



THE INSTITUTE OF MATHEMATICAL SCIENCES
TARAMANI, CHENNAI 600 113
January 2018 – March 2019

1. The Institute

The Institute of Mathematical Sciences (IMSc), is an autonomous institute funded by the Government of India, through the Department of Atomic Energy. Its members work primarily in the areas of Computational Biology, Mathematics, Theoretical Physics and Theoretical Computer Science. The Institute is an autonomous body governed by a Governing Board and an Executive Council. Academic personnel of the Institute are designated as Faculty, Post-Doctoral Fellows and Junior Research Fellows. The academic programmes are ably supported by an administrative set-up. The Director is assisted by the Faculty in academic matters and by the Registrar in administrative matters. About 5 awards and honors were bestowed on our faculty during this period. The Institute has a faculty strength of 55 during the current year, with 40 of them at the professor level. The Institute has 155 Junior Research Fellows, 39 Post Doctoral Fellows, 36 members of scientific, administrative and Accounts staffs. Also there are 55 project staffs at various levels.

The Institute has an excellent scientific library and computing environment with dedicated high speed network. The Institute has adequate infrastructure to host several national and international conferences, workshops and instructional schools which it does regularly. This includes the state of the art, 200 seater 'Ramanujan Auditorium' in our campus.

2. Teaching Programmes

IMSC has an intensive teaching programme with a high level quality. Students are selected at the graduate and postgraduate level each year through an all India joint entrance screening test followed by an interview. They undergo two years (typically) of rigorous course-work, and after successful completion of which they join doctoral thesis work under the supervision of a faculty member. The qualified thesis work is submitted to the Homi Bhabha National Institute, which is a deemed University of which IMSc is a part, for award of PhD degrees.

3. Research Highlights

Knowledge base on phytochemicals of Indian medicinal plants

Areejit Samal and his students have built an open access digital knowledge base, IMPPAT, which compiles 1742 Indian Medicinal Plants, 9596 Phytochemicals, and 1124 Therapeutic uses. Notably, IMPPAT has generated a small molecule library of 9596 phytochemicals which can be derived from Indian medicinal plants with 2D and 3D structures and this library can be used for virtual screening and drug discovery. In addition, IMPPAT provides the computed physicochemical properties, predicted ADMET properties, drug-likeness scores and predicted human gene targets for the phytochemicals in the database. Druggability analysis led to a subset of 960 phytochemicals which pass multiple standard scores used by pharma companies in drug



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discovery pipeline. Furthermore, among the 960 druggable phytochemicals, only 28 are existing approved drugs and 369 share chemical similarity with approved drugs.

IMPPAT is freely accessible at: <https://cb.imsc.res.in/imppat>

This work was published in the journal Scientific Reports on March 12. Subsequently, the work has received coverage in print and online media such as Hindustan Times, Nature India, Hindu, Indian Science Wire, Down to Earth, Research Stash, Biotech News, BioVoice News and Dinamalar.



Schematic diagram summarizing the reconstruction and analysis of IMPPAT database

The handedness of Language

There have been many attempts at inferring unifying patterns that may underlie the extraordinary diversity of human languages. The few common features of language that are well-known, e.g., Zipf's law, generally concern the distribution of words. However, words are themselves composed of signs (e.g., letters). Traditional linguistic investigations have tended to focus on the language-specific combinations of consonants and vowels allowed in syllables.

In a recently published paper (Md Izhar Ashraf and Sitabhra Sinha. "The "handedness" of language: Directional symmetry breaking of sign usage in words".

PloS One 13.1 (2018): e0190735,

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0190735>)

we have shown the existence of a remarkable universality in the distinct heterogeneous nature of the frequency distributions of signs that occur at the beginning (and end) of a word. Using quantitative measures of inequality on large written corpora of languages belonging to diverse linguistic families, and expressed in different types of writing systems, we have characterized this asymmetry between the probability distributions of graphemes which occur as the initial character and that for the final character. Our results show that the beginning of a word is less restrictive in sign usage than the end, a phenomenon that we also observe in undeciphered inscriptions from the Indus Valley Civilization (2500-1900 BCE) and which has been used by us to infer the direction of writing that agrees with the archaeological evidence. Our results strongly



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suggest that this observed “handedness” of words may be a universal property of language, reflecting an innate feature of the human cognitive phenomenon.

This work has attracted media attention with stories about it appearing in:

The Telegraph (Jan 29,2018): Hidden pattern of sound in languages found
<https://www.telegraphindia.com/india/hidden-pattern-of-sounds-in-languages-found-204379>

The Hindu (Feb 1,2018): Indus script was written from right to left, says computation
<http://www.thehindu.com/news/national/indus-script-was-written-from-right-to-left/article22613418.ece>

The Wire (Feb 26, 2018): Scientists Elicit Universal Pattern of Sound Use in Languages
<https://thewire.in/227572/scientists-elicit-hidden-universal-pattern-sound-use-languages/>

The work was partially supported by the IMSc PRISM project funded by the Department of Atomic Energy (DAE), Government of India.

Popular Matching in Roommates Setting is NP-hard

An input to the Popular Matching problem, in the roommates setting, consists of a graph G and each vertex ranks its neighbors in strict order, known as its preference. In the Popular Matching problem the objective is to test whether there exists a matching M^* such that there is no matching M where more people are happier with M than with M^* . In a recent paper, the computational complexity of the Popular Matching problem was settled in the roommates setting by showing that the problem is NP-complete. This resolved an open question that has been repeatedly, explicitly asked over the last decade. This work was carried out by Saket Saurabh of IMSc(with collaborators).

Modular forms

Ramanujan introduced the famous τ function as coefficients of the following infinite product:

$$\Delta(z) := \sum_{n \geq 1} \tau(n)q^n = q \prod_{\ell \geq 1} (1 - q^\ell)^{24}$$

Ramanujan’s investigation about the arithmetic properties of this function led to the theory of modular forms. Development of this theory led to the solutions of some of the outstanding problems in Mathematics, e.g. Fermat’s last theorem, Serre’s conjecture, Sato-Tate conjecture and so on. One of the most well-known open problems about Ramanujan’s τ function is a conjecture of Lehmer which states that $\tau(n) \neq 0$ for all n . This conjecture has been investigated by several distinguished mathematicians, e.g. Deligne, Serre, Rankin, Selberg and so on. In joint work with J.M. Deshouillers, Y.F. Bilu and F. Luca, Sanoli Gun of IMSc showed that the first k many τ -values are non-zero if and only if infinitely many blocks of consecutive values of τ of length $2k$



are non-zero. In order to prove this, we use certain techniques of Ramanujan, some recently developed Sieve theoretic tools and the Sato-Tate conjecture which is now a theorem.

Automata, Logic and Concurrency

Since the 1960s, logic has been related to formal language theory. Fixing words or trees as models, definable sets can be seen as word or tree languages. Many mathematical questions can be stated in first-order logic, making it a natural descriptive formalism. Rabin (1970) showed that a large number of questions can be formulated in first-order logic on trees, and solved the problem whether a given sentence has a model. Meyer and Stockmeyer (1975) showed that the amount of memory used by the algorithm cannot be bounded by a fixed tower of exponentials. The answers connected logic to the theory of finite automata, and for the definability problem on words to algorithms based on the theory of finite algebras with an associative operation, developed by Schützenberger (1965). Kamp showed in his PhD thesis (1976) that every first-order sentence can be expressed using three variables. Meyer and Stockmeyer's lower bound applies to three-variable logic.

This raised the definability problem for two-variable sentences of first-order logic, which was solved by Thérien and Wilke (1998), forming part of Wilke's habilitation thesis (1998). Algebraic techniques developed by Schützenberger (1976) were used. Given a finite automaton description, definability in two-variable logic is decided by an algorithm using a polynomial amount of memory. Given a sentence of two-variable logic, whether it has a model is decided by a nondeterministic algorithm using an exponential number of steps. In practice this means using an exponential amount of memory.

In joint work with Krebs, Pandya and Straubing over two years, a logic on words was proposed by Kamal Lodaya of IMSc, extending two-variable logic by relations which specify that a letter occurs between two positions on the word. These are typical three-variable properties, the idea goes back to Hilbert (1899). An algebraic condition is found, using operations developed by Schützenberger around his (1976) paper, which solves the definability problem for this intermediate logic, deciding it by an algorithm as in the earlier work. In particular there are (infinitely many) languages in three-variable logic which are not definable in the intermediate logic. Given a sentence of the intermediate logic, whether it has a model is decided using an exponential amount of memory. These computational bounds are shown to be tight.

Astrophysics

Precision timing analysis of radio pulsars is used as a tool to probe various aspects of fundamental physics. The most basic task is to measure the spin and orbital periods of pulsars, and the rate of the change of these periods as accurately as possible. However, the measured values of the rate of change of the orbital and the spin periods are affected by different dynamical effects like velocity and acceleration of the pulsars relative to the solar system.

For the last few decades, some simplistic models have been used to eliminate these dynamical effects and estimate the intrinsic values of the rate of change of periods. However, these



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simplified models are valid only for pulsars close to the solar system. Recently a more accurate model was developed, which is valid for even pulsars far away from the solar system. Being very accurate, this model has become popular among all pulsar astronomers worldwide. For example, this model was used to place the the best ever limit of the non-violation of the universality of free fall, one of the fundamental aspect of Einstein's general theory of relativity (by Archibald et al. 2018, Nature 559, 730). The python code to implement this model is developed and the same is publicly available at <https://github.com/pathakdhruv/GalDynPsr>, and the paper describing the model has been published recently by Manjari Bagchi and Dhruv Pathak of IMSc (*Astrophysical Journal*, **868(2)**, 2018). This work is a part of Dhruv Pathak's PhD thesis.

4. Honours and Awards

V. Ravindran was awarded Fellow of the Indian National Science Academy, for 2018, by the Indian National Science Academy.

Areejit Samal was awarded Research Ambassador, for 2018, by the Deutscher Akademischer Austauschdienst (DAAD) for to promote bilateral cooperation between Germany and India. This appointment is for the period 2018-2022.

Parameswaran Sankaran was awarded Fellow of the Indian National Science Academy, for 2018, by the Indian National Science Academy.

Saket Saurabh was awarded SwarnaJayanti Fellowship, for 2018, by the DST, India.

Sayantana Sharma was awarded Ramanujan Fellowship, for 2018, by the SERB, DST, Government of India.

IMSc bags two SPARC grants for international collaboration

Sanoli Gun and Amritanshu Prasad received two separate grants under the Scheme for Promotion of Academic Research Collaboration (SPARC) of the Ministry of Human Resource Development. Prof. Gun's proposal on Arithmetical aspects of the Fourier coefficients of modular forms is for collaboration with Prof. Yuri Bilu of the University of Bordeaux, France. Prof. Prasad's proposal in Representation zeta functions is for collaboration with Prof. Uri Onn of the Australian National University.

Size matters

Rahul Siddharthan and Gautam Menon are investigators, with Leelavati Narlikar (NCL Pune; principal investigator), Uma Ram (obstretician and gynaecologist at Seethapathy Clinic, Chennai) and Ponnusamy Saravanan (endocrinologist and professor at Warwick, UK) of a project "Size Matters" on predicting risk for pregnant women of delivering babies that are small for gestational age. This project is funded by BIRAC, DBT and the Bill and Melinda Gates Foundation, and will use data from the Gates Foundations knowledge integration initiative as well as in-house data from our clinical collaborators, and will run for 18 months from start of funding. Leelavati



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Narlikar and Rahul Siddharthan also attended a Gates Grand Challenges Partners Meeting in New Delhi, from March 14-16, 2019, and presented this proposal. The meeting was attended by awardees, officials from India, Brazil and Africa, as well as organizers and platform experts from those countries and the USA.

5. Workshops /Seminars/Conferences/Outreach Programmes Organised

The Institute has conducted various Conferences and workshops in addition to regular seminars during the academic year 2018-19; The list of outreach activities includes the following:-

Foldscope Workshop (2nd January 2018)

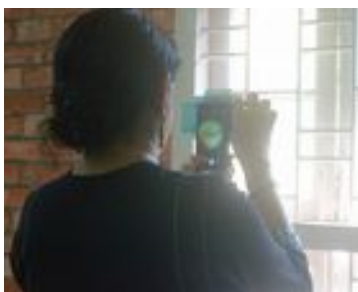
IMSc hosted a small Foldscope workshop for a diverse group of educators, teachers, students and users from IMSc, TIFR Hyderabad, APU, TNSF and local schools. The aim was to try out new Foldscopes (arranged for by DBT) and discuss curricula that can be designed around Foldscopes.



Participants assembling Foldscopes



Preparing samples to view



Capturing images of puddle water on Foldscope

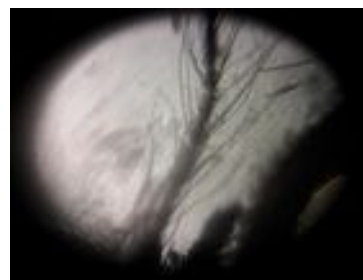


Image of Mosquito Antenna as viewed through a Foldscope (PC: Pappitha N, Vedavalli Vidylaya)

Science at the Sabha (11th Feb 2018)

“Science at the Sabha” is the flagship outreach event of the Institute of Mathematical Sciences. It connects accomplished mid-career scientists who care deeply about science communication, with



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the public at large. While IMSc organizes several other programs where scientists interact with those outside their peer group, these are for the most part targeted at specific audiences---usually some section of teachers or students---and are about the nitty-gritty of some slice of science itself (e.g., a school on quantum mechanics for university students, or a workshop for mathematics teachers at higher secondary level). None of these would be appropriate for a member of the lay public such as an IT professional, a business manager, a retired government servant, or an artist, even though they might have an abiding interest in science and a desire to know about the contributions that Indian scientists make. Science at the Sabha attempts to bridge this gap.

The Science at the Sabha event is always held on a Sunday afternoon, between 4 and 8pm, on a date close to the National Science Day. It was started in February 2016, and February 2018 saw the third edition of this program. Every year, there are four talks, of 40 minutes duration, with each followed by a short question-answer session. There is a half an hour refreshment break between the second and the third talks. At the end of the event, all the four speakers collectively field questions from the audience. Both before the event and during the break, IMSc screens videos that feature the institute and its contributions as well as other material relevant to science education and outreach. The event is advertised widely both via traditional media (poster distribution, newspaper articles, TV and radio announcements) and on Twitter and Facebook.

Video recordings of the entire proceedings are freely and perpetually available (for viewing/downloading) on the Science at the Sabha web page:

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

The topics featured at the event typically cover all the sciences and mathematics. In the most recent edition, for instance, there was a neuroscientist speaking on brain perception, a statistical physicist on why time goes forward, a chemical engineer speaking about composite materials, and a mathematician who described the basics of the theory of knots. Talks in the previous editions have dealt with the Indian monsoon, with subatomic particles, with insect flight, and with tiger conservation, among other topics. The speakers are chosen from mid-career scientists who enjoy the experience of explaining their work to a large, enthusiastic, but heterogeneous audience of non-experts. The point of the talks is to convey some of the spirit and excitement of recent scientific developments, avoiding technicalities. All editions of the event have featured both men and women speakers, with the cumulative numbers split about evenly.

The venue of this event is always the iconic Music Academy in Chennai, easily the most prominent of the "Sabhas" where music concerts are held, thus explaining the choice of the name. The Music Academy is centrally located and well equipped to accommodate a large gathering, with a total capacity of around 1400. A deliberate part of the design of this event is that scientists are speaking at a venue not usually associated with the sciences. This choice of venue for an outreach event was intended to break down the barriers that would inevitably exist if the audience had to enter a scientific institution to hear these talks.



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Participation at the event is free and open to all. Online registration is, however, required. The actual number of people who showed up has been growing. Starting from an estimated 600--700 in the first edition, to about 800 in the second, numbers at the latest edition easily exceeded 1000. The number of registrations was over 1500 for the latest edition. The day of this year's Science at the Sabha, 11 February 2018, was also the United Nations International Day for Women and Girls in Science. IMSc teamed up with the outreach organization "The Life of Science" to celebrate the occasion with a poster exhibition featuring 13 eminent Indian women scientists. The posters were displayed in the lobby of the Music Academy during the event and have also been borrowed by other institutions for display purposes since then.

The event is extensively covered in the press, both before and after. The feedback that has been received has been uniformly positive, with many members of the public urging us to hold it even more regularly and speakers enthused by the opportunity to speak before an engaged audience at such an iconic venue.

Science at the Sabha 2018 was attended by about 1200 people.



Speakers answering questions from the audience

Speakers: Shubha Tole - "Outside-in: How we perceive the world"
R. Rajesh - "Why does time go forward?"
Guru Kumaraswamy- "Materials: The Hard, the Soft and the Squishy"
Vijay Kodiyalam- "Knotty problem: how many different ways can you tie your shoelaces?"

Indian Women in Science Exhibition

To mark the UN International Day of Women and Girls in Science on 11th February, IMSc partnered with "The Life of Science" (<https://thelifeofscience.com/>) to feature 13 Indian Women in Science as a poster exhibition. The posters described the work and the achievements of the scientists in their respective fields.

The exhibition was displayed

Science at the Sabha 2018, The Music Academy: 11th February 2018, Chennai Mathematical Institute: 5th to 9th March 2018. We plan to display the poster at various other public places in the coming months.



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People viewing posters at Science at the Sabha in the foyer of The Music Academy



The exhibition being set up for display at Chennai Mathematical Institute

Zero Shadow Day (24th April 2018)

Kamal Lodaya, Varuni P and Vijay Ravikumar (CMI) designed a poster to explain the astronomical phenomena called Zero Shadow Day which occurs twice a year when the sun is directly overhead at each latitude in the tropics. The poster received much attention on social media and was even covered in the science section of the Indian Express.

(<https://indianexpress.com/article/explained/zero-shadow-day-how-shadows-played-hide-seek-with-chennai-kids-5156463/>).

Kamal Lodaya, Varuni P and Vijay Ravikumar (CMI) also conducted a session for students at Pudiyaador (Urur Kuppam) on 24th April at local noon to observe the phenomena.

Zero Shadow Day, April 24th 2018



Summer School Students Workshop (8th - 17th May 2018)

IMSc organized a Mathematics and Science workshop for high school students. We were delighted by the overwhelming number of applicants for the program!



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IMSc hosted 70 students from classes X & XI for the program. The workshop consisted of activity sessions, lectures and research talks in a range of topics from microscopy to astronomy. Participants also worked on projects and presented them on the last day of the workshop.

Sessions: Ajjath AH, Aparna Sankar, Anantha Padmanabha, Arivnd Gupta (Arvind Gupta Toys), G. Baskaran, K. A. Chandrashekar, Digjoy Paul, Pinaki Chaudhuri, Indumathi D. Jayashree (HBCSE), Kamal Lodaya, Madhusudan Raman, M.V.N. Murthy, Oorna Mitra, Pandu Rangan (IITM), S. Pavitra, Pooja Mukherjee, R. Ramanjuam, Semanti Dutta, R. Shankar, Sreevidya T S, Sushmita Venugopalan, Varuni P.



Summer School Students Workshop: 8th - 17th May 2018

Teacher's Enrichment Workshop: Algebra, Analysis and Topology of p-adic numbers
(21st - 26th May 2018)

IMSc hosted a week long workshop aimed at mathematics teachers in Arts and Science colleges, to enable them to revisit and update content knowledge.

Discussion hours offered opportunities to get doubts cleared and work out exercises (both routine and advanced). About 60 teachers were selected from about 200 applicants. This program was part of IMSc's Enriching Collegiate Education (ECE) series of workshops as an effort to facilitate interactions between research mathematicians and college teachers. The workshop was held as a Teacher's Enrichment Workshop, a series co-sponsored by the National Centre for Mathematics (NCM).

Speakers: Anirban Mukhopadhyay, D. S. Nagaraj, P. Sankaran, Sanoli Gun

Facets (5th - 6th July 2018)

Mathematics program for college students

This was the 2018 edition of the institute's outreach program for advanced undergraduate (BSc third year) and postgraduate (MSc) students of mathematics.



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The speakers were

- Amritanshu Prasad, IMSc
- Aaloka Kanhere, Homi Bhabha Centre for Science Education (Mumbai)
- Balaji K, Adobe Research (Bangalore)
- Nemani Suryanarayana, IMSc
- Rahul Siddharthan, IMSc
- Sivaguru R, TIFR Centre For Applicable Mathematics (Bangalore)
- Sushmita V, IMSc

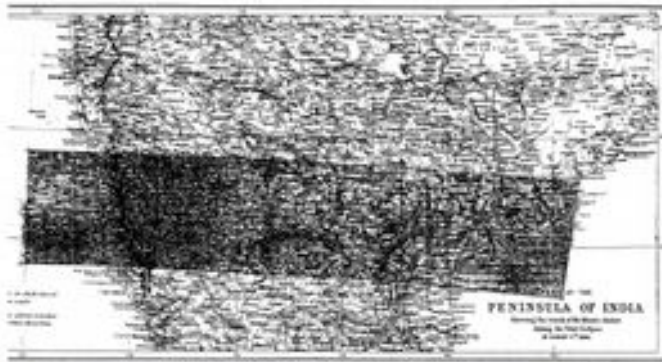
About 180 students participated in this program.

Discovery of Helium from Andhra Pradesh (17th August 2018)

This lecture was organised to celebrate the 150th anniversary of the discovery of the element Helium that happened during a total solar eclipse observed by European astronomers from Machilipatnam and Guntur in 1868.

Helium remains the only element to have been discovered first in space, before being found on Earth. The story of this discovery itself is fascinating – the truth behind who among Janssen, Lockyer and Pogson (of Madras Observatory) should get the credit, was cleared up only a few years ago. More importantly, this discovery truly marks the beginning of modern astrophysics. This beginning is intricately linked with the history of thermodynamics, atomic theory, and chemistry. Dr. Niruj Mohan Ramanujam presented this lecture.

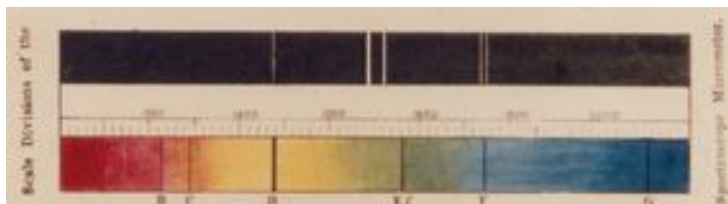
<https://www.youtube.com/watch?v=eEbSV6HNWGU>



Path of totality on 18 Aug 1868 (calculated by Major Tennant)



Norman Pogson (1829-1891)
Director, Madras Observatory





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Science, Journalism, Media: Communicating Science in a Changing India
(20th - 21st Aug 2018)

In collaboration with the Indian Academy of Sciences, IMSc organized a two-day workshop on “Science, Journalism, Media: Communicating Science in a Changing India” during August 20 - 21, 2018. The workshop was organized by Rahul Siddharthan and Gautam Menon from the Computational Biology group at IMSc. It brought together about 80 panelists and participants, largely scientists interested in communicating to the public across multiple media and science journalists with an interest in accurately describing Indian science, its breakthroughs as well as its problems. It tried to provide scientists with an idea of “what journalists really want” as well as to provide journalists with an idea of scientist's concerns about how their work was represented. The workshop was attended by a large number of journalists, including from such prominent outlets as the Hindu, the Indian Express, the Eastern Chronicle, Nature India, Anandabazar and the Wire as well as governmental organizations such as Vigyan Prasar. Large-scale science funders such as the DBT-Wellcome India Alliance were represented, as was the Indian Academy of Science along with scientists from NCBS, TIFR, INSTEM, IITM and JNCASR. Local language sites such as ipodhu.com, as well several independent science writers and individuals involved in science communication participated. The format was based on panel discussions rather than long talks. Each panelist made short presentations before opening the topic to discussion, enabling active participation by all attendees. Prof. K. VijayRaghavan, PSA to the GOI, attended the workshop and was part of a panel. The program was exceptionally successful. Its proceedings were videographed and are available freely from:

<https://www.imsc.res.in/~scimedia/>



IMSc Open Day (15th Sept 2018)

A day of fun mathematics and science talks and activities for school children

The program was intended for students of 8th - 10th standards.

The program comprised of lectures and demonstrations in a range of topics by students and professors of the institute. Sharing the curiosity and excitement that we have for mathematics, science and research with the school students is the focus of this program.



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Enriching Mathematics Education (4th - 5th Oct 2018)

This was the 7th edition of IMSc's outreach program for school teachers of classes XI and XII. This year, the workshop was hosted by PS Secondary School, Mylapore. The program included ideas about new ways to teach syllabus topics and different approaches to problem solving. 70 teachers attended the workshop.

Speakers: Athmaraman R. (Retired Headmaster), P. Sankaran, Sushmita V., R. Ramanujam, S. Viswanath, Varuni P.

kaNita-kAnakam (26th Oct 2018)

IMSc conducted kaNita-kAnakam, an outreach program in Tamil for children of classes VIII to XII on 26th October 2018. The program was attended by 150 students from 15 corporation



schools in Chennai. Mathematical ideas were analyzed through hands-on activities such as modular origami, analyzing bicycle tracks, kolams (tamil-style rangoli), and games of strategy, conducted mostly in Tamil. An underlying theme was the pervasive role of mathematical thought in all aspects of modern life.

The event received coverage in the local press with a detailed article in Dina Malar's Pattam (https://www.imsc.res.in/outreach/KK2018/pattam_29102018.pdf).

Speakers: R. Ganesh, Roopika Jayaram, R. Ramanujam, Vijay Ravikumar (CMI)

Photos: <https://ekalavya.imsc.res.in/node/3708>



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The workshop was attended by 30 mathematics and science teachers from KV and AECS schools from Chennai, Kalpakkam and Puducherry.

Speakers: Chaitanya Ursekar (HBCSE), Jayashree S. (HBCSE), Niruj Mohan Ramanujam (ASIPOEC), R. Ramanujam, Reema Mani (HBCSE), Varuni P.

Photos: <https://ekalavya.imsc.res.in/node/3719>

Teacher's Enrichment Workshop (26th Nov – 1st Dec 2018)

This week-long workshop was aimed at mathematics teachers in Engineering colleges, to enable them to revisit and update content knowledge. About 50 teachers were selected from about 200 applicants. This program was part of IMSc's Enriching Collegiate Education (ECE) series of workshops as an effort to facilitate interactions between research mathematicians and college teachers. The workshop was held as a Teacher's Enrichment Workshop, a series co-sponsored by the National Centre for Mathematics (NCM).



Speakers: Phoolan Prasad (IISc), T. N. Shanmugam (Anna University), S. Viswanath

Photos: <https://ekalavya.imsc.res.in/node/3728>

Representation Theory (5th – 8th Dec 2018)

A. Prasad, K N Raghavan, and S Viswanath of IMSc, together with G Thangavelu and S Mohanty of IISER Thiruvananthapuram, organized the conference “Algebras, Combinatorics and Representation Theory” at IISER Thiruvananthapuram from 5th to 8th December 2018. The conference was jointly funded by IMSc and IISER Thiruvananthapuram. The program consisted of 13 invited talks and 12 contributed talks.

The Stellar Legacy of Prof. Meghnad Saha (3rd - 4th Jan 2019)

This two-day event at IMSc was organized by Manjari Bagchi and Varuni P. to celebrate the 125th birth anniversary of Meghnad Saha. It consisted of a conference and a day of lectures aimed at school students. It was partially funded by NASI (Chennai local chapter). Eminent speakers from various institutes (IIA, TIFR, IUCAA, UC-Berkeley, and KIPAC-Stanford) presented their research work. Around 100 school children participated.

Website: <https://www.imsc.res.in/outreach/MSaha2019/>



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Quantum Black Holes (7th Jan 2019)

Sujay Ashok organized a public lecture on an encounter between Hawking and Ramanujan (part of the Nag memorial lecture series) by Atish Dabholkar, International Centre for Theoretical Physics.

Website: https://www.imsc.res.in/outreach/lectures/posterNag_AD.jpg

UN International Day for Girls and Women in Science (11th Feb 2019)

IMSc hosted about 180 girls from local schools to celebrate the UN International Day for Girls and Women in Science. The program included lectures by young women in science and mathematics: Shanti Bhattacharya (IITM), Prajakta Nimbhorkar (CMI) and Satyavani Vemparala (IMSc). IMSc students organized a series of demonstrations. In association with Nandita Jayaraj (TLoS) and the American Consulate (Chennai), a screening was organized of the film Hidden Figures (2016), the story of a team of female African-American mathematicians who served a vital role in NASA during the early years of the U.S. space program.



Science at the Sabha (24th Feb 2019)

This year, Science at the Sabha, IMSc's flagship outreach program, was held as usual at the Music Academy on Sunday, 24 February. The talks are aimed at anyone with an interest in science, irrespective of age or background. Science at the Sabha is free and open to all. This year the speakers were: Sandhya Koushika (TIFR), Vijay Shenoy (IISc), Harini Nagendra (APU) and Sitabhra Sinha (IMSc). This event was attended by about 1200 people.





THE INSTITUTE OF MATHEMATICAL SCIENCES
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From Learning to Doing: Science, Education and Public Service in Chennai

This panel exhibition was unveiled at Science at the Sabha, highlighting Chennai's traditions in science, mathematics, education and public service, along with the people and institutions that helped to define them.

Science at the Sabha and the accompanying exhibition received extensive press coverage:

<https://www.thehindu.com/sci-tech/science/fourth-edition-of-science-at-sabha/article26365816.ece>

<https://timesofindia.indiatimes.com/city/chennai/science-at-the-sabha-educates-youngsters-and-enthral-ol/articleshow/68143474.cms>



website: <https://www.imsc.res.in/triveni/2019/>

photos: <http://ekalavya.imsc.res.in/node/3782>

Indian Women in Science Exhibit display (February - March 2019)

IMSc in collaboration with The Life of Science (TLoS) produced a poster exhibition on Indian Women in Science and premiered it at last year's Science at the Sabha (2018). It consisted of 13 posters highlighting the life and work of women scientists of the country. The exhibition was displayed at Women's Christian College, Chennai, (25th Feb -- 1st March 2019) and Stella Maris College (2nd March -- 7th March 2019)



Photos:

<https://photos.app.goo.gl/1zRSUeVH9avQwmix8>

<https://photos.app.goo.gl/tC5cwGyoKT2Dgdu76>



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Mechanics of Complex Matter (4th - 7th March 2019)

A workshop on “Mechanics of Complex Matter: Criticality, intermittency and collective behaviour” was organized by Pinaki Chaudhuri and Purusattam Ray at IMSc during March 04-07, 2019. It is the seventh such workshop in the Fracmeet series of meetings that has been held at IMSc since 2012. The objective of the workshop was to provide graduate students and researchers with an exposure to the current developments in understanding how various materials, both soft and hard, in crystalline and amorphous forms, respond to mechanical perturbations of various kinds leading to plasticity, fracture, flow etc. This year, the workshop featured speakers from India, France, Spain, and Singapore, both theorists and experimentalists, signifying the need for an interdisciplinary approach to develop a common understanding across a wide range of materials, both hard and soft.

The workshop also had strong participation of scientists from IGCAR, thus providing a scope for increased contact and exploration of possible collaborations between IMSc and IGCAR on the physics of materials.

Symposium on Regulatory Epigenomics (10th – 13th March 2019)

Rahul Siddharthan of IMSc was one of the four organizers of EMBO Symposium on Regulatory Epigenomics: From Large Data to Useful Models, held in Muttukadu near Chennai from March 10-13, 2019. The event was primarily funded by European Molecular Biology Organization (EMBO) and DBT-Wellcome India Alliance (IA), with local support and some funding from IMSc. It featured 19 speakers including 11 international speakers, and about 70 participants, mostly from India. It is one of three symposia funded by EMBO and IA annually in India. The event was praised by speakers and participants as of very high quality and a rare opportunity for Indian students to hear about cutting-edge work in this field as well as to interact with speakers over coffee and meals.

Website: <http://meetings.embo.org/event/19-regulatory-epigenomics>.

In short the Institute is contributing significantly and extensively to the DAE mandate for supporting basic sciences in the area of Theoretical Physics, Theoretical Computer Science, Mathematics and Computational Biology.