the Roadmap Ahead, organised by Directorate of Archaeology and Museums Maharashtra, jointly with K.J. Somaiya Institute of Dharma Studies, Somaiya Vidyavihar University, Mumbai, July 7, 2023 • Title: Science Education in the vernacular: Marathi and Urdu textbooks in the colonial period, for the panel The Impact of Colonial Education in India and Taiwan, AAS-in-Asia conference, organised by Association for Asian Studies (AAS) and Kyungpook National University, Daegu, Korea, June 26, 2023 • Key discussant for the lecture 'Confluence of Indo-Persian art and architecture' by Prof. Azizuddin Husain, for the course Indo-Persian Heritage organized by Nalanda University, Rajgir, May 18, 2023 • Moderator for a lecture on 'Forging Early Modern Dakani's Literary Canon(s)' by Namrata Kanchan in the series Deccan Conversations organized by the Khidki Collective, online, May 13, 2023 • Title: Maratha architecture, for World Heritage Week, Sinhgad College of Architecture, Pune, April 26, 2023 • Title: Cultural landscapes, Workshop on Research in Built Environment for Early Career Scientists and Architecture Students organised by MIT-ADT University Pune, and SMM College of Architecture, Nagpur, April 4, 2023 • Title: Research in History for architects - documentation of research, for National Online Faculty Development Programme on Teaching-Learning and Application of History for Architects, organised by the Aayojan School

of Architecture, Jaipur, and Council of Architecture, Research and Training Centre, Pune, April 19, 2023 • Title: Imagining India through architecture, National Conference on The Idea of India: Historical Transition and Challenges Ahead, organised by Department of History, School of Social Sciences, Moolji Jaitha College, Jalgaon, and Pragatika Itihasa Samstha, Maharashtra, M.J. College, Jalgaon, April 6, 2023

#### Arun Thalapillil

Title: Less travelled path to the dark universe conference, Talk, International Centre for Theoretical Sciences, Bengaluru (2023)

#### Bejoy Thomas

Title: Environmental sustainability and human well being focusing on the water sector', Policy Roundtable on 'Biodiversity Conservation and Civil Society Organizations', Amrita Vishwa Vidyapeetham, Coimbatore (online), C20 India 2023 Engagement Group of the G20, April 4, 2023 • Title: Equity and sustainability in development practice and policies, K N Raj School of Economics, Mahatma Gandhi University, Kottayam, October 26, 2023 • Title: Addressing equity and sustainability at different scales, Keynote, Conference on Sustainability: Assessment and Challenges, M A College, Kothamangalam, Kerala, January 12, 2024 • Title: Equity and challenges at scale in climate action, Policy Conflux organised by CHRIST (Deemed to be University), Bengaluru and Gujarat Institute of Development Research (GIDR), Ahmedabad, March 6, 2024 • Title: Strategies for freshwater conservation, Panelist on World Water Day at Mumbai Water Conclave 2024, March 22, 2024

#### Arun Venkatnathan

Title: Computational investigation of structure, thermal stability and ion transport in alkali metal ion battery electrolytes, TCG-CREST, Kolkata, May 25, 2023 • Title: Computer simulations on structure and ion transport in battery electrolytes, International Conference (Virtual/Online) on Molecularly Designed Functional Materials 2023, September 28-30, 2023 • Title: Molecular simulations of structure and ion transport in battery electrolytes, MD@60, JNCASR-CECAM conference, JNCASR, Bengaluru, February 26-29, 2024

#### Suneeta Vardarajan

Title: Generalized entropy in higher curvature gravity, Emmy Noether seminar (online), University in Leipzig Germany, January 25, 2024 • Title: Generalized entropy and algebra of observables at QG at RRI, Quantum Gravity conference, Raman Research Institute, Bengaluru, September 5, 2023

## ACADEMIC EVENTS ORGANISED

### Amit Apte

Co-organiser (with M.S. Santhanam, Pranay Goel), Data Dynamics Summit, IISER Pune, 90 participants, March 15-16, 2024

### Apratim Chatterji

Organised session "Early Career Researchers" in annual soft matter conference in India, Compflu 2023, 550 participants from India and abroad, IIT Madras, December 18-20, 2023

### Devapriya Chattopadhyay

Instructor, NPTEL course "The evolution of the Earth and life", January-April, 2024 • Organiser, Biotic Interactions in Deep Time (BITE) Workshop, Erlangen, Germany, May 9-12, 2023 • Instructor, Short course on "Understanding the past and present biodiversity using fossils", Department of Geology and Environmental Science, Christ College Autonomous, Irinjalakuda, Kerala, June 21-22, 2023

### Anisa Chorwadwala

Co-organiser (with Rabeya Basu, Mousomi Bhakta, and Math Club at IISER Pune), Celebrating Women in Mathematics, IISER Pune, May 12 Initiative: 2023 Edition in May 2023. As part of this arranged a talk on the Life and Work of Cristiana De Filippis from University of Parma, Italy • Co-organised a screening of a documentary film "Olga Ladyzhenskaya" on May 13, 2023

### Shouvik Datta

Invited Lead organiser of Symposium QT-01 on 'Excitonic Materials' in Materials Research Society (MRS), Fall Meeting, in the 50th year celebrations of MRS, Boston, Massachusetts, November 26-December 1, 2023, and Virtually on December 5-7, 2023

### Sreejith G.J.

Co-organiser (with Adhip Agarwala (IIT Kanpur), Subroto Mukerjee (IISc Bengaluru), Tapan Mishra (NISER Bhubaneswar)), Physics of Quantum Matter School 2023, NISER Bhubaneswar, May 22-June 4, 2023

### Sujit K. Ghosh

Co-organiser (with Dr. Moumita Majumdar), Mini Symposium on Organometallic Chemistry and Catalysis, Department of Chemistry, Number of participants ~ 150, IISER Pune, November 3, 2023

### Rejish Nath Gopinathan Rejani

Co-organiser (with Weibin Li, School of Physics and Astronomy, University of Nottingham; Filippo Gambetta, Phasecraft, Bristol), international summer school and Workshop in New trends in quantum simulation and computation, University of Nottingham, United Kingdom, July 24-28, 2023 • Co-organiser (with Prof. Umakant Rapol, Prof. Weibin Li, and Dr. Filippo Gambetta) Workshop for PhD students and postdocs, IISER Pune, November 15-17, 2023

### Anindya Goswami

Organiser, Mathematics in Academia and Industry, Dept. Math, IISER Pune, March 2, 2024

### Partha Hazra

Co-organiser (with Angshuman Nag, Arnab Mukherjee, Muhammed Musthafa, Nirmalya Ballav, Pankaj Mandal, Pramod Pillai), Emerging Material Conference 2023, IISER Pune, July 13-15, 2023

### Tejas Kalelkar

Co-organiser (with Stefan Friedl (University of Regensburg), Radhika Gupta (TIFR), Mahan Mj (TIFR), Arunima Ray (Max Planck Institute)), Low-dimensional Topology conference, Organising bodies: IISER Pune, Max Planck Society, and TIFR Mumbai, 50 participants, IISER Pune, September 20-29, 2023

### Krishanpal Karmodiya

Co-organiser (with Mayurika Lahiri (Chairperson), Kundan Sengupta (Secretary), Nagaraj Balasubramanian (Treasurer), Mridula Nambiar,

Siddhesh Kamat), 43rd Annual Conference of The Indian Association for Cancer Research, IISER Pune, January 19-22, 2024 • Co-organiser (with Prof. L.S. Shashidhara, NCBS, IISER Pune, Mr. Akshay Chitlangia, Persistent Systems, Dr. Ankita Singh, IGIB, Dr. Aradhita Baral, Ashoka University, Dr. Devaki Kelkar, PCCM, Dr. Kundan Sengupta, IISER Pune, Dr. Madhura Kulkarni, PCCM, Dr. Mayurika Lahiri, IISER Pune, Dr. Nagaraj Balasubramanian, IISER Pune, Dr. Priya Nagaraj, Pune Knowledge Cluster, Dr. Rupa Mishra, PCCM, Dr. Sneha Joshi, PCCM, Dr. Suveera Dhup, ICGA Foundation), ICGA Conference 2023: 4th Conference: Indian Cancer Genome Atlas 2023, Theme: Advancing Towards Integrated Precision Oncology in India, IISER Pune, October 6-8, 2023

### Mayurika Lahiri

Convenor and Co-organiser (with Kundan Sengupta (Secretary), Nagaraj Balasubramanian (Treasurer), Mridula Nambiar, Krishanpal Karmodiya, Siddhesh Kamat), 43rd Annual Conference of the Indian Association for Cancer Research, IISER Pune, 290 participants, January 19-22, 2024

### Soumen Maity

The fifth annual conference on Computational Thinking in Schools, CTiS2023, IISER Pune, July 7-8, 2023

### Moumita Majumdar

Mini-Symposium on Organometallic Chemistry and Catalysis, Moumita Majumdar and Sujit Kumar Ghosh, Department of Chemistry, IISER Pune, 150 participants, November 3, 2023

### Suhita Nadkarni

Co-organiser (with Collins Assisi, Rishikesh Narayanan) Computational Approaches to Memory and Plasticity, IISER Pune, 60 participants, July 11-25, 2023

### Angshuman Nag

Convener, Emerging Materials - 2023, 200 participants, IISER Pune, July 13-15, 2023 • Co-organiser: India@DESY Users Workshop, 150 participants, JNCASR Bengaluru, March 12-14, 2024

### Mridula Nambiar

Co-organiser (with Mayurika Lahiri (Chairperson), Kundan Sengupta (Secretary), Nagaraj Balasubramanian (Treasurer), Krishanpal Karmodiya, Siddhesh Kamat), 43rd Annual Conference of The Indian Association for Cancer Research, IISER Pune, 290 participants, January 19-22, 2024

### Muhammed Musthafa O.T.

Co-organiser (with Angshuman Nag, Arnab Mukherjee, Nirmalya Ballav, Pankaj Mandal, Partha Hazra, Pramod Pillai), Emerging Materials 2023, July 13-15, 2023

### Pramod P. Pillai

Co-convenor, Emerging Materials 2023, ~150 participants, IISER Pune, July 13-15, 2023

### Mainak Poddar

International Colloquium on Randomness, Geometry and Dynamics, Co-organisers: Anish Ghosh, Mahan Mj., et al., IISER Pune, ~120 participants, January 1-12, 2024

### Moumanti Podder

Organiser, Symposium in Probability as part of the Ramanujan Mathematical Society's 38th Annual Conference, Indian Institute of Technology (IIT) Guwahati, December 22-24, 2023

### Sudha Rajamani

Co-organiser (with Dr. Joy Monteiro), Meeting titled Strange New Worlds: The exploration of exoplanets, IISER Pune, August 17-19, 2023 • Member of the SOC along with 15 other scientists globally,



Meeting titled Origins 2023 by the International Society for the Study of the Origin of Life (ISSOL) and the International Astronomical Union (IAU) Astrobiology Commission (F3) at USFQ campus, Quito, Ecuador, July 30-August 4, 2023 • Co-organiser (with Dr. Naresh Sharma) BIOSANTEXC Kick-Off Meeting - Franco-Indian Campus in Life Sciences and health, May 23-25, 2023

#### Raghav Rajan

Co-organiser (with Mimi H Kao (Tufts University), Sarah C Woolley (McGill University), Carolyn Pytte (City University of New York), George Washington University, Washington DC), BirdSong X - a satellite meeting before SFN 2023, 94 participants, November 10, 2023 • Co-organiser (with Carolyn Pytte (City University of New York)), Virtual Songbird Satellite Symposium, 100-150 participants), February 2024 • Organiser, Outreach event for Std. 3 from Vidya Valley School, Sus Gaon, Pune, 145 children + 5 teachers, IISER Pune, March 19, 2024

#### Boomi Shankar Ramamoorthy

Co-convener, Recent Advances in Inorganic Molecules to Materials (RAIMM-2023), IIT-Kanpur, November 4, 2023

#### Girish Ratnaparkhi

Co-organiser (with Jishy Varghese, Nisha Kannan, Richa Rikhy), Indian Drosophila Research Conference (InDRC), IISER Thiruvananthapuram, December 6-9, 2023

#### Richa Rikhy

Co-organiser (with Jishy Varghese, Nisha Kannan, Girish Ratnaparkhi), Indian Drosophila Research Conference, IISER TVM, 200, December 6-9, 2023

#### M.S. Santhanam

Co-organiser (with Pranay Goel and Amit Apte), Data Dynamics Summit 2024, 90 participants, IISER Pune, March 15-16, 2024

#### Pushkar Sohoni

Organiser, All-IISER Humanities and Social Sciences Meeting, IISER Pune, December 8-10, 2023 • Organiser, Indo-Taiwan Workshop on Colonial Science Education, IISER Pune, January 17-20, 2024

#### Bejoy Thomas

Organiser, Workshop on Streamlining participatory approaches and agent-based model to explore ideas of fairness at the food-water-biodiversity nexus, fairSTREAM project workshop, Collaborators: SOPPECOM, Pune and IIASA, Austria, 45 participants from government agencies, NGOs, academic institutions and local communities, IISER Pune, February 6-7, 2024

## NEW EXTRAMURAL GRANTS

Funds shown in the last column represent the amount either received by or assigned to the project

Amount in ₹

Sr. No.	Name of the Project and Project Leader	Project Code	Funding Agency	Period From-To	Total Funds Sanctioned	Funds Received during the Year
1	Analysis of polarity protein function in the formation of polygonal epithelial-like cells in embryogenesis PI: Dr. Richa Rikhy Co-PI: Dr. Kundan Sengupta	GAP/DBT/BIO-23-639	DBT	24.3.2023 23.3.2026	93,75,800	36,18,600
2	Reclamation of degraded tribal agricultural lands using Western Ghat's actinorhizal shrub <i>Elaeagnus conferta</i> Roxb PI: Dr. Sagar Pandit	GAP/RGSTC/BIO-23-640	RGSTC	29.4.2023 28.4.2026	24,85,052	11,40,684
3	Differential central simple algebra and differential splitting PI: Dr. Anupam Kumar Singh	GAP/DAE/MTH-23-641	DAE-NBHM	4.5.2023 3.5.2026	3,98,000	2,06,000
4	Towards an evidence-based regimen for treating extra-Pulmonary Tuberculosis (EPTB) PI: Dr. Siddhesh Kamat	GAP/DBT/BIO-23-642	DBT	28.3.2023 27.3.2025	2,64,91,600	2,37,20,800
5	SERB-POWER Fellowship to Dr. Srabanti Chaudhury PI: Dr. Srabanti Chaudhury	GAP/SERB/CHE-23-643	SERB	19.6.2023 18.6.2026	38,10,000	12,70,000
6	Cell-matrix adhesion-dependent Golgi organisation: Regulation and role in normal and anchorage-independent cancers PI: Dr. Nagaraj Balasubramanian	GAP/SERB/BIO-23-644	SERB	20.6.2023 19.6.2026	58,88,696	19,49,000

Amount in ₹

Sr. No.	Name of the Project and Project Leader	Project Code	Funding Agency	Period From-To	Total Funds Sanctioned	Funds Received during the Year
7	AOARD 23IOA037 - Anchoring ionic polymers into COF to develop conducting ionic-sponges for charge storage PI: Dr. Vaidhyanathan Ramanathan	GAP/AOARD/CHE-23-645	AOARD	7.6.2023 6.6.2024	24,49,350	24,49,350
8	Teachers Associateship for Research Excellence (TARE) Dr. Biplab Bag, Amity University Jharkhand (Mentor - Dr. Sunil Nair)	GAP/SERB/PHY-23-646	SERB	1.11.2022 31.10.2025	10,05,000	3,35,000
9	Reconstitution of a soluble bacterial chemosensory complex PI: Dr. Gayathri Pananghat	GAP/SERB/BIO-23-647	SERB	30.6.2023 29.6.2026	75,42,040	42,43,000
10	Exploring novel interface effects in transition metal oxides / carbon nanotubes based hybrids PI: Dr. Ashna Bajpai	GAP/SERB/PHY-23-648	SERB	3.8.2023 2.8.2026	72,96,091	62,54,000
11	Hecke algebras for tame Bernstein blocks PI: Dr. Manish Kumar Mishra	GAP/SERB/MTH-23-649	SERB	4.8.2023 3.8.2026	29,78,888	10,99,629
12	Upgradation of 500 MHz Bruker NMR Spectrometer PI: Dr. T.S. Mahesh	GAP/I-HUB/PHY-23-650	I-HUB Quantum Technology Foundation	8.8.2023 7.8.2026	5,00,00,000	5,00,00,000
13	Designing and analysing quantum materials using optimized algorithms on analogue and digital quantum computers PI: Dr. Rejish Nath	GAP/UoN/PHY-23-651	University of Nottingham	20.12.2022 30.12.2023	GBP 38980 (total amount in rupees to be known later)	9,48,948
14	2023 and 2024 Computational approaches to memory and plasticity PI: Dr. Collins Assisi	GAP/SF/BIO-23-652	Simons Foundation INC	1.6.2023 31.5.2025	49,81,500	24,78,075
15	Synthesis of heparan sulfate-laminin glycopeptides to decipher basement membrane code in cancer cells metastasis PI: Dr. Raghavendra Kikkeri	GAP/CSIR/CHE-23-653	CSIR	7.9.2023 27.12.2023	15,00,000	1,25,000
16	Wellcome Trust / DBT India Alliance - Dr. Nixon Abraham PI: Dr. Nixon Abraham	GAP/Wellcome Trust/BIO-23-654	Wellcome Trust - DBT India Alliance – Other	1.9.2023 31.8.2028	4,49,96,226	1,25,50,086
17	Architecture and dynamics of magma reservoir in Deccan Volcanic Province: Seismological-geochemical synthesis PI: Dr. Arjun Datta	GAP/SERB/ECS-23-655	SERB	11.9.2023 10.9.2026	47,37,200	15,60,000

Amount in ₹

Sr. No.	Name of the Project and Project Leader	Project Code	Funding Agency	Period From-To	Total Funds Sanctioned	Funds Received during the Year
18	Quantum-enhanced atomic gravimetry for improved sensing capabilities PI: Dr. Sebastian Wuster Co-PI: Dr. Umakant Rapol	GAP/DST/PHY-23-656	DST	5.10.2023 4.10.2026	34,29,700	32,00,000
19	Understanding the plasticity of diverse cohesin complexes during mitosis and meiosis PI: Dr. Mridula Nambiar	GAP/SERB/BIO-23-657	SERB	10.10.2023 9.10.2026	50,84,970	25,76,700
20	INSPIRE Faculty Award - Dr. Ushasi Roy PI: Dr. Ushasi Roy	GAP/DST-INSPIRE/PHY-23-658	DST	26.6.2023 25.6.2028	1,12,40,000	22,00,000
21	MoE STARS - Single-cell quantitation of mRNA and protein expression of antigenic variation genes and tissue tropism characterization in <i>Plasmodium falciparum</i> PI: Dr. Krishanpal Karmodiya	GAP/MoE-STARS/BIO-23-659	MoE-STARS	3.10.2023 2.10.2026	72,00,000	33,75,000
22	MoE STARS - Towards exciton-based valleytronic technologies using 2D semiconductor/magnet heterostructures: high-performance magneto-optics and magneto-ellipsometry investigations PI: Dr. Ashish Arora	GAP/MoE-STARS/PHY-23-660	MoE-STARS	3.10.2023 2.10.2026	50,00,000	32,20,000
23	Understanding and modeling the interactions between Debris and glacier Ice in a Changing Climate (D-ICE) PI: Dr. Argha Banerjee	GAP/MoES/ECS-23-661	MoES	9.10.2023 8.10.2027	27,46,960	7,55,280
24	Internationalising higher education in science journalism and science communication PI: Dr. Shalini Sharma	GAP/UWE/BIO-23-662	University of The West of England	20.12.2022 15.2.2024	23,54,343	9,09,273
25	Nature's preference for heterobimetallic cofactors: Investigation of the structure-function-reactivity relationship using synthetic mimics PI: Dr. Debangsu Sil	GAP/SERB/CHE-23-663	SERB	19.10.2023 18.10.2025	33,00,000	27,70,270
26	MoE STARS - Nonequilibrium self-assembly of colloidal particles in living fluids PI: Dr. Vijayakumar Chikkadi	GAP/MoE-STARS/PHY-23-664	MoE-STARS	3.10.2023 2.10.2026	52,30,000	31,07,000
27	MoE STARS - Mechanistic investigations into the minimal cell division machinery of cell wall less bacteria PI: Dr. Gayathri Pananghat	GAP/MoE-STARS/BIO-23-665	MoE-STARS	3.10.2023 2.10.2026	48,00,000	20,68,000

Amount in ₹

Sr. No.	Name of the Project and Project Leader	Project Code	Funding Agency	Period From-To	Total Funds Sanctioned	Funds Received during the Year
28	MoE STARS - Novel aggregation induced thermally activated delayed fluorescent (AIE-DF) organic luminogens for time-resolved fluorescence imaging and efficient OLED device fabrication PI: Dr. Partha Hazra	GAP/MoE-STARS/CHE-23-666	MoE-STARS	3.10.2023 2.10.2026	40,00,000	28,62,000
29	Studies on continuous-flow photochemical cyclopropanation towards permethrin derivatives PI: Dr. Gnanaprakasam Boopathy	GAP/CSIR/CHE-23-667	CSIR	7.10.2023 6.10.2026	28,00,000	4,18,750
30	AOARD 23IOA054 - Optothermal tweezer microscopy of light-absorbing colloids PI: Dr. G.V. Pavan Kumar	GAP/AOARD/PHY-23-668	AOARD	30.9.2023 29.9.2024	24,87,225	24,87,225
31	Plasmonic Nanoparticles and triplet state engineering for the emission enhancement of luminescent Cu Nanoclusters: A step towards the development of stable and efficient light harvesting devices PI: Dr. Partha Hazra	GAP/CSIR/CHE-23-669	CSIR	7.10.2023 6.10.2026	9,00,000	56,250
32	Functionalized Metal-Organic Polyhedra (MOPs) for industrially relevant hydrocarbon separation PI: Dr. Sujit Kumar Ghosh	GAP/CSIR/CHE-23-670	CSIR	7.10.2023 6.10.2026	9,00,000	56,250
33	AOARD 23IOA046 - Investigating emergent inductance in strongly correlated oxides PI: Dr. Sunil Nair	GAP/AOARD/PHY-23-671	Asian Office of Aerospace R & D (AOARD)	11.8.2023 10.8.2024	20,70,625	20,70,625
34	Theory and computation of option price & optimal portfolio under regime switching market models PI: Dr. Anindya Goswami	GAP/DST/MTH-23-672	DST	26.3.2021 25.3.2023	6,37,000	2,73,000
35	Multidisciplinary approach for design and development of novel ionchannel inhibitors for cancer therapy PI: Dr. Hosahudya Gopi	GAP/DBT/CHE-23-673	DBT	9.10.2023 8.10.2026	53,98,080	10,69,960
36	MoE STARS - Photochemistry with plasmonic materials: Taking the heat out of plasmons for translational chemical transformations PI: Dr. Pramod Pillai	GAP/MoE-STARS/CHE-23-674	MoE-STARS	3.10.2023 2.10.2026	40,00,000	28,62,000
37	Post translational modifier SUMO regulates development of primordial germ cells in <i>Drosophila</i> PI: Dr. Girish Ratnaparkhi (Indian PI) Co-PI: Dr. L.S. Shashidhara (Indiana Co-PI) PI: Dr. Girish Deshpande (International PI) Co-PI: Dr. Paul Schedul (International Co-PI)	GAP/SPARC/BIO-23-675	SPARC	28.7.2023 27.7.2025	49,90,740	25,00,000

Amount in ₹

Sr. No.	Name of the Project and Project Leader	Project Code	Funding Agency	Period From-To	Total Funds Sanctioned	Funds Received during the Year
38	Structural analysis of coiled domains involved in motility PI: Dr. Gayathri Pananghat (Indian PI) Co-PI: Dr. J. Venkatesh Pratap (Indina Co-PI) PI: Dr. Ben F. Luisi (International PI) Co-PI: Dr. Chris R. Calladine (International Co-PI)	GAP/SPARC/BIO-23-676	SPARC	28.7.2023 27.7.2025	40,04,080	25,00,000
39	A knowledgebase of molecular interactions in <i>Mycobacterium</i> - national network project of IISER Pune PI: Dr. M.S. Madhusudhan	GAP/DBT/BIO-23-677	DBT	11.10.2023 10.10.2028	1,07,80,216	20,88,560
40	Unravelling the metabolic nexus in the granulosa cells of women with PCOS PI: Dr. Jeetender Chugh	GAP/ICMR/CHE-23-678	ICMR	19.12.2023 18.12.2026	16,30,297	3,24,700
41	MoE STARS - Nuclear lamins as mechanomodulators of chemoresistance PI: Dr. Kundan Sengupta	GAP/MoE-STARS/BIO-23-679	MoE-STARS	3.10.2023 2.10.2026	96,00,000	44,77,000
42	Valorization of mangrove species for the livelihood improvement of the mangrove-associated local communities via sustainable utilization PI: Dr. Sagar Pandit	GAP/MMRDA/BIO-23-680	MMRDA	5.1.2024 4.1.2029	5,00,00,000	4,16,00,000
43	MoE STARS - Synthesis of sustained-releasing rifampicin crystalline formulation for patient compliant treatment of tuberculosis PI: Rachit Agarwal, IISc Bengaluru; Co-PI: Dr. Harinath Chakrapani	GAP/MoE-STARS/CHE-23-681	MoE-STARS	4.12.2023 3.12.2026	37,24,364	5,40,000
44	Raja Ramanna Chair (Track 1) PI: Dr. Sunil Mukhi	GAP/DAE/PHY-23-682	DAE - Others	1.11.2023 30.10.2026	40,50,000	13,50,000
45	Wellcome Trust / DBT India Alliance - Dr. Thomas Pucadyil PI: Dr. Thomas Pucadyil	GAP/Wellcome Trust/BIO-23-683	Wellcome Trust - DBT India Alliance - Other	1.10.2023 30.9.2029	9,97,30,840	2,36,04,284
46	Bioprospecting and pollution tolerance capacity analysis of mangrove species for the livelihood improvement of the mangrove-associated local communities via sustainable utilization and conservation PI: Dr. Sagar Pandit	GAP/MSRDC/BIO-23-684	MSRDC	22.1.2024 21.1.2029	5,00,00,000	4,16,00,000
47	Studies on continuous flow domino borrowing alkylation strategy towards heterocycles and alkaloids PI: Dr. Gnanaprakasam Boopathy	GAP/SERB/CHE-23-685	SERB	23.1.2024 22.1.2027	61,77,171	37,36,500
48	Wellcome Trust / DBT India Alliance - Dr. Mridula Nambiar PI: Dr. Mridula Nambiar	GAP/Wellcome Trust/BIO-23-686	Wellcome Trust - DBT India Alliance - Other	1.1.2024 31.12.2028	3,43,85,868	75,35,543

Amount in ₹

Sr. No.	Name of the Project and Project Leader	Project Code	Funding Agency	Period From-To	Total Funds Sanctioned	Funds Received during the Year
49	Wellcome Trust / DBT India Alliance - Dr. Gayathri Pananghat PI: Dr. Gayathri Pananghat	GAP/Wellcome Trust/ BIO-23-687	Wellcome Trust - DBT India Alliance	1.1.2024 31.12.2028	4,49,58,826	1,11,57,942
50	Characterizing the sensitivity of Indian forests to droughts and extreme temperatures using functional traits PI: Dr. Deepak Barua	GAP/DBT/BIO-23- 688	DBT	8.12.2023 7.12.2026	36,03,328	15,21,248
51	Probing the energy landscape of RNA aptamers using <sup>19</sup> F NMR spectroscopy PI: Dr. Jeetender Chugh & Dr. S.G. Srivatsan	GAP/SERB/CHE-23- 689	SERB	25.1.2024 24.1.2027	51,74,224	27,38,074
52	Novel signatures of self-interacting dark matter: Simulations of gravothermal collapse and baryonic modelling PI: Dr. Susmita Adhikari	GAP/SERB/PHY-23- 690	SERB	5.2.2024 4.2.2026	14,10,816	7,85,408
53	Extracting cosmological information beyond 2-point correlations: application of k-nearest neighbor distributions to nonlinear structure formation PI: Dr. Arka Banerjee	GAP/SERB/PHY-23- 691	SERB	7.2.2024 6.2.2026	17,06,496	14,78,928
54	Stochastic resonance in the brain's GPS. How it helps encode and remember our trajectories through space PI: Dr. Collins Assisi	GAP/SERB/BIO-23- 692	SERB	12.2.2024 11.2.2027	6,60,000	2,20,000
55	Lightening arylidene diazosuccinimides: Photoinduced generation of carbenes and radicals to access Pyromellitic Diimide (PMDI) based luminophors and bioactive organic compounds PI: Dr. Ramakrishna G. Bhat	GAP/SERB/CHE-23- 693	SERB	14.2.2024 13.2.2027	63,01,196	35,57,000
56	Designer small molecule-based ferro-and piezoelectric materials for nanogenerators and field-effect transistors PI: Dr. R. Boomi Shankar	GAP/SERB/CHE-23- 694	SERB	14.2.2024 13.2.2027	79,44,535	55,54,781
57	Photocatalysis beyond the band gap: Accessing the higher redox levels in quantum dots using light and potential PI: Dr. Pramod P. Pillai	GAP/SERB/CHE-23- 695	SERB	14.2.2024 13.2.2027	53,02,000	37,80,666
58	Structurally-consistent model parameter estimation in inverse modeling of EM data PI: Dr. Rahul Dehiya	GAP/SERB/ECS-23- 696	SERB	17.2.2024 16.2.2027	6,60,000	2,20,000
59	AQUAMUSE: Facilitating just and sustainable water futures through water museums, digital media and the arts PI: Dr. Shalini Sharma & Dr. Sara Ahmed	GAP/IHE/BIO-23-697	Stichting IHE Delft	7.2.2024 31.12.2025	EUR 71962 (total amount in rupees to be known later)	25,66,088

Amount in ₹

Sr. No.	Name of the Project and Project Leader	Project Code	Funding Agency	Period From-To	Total Funds Sanctioned	Funds Received during the Year
60	Synthesis and evaluation of organic modulators of cellular sulfane sulfur PI: Dr. Harinath Chakrapani	GAP/SERB/CHE-23-698	SERB	4.3.2024 3.3.2027	73,07,525	37,99,300
61	Design, synthesis and evaluation of redox and magnetic properties of 25p-radicals for organic radical batteries Dr. V.G. Anand	GAP/SERB/CHE-23-699	SERB	4.3.2024 3.3.2027	46,39,888	15,59,962
62	Bioinformatics-guided enzyme engineering to modulate lower ligand activation and attachment for the production of cobalamin and other cobamide vitamins PI: Dr. Amrita Hazra	GAP/SERB/CHE-23-700	SERB	4.3.2024 3.3.2027	70,29,176	38,80,600
63	Cytoskeletal and membrane adaptations of stretched neurons from tension-induced growth to traumatic brain injury PI: Dr. Aurnab Ghose	GAP/DST/BIO-23-701	DST	12.7.2023 11.7.2026	34,08,724	9,96,520
64	MMTTC (erstwhile PMMMMNMTT) towards Malaviya Mission - Teachers Training Programme PI: Dr. Harinath Chakrapani	GAP/CHE/UGC-23-702	UGC	5.1.2024 4.1.2025	9,35,700	9,35,700
65	Improving short-to-medium range extreme precipitation forecasts with climate networks and hybrid physics-ML convection parameterization PI: Dr. Joy Monteiro	GAP/ECS/IITM-23-703	IITM	11.2024 31.12.2026	36,23,360	5,15,320
66	Development of medicinal plant propagation facility, standardization of propagation and analysis protocols PI: Dr. Sagar Pandit	GAP/CS/BIO-23-704	Chikitsak Samuha	20.3.2024 19.3.2029	1,51,00,000	51,00,000
67	Disruption of brain rhythms as an early marker of Alzheimer's disease: A multiscale computational modeling approach PI: Dr. Suhita Nadkarni	GAP/PT-EMSTAR/BIO-23-705	EMSTAR/2023/SL04 dt. 31.01.2024	22.3.2024 21.3.2029	4,47,70,418	1,26,76,818
68	VAPB at membrane contact sites: ALS-FTD at the crossroads of ER stress, proteostasis, lipid homeostasis and inflammation PI: Dr. Girish Ratnaparkhi	GAP/PT-EMSTAR/BIO-23-706	EMSTAR/2023/SL03 dt. 31.01.2024	22.3.2024 21.3.2029	4,68,82,880	87,27,840
69	Mapping the social history of sugar manufacturing: A case study of Haregaon PI: Dr. Chaitra Redkar	GAP/ICSSR/HSS-23-707	ICSSR/RPD/MN/2023-24/G/139 dt. 15.02.2024	15.2.2024 14.2.2025	7,00,000	3,50,000








**Indian Institute of Science Education and Research Pune**

Dr. Homi J. Bhabha Road, Pune 411008, India

 +91 20 25908001

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