



# The Institute of Mathematical Sciences, Chennai

## Quarterly Report

January - March 2023



---

## Highlights: research and events

### **IMSc - CELEBRATING 60 YEARS OF CREATIVE SCIENCE during Jan 2 – Jan 5, 2023.**

The Institute of Mathematical Sciences (IMSc), founded by Alladi Ramakrishnan in 1962, is a national institution for research in frontier areas of computational biology, computer sciences, mathematics, and theoretical physics. The institute members are also actively engaged in training young researchers through a vibrant doctoral program and also sharing the wonders of theoretical and computational sciences with school and college students.

The year 2022 marked the 60th foundation year of our institute and we had a year long scientific and outreach activities by honoring young and experienced scientists who have made fundamental contributions in their areas of research.

The kick-off event was inaugurated by Prof. V Ravindran, Director of the Institute on January 3, 2022. To mark this momentous occasion, a virtual event was organized by the institute to start a year-long celebration which will include lectures, conferences and academic events across all research groups.

The brief schedule for this IMSc60 kick-off event was as follows: Short address by Prof. V. Ravindran (Director, IMSc) Brief addresses by former Directors / Joint-Directors of IMSc, Prof. G. Rajasekaran, Prof. R. Ramachandran, Prof. R. Balasubramanian, and Prof. V. Arvind There were reminiscences of current and past members of the institute The event also consisted of the release of special volumes of the Tamil Nadu Science Forum (TNSF) science outreach magazines Thulir and Jantar Mantar featuring the contributions of IMSc members over the years. There was a poster exhibition that featured covers of the magazines and IMSc members in TNSF events.

The program coordinators were Viswanath, Indumati and Following these events, we had the inception of The IMSc 60 colloquium series that was designed with the aim of celebrating the 60th foundation year. We have had colloquia on a wide variety of topics by both young and experienced researchers, who are working at the forefront in their respective fields of research. We had both online and offline talks by speakers across the globe.

There were a total fifty nine distinguished seminars as a part of this series. This year-long colloquium series was a huge success with gaining wide publicity and fostering interactions between the inhouse IMSc students, postdocs, faculty members and the eminent speakers.

---

Much of the details can be found here: <https://www.imsc.res.in/imsc60/>

As a part of this celebration, a flagship event namely Boltzmann Day was launched. The Boltzmann medal (or Boltzmann award) is a distinguished prize awarded to physicists for outstanding achievements in statistical physics; it is named after the physicist Ludwig Boltzmann. The "Boltzmann Day" at the Institute of Mathematical Sciences is to celebrate and honor the achievements of these eminent scientists. The lectures in this series are given by the awardees and are aimed at a general scientific audience. This took place on June 28, 2022 and the talks were given by the 2022 Boltzmann Awardees Prof. Deepak Dhar from TIFR Mumbai and Prof. John Hopfield from Princeton University. The program was coordinated by Arnab Pal. Event details can also be found here: <https://www.imsc.res.in/imsc60/boltzmannday.html>



The IMSc60 foundation year ended on a high note with a flagship event namely IMSc60 celebration which took place during Jan 2-5, 2023. It was planned to celebrate all areas of science and bring together the scientific community encompassing scientists, nation-builders, policy-makers and research scholars not only to honor and recognize remarkable scientific contributions from the past but also to strengthen India's scientific vision for the next decade and help India lead the global research landscape.



Members of the IMSc60 committee were: Sanoli Gun, Anup Dixit, Ramya C, Rahul Siddharthan, Saket Saurabh, Sayantan Sharma, Arnab Pal, Areejit Samal, and V Ravindran.

During the four days, we have had 66 scientific talks including those by eminent scientists, invited faculty, IMSc faculty and a significant number by the IMSc students. These were in-person talks and were conducted at the Ramanujan Auditorium. Other than the scientific talks, we had a poster session, a Release of Special Cover and My Stamp by the Postmaster General Chennai Circle to commemorate IMSc60, a cultural dance event followed by family gathering over a banquet, and a book release by TNSF for Children Jantar Mantar. There was also a panel discussion on Chennai as a Science hub which had the following eminent panelists: Soumya Swaminathan (former DG ICMR, former Chief Scientist WHO), B Venkatraman (Director, IGCAR Kalpakkam), Smita Srivastava (faculty incharge, IIT Madras Bioincubator), Madhavan Mukund (Director, Chennai Mathematical Institute), Rajeeva Karandikar (former Director, CMI), GN Hariharan (Executive Director, MSSRF Chennai), V Ravindran (Director, IMSc Chennai).



Overall, IMSc60 celebrations was a tremendous success and has aptly highlighted the immense contribution of our institute to Indian Science.

All the details of the program can be found here: <https://www.imsc.res.in/imsc60/celebration/>

---

### **Teachers Enrichment Workshop on Linear Algebra and Discrete Mathematics during Jan 23 – Jan 28, 2023.**

The objective of this workshop was to develop basic linear algebra in a conceptually, mathematically and pedagogically sound manner, and to illustrate applications to other areas. There will be a special focus on applications to graph theory, and physical, geometric, computational and combinatorial aspects of the determinant.

### **Frontiers in Non-Equilibrium Physics during Jan 17 – Jan 20, 2023.**

While the formalism of equilibrium physics is established in an elegant way within the Boltzmannian description, understanding of non-equilibrium systems remains elusive although they are prevalent in nature. For example, nonequilibrium is essential for fluid motions or sustaining life in a single cell. The last two decades have seen a tremendous growth on this subject and lots of efforts have been made to put forward unifying principles and general truths. This conference is to bring together leading and young scientists, early career researchers and students working in different areas of the broad field of non-equilibrium physics in the pursuit of cross-talks across disciplines and promoting collaborations. The conference will not be restricted to certain areas but broad themes would be: random processes and applications, stochastic thermodynamics, non-equilibrium phenomena in soft and biophysics.

Organizers: Arnab Pal and Pinaki Chaudhuri

Webpage: [https://www.imsc.res.in/frontiers\\_non\\_equilibrium\\_physics\\_fnep](https://www.imsc.res.in/frontiers_non_equilibrium_physics_fnep)

We had around 80 participants (inhouse, domestic and foreign speakers).

### **Program on astrophysics during Feb 1 – Feb 8, 2023.**

This 8-day long program was divided into three parts:

- (i) Neutron Stars: The celestial clocks that probe extreme physics an international conference in the hybrid mode during the period of 01-February-2023 (Wednesday) to 03-Feb-2023 (Friday).
- (ii) Outreach event for school kids on 04-Feb-2023 (Saturday): This event had two talks Pulsars: Timekeepers of the Cosmos by Prof. Maura McLaughlin (WVU) and How to become an

---

astronomer by Dr. Prerna Rana, followed by a quiz session. About 125 students (of class IX and XI) mostly from Kendriya Vidyalaya participated.

(iii) Discussion and work together meeting for the Indian Pulsar Timing Array consortium during the period of 06-February-2023 (Monday) to 08-Feb-2023 (Wednesday).

## Participation in conferences

### **Chaudhuri, Pinaki P.**

Participated in 8th Indian Statistical Physics Community Meeting held at ICTS, TIFR, Bangalore during Feb 1 – Feb 3, 2023. Invited talk

### **Coimbatore Balram, Ajit**

Participated in Quantum Geometric Advantage Workshop held at Nanyang Technological University, Singapore during Jan 3 – Jan 6, 2023. Invited Talk

Participated in PRL conference on Condensed Matter Physics (PRL CCMP 2023) held at PRL, Ahmedabad during Feb 6 – Feb 8, 2023. invited talk

Visited IIT Gandhinagar during Feb 8 – Feb 9, 2023. invited seminar

Visited IIT Guwahati during Feb 20 – Feb 21, 2023. invited seminar

Participated in APS March meeting 2023 held at Las Vegas Convention center (satellite online meeting: 20-22 March, 2023) during Mar 6 – Mar 10, 2023. focus talk

Participated in Physics of Strongly Correlated Electron Systems (PSCES) 2023 held at IISER Pune during Mar 15 – Mar 17, 2023. invited talk

### **Dixit, Anup B.**

Participated in Chennai Tirupati Number theory conference held at Chennai Mathematical Institute during Feb 11 – Feb 12, 2023. Invited speaker

### **Ghosh, Sibasish**

Participated in Progress in Quantum Science and Technology (2023) held at IIT-Madras during Jan 23 – Jan 27, 2023. I was an invited speaker in the Conference, and delivered a seminar there.

### **Kodiyalam, Vijay**

---

30 Participated in IMSc 60 held at IMSc, Chennai during Jan 2 – Jan 5, 2023. Gave a lecture on "Picture invariants and their applications"

Visited Presidency College, Chennai on Feb 23, 2023. Delivered the P. Subramaniam Endowment lecture on "Unitary invariants and their applications"

Visited RIASM, Chennai on Mar 6, 2023. Delivered the V. K. Balachandran endowment lecture on "Infinitely many quantum solutions to Euler's 36 officers problem"

### **Mahajan, Meena B.**

Visited IISER Tirupati during Jan 18 – Jan 19, 2023. Gave an Institute Colloquium titled "What is hard to prove, and why?"

Participated in ACM-W India Decade Celebrations, and ACM India Annual Event 2023 held at OIST, Bhopal during Feb 10 – Feb 11, 2023. Panelist in the ACM-W event in a panel discussion on the theme "Diversity, Equity and Inclusion: The journey till now and way forward"

Participated in Dagstuhl Seminar 23111: Computational Complexity of Discrete Problems held at Schloss Dagstuhl, Leibniz Zentrum for Informatics during Mar 12 – Mar 17, 2023. One of the four scientific co-organisers of the research seminar.

Participated in North American Annual Meeting of the Association of Symbolic Logic held at University of California at Irvine, USA during Mar 25 – Mar 26, 2023. In the special session on "Proof Complexity Beyond Propositional Logic", gave an invited talk on "Quantified Boolean formulas: solving and proof complexity."

### **Mukhopadhyay, Anirban**

Participated in Conference on Analytic Number Theory held at Indian Statistical Institute, Kolkata during Feb 6 – Feb 9, 2023. gave a talk on "Poissonian pair correlations".

### **Raghavan, K. N.**

Visited Indian Academy of Sciences during Jan 9, 2022 – Jan 9, 2023. Chair of the Mathematics Selection Committee of Summer Research Fellowships

Participated in Conference on Commutative Algebra and Algebraic Geometry held at IIT Hyderabad during Feb 8 – Feb 9, 2023.

Participated in Group Theory and Related Topics held at NISER, Bhubaneswar on Mar 4, 2023. Gave an invited talk

Visited University of Hyderabad during Mar 6 – Mar 7, 2023. School Board Meeting, Colloquium Talk

---

Participated in 13th Refresher Course in Mathematical Science held at University of Calicut (Online) during Mar 10 – Mar 18, 2023. Gave two online talks

Visited Secretariat of the International Mathematical Union, Berlin during Mar 11 – Mar 14, 2023. Meeting of the IMU Commission for Developing Countries

Visited Harish-Chandra Research Institute during Mar 20 – Mar 21, 2023. NBHM Library Committee Meeting, Colloquium Talk

### **Subramanian, C. R.**

Participated in 9th International Conference on Algorithms and Discrete Applied Mathematics (CALDAM-2023) held at Dhirubhai Ambani Institute of Information and Communication Technology during Feb 9 – Feb 11, 2023.

## **IMSc Outreach**

### **Azadi Ka Amrit Mahotsav**

**Title** : Delineating survival strategies employed by Mycobacterium tuberculosis

**Speaker** : Prof. Vinay Nandicoori, Director, CSIR - Centre for Cellular and Molecular Biology, Hyderabad

**Date** : 27 March 2023

---

**Title** : Masala Lab -- the science of Indian cooking

**Speaker** : Krish Ashok, Global Head, Digital Workspace for Tata Consultancy Services

**Date** : 18 March 2023

---

### **Vigyan Pratibha Regional Workshop (KVS & JNV): (10–13 January, 2023)**

IMSc organized a 4-day follow up workshop for teachers in the Vigyan Pratibha program, a Government of India program to nurture of talent in Science and Mathematics among VIII - X students. The workshop was attended by 35 teachers from central government schools (KVs and JNVs) from the southern region.



---

Organizers: K. N. Raghavan, Manikandan Sambavasivan, Varuni P, S. Viswanath

Details/photos: <https://www.imsc.res.in/outreach/vpchennai/TWChEng2023.html>

### **Teacher's Enrichment Workshop: (23–28 January, 2023)**

Workshop for mathematics teachers of Engineering colleges focusing on Linear algebra and discrete mathematics.

Organizers: Amritanshu Prasad, K. Srinivas

### **Darwin Day: (12 February, 2023)**

To mark Darwin Day, the birth anniversary of Charles Darwin, IMSc and TNSF volunteers organised a with public event at Elliots Beach (Chennai) to raise awareness among students, teachers and the general public about the topic of Evolution and Natural Selection.

Details/photos: <https://www.imsc.res.in/outreach/DD2023/>

### **Science at the Sabha (19 February, 2023)**

Science at the Sabha 2023" was conducted on Sunday, 19 February, 4:00-7:30 pm at The Music Academy (TTK Auditorium). "Science at the Sabha" is a set of four public talks on different aspects of science and is part of the Institute of Mathematical Sciences, ongoing program of outreach to the general public. This was the 6th edition of this flagship event conducted in February of each year at this venue. The event was attended by 500-700 people.

The talks were aimed at anyone with an interest in science, irrespective of age or background. This year the talks were:

- Black holes through different windows by Parameswaran Ajith, International Centre for Theoretical Sciences, Bengaluru.
- Ayurveda and modern medicine: the beginning of a molecular conversation by Mitali Mukerji, Indian Institute of Technology Jodhpur.

- The Quest for Automating Mathematics by Siddhartha Gadgil, Indian Institute of Science, Bangalore.
- Carnatic Music Processing: A Culture Specific Approach by Hema A Murthy, Indian Institute of Technology Madras.



There was also a poster series exhibited in the foyer describing research work from various IMSc members.

### **Vanavil Mandram IMSc visit: (21 March 2023)**

150 students (Class 6 to 8) from various parts of Tamil Nadu visited IMSc as part of Vaanavil Mandram, an initiative by the TN School Education Department.

Speakers: Disha Kuzhively, G Arun Kumar (IITM) and IMSc volunteers

Organizers: Amritanshu Prasad, Disha Kuzhively, Manikandan Sambasivam, Varuni P.

Detailsphotos: <https://www.imsc.res.in/outreach/VM2023/>

<https://www.imsc.res.in/triveni/2023/>