# गणितीय विज्ञान संस्थान
# THE INSTITUTE OF MATHEMATICAL SCIENCES

## चेन्नई
### CHENNAI

वार्षिक प्रतिवेदन
और लेखा परीक्षित लेखा विवरण
अप्रैल 2018 – मार्च 2019

## ANNUAL REPORT
## AND AUDITED STATEMENT OF ACCOUNTS
### April 2018 - March 2019

# Director's Note

I am very pleased to present the annual report of the Institute for 2018-2019 and put forth the distinctive achievements of its members during the year along with a perspective for the future.

During the period April 2018 - March 2019, there were 155 students pursuing their PhD and 39 scholars pursuing their post-doctoral programme at IMSc.

Spread through this period, the Institute organized or co-sponsored several **workshops and conferences**. Specifically, the *IndiaEMBO Symposium on Regulatory Epigenomics: From Large Data to Useful Models* was an international conference featuring cutting-edge research, primarily funded by **European Molecular Biology Organization (EMBO)** and **DBT-Wellcome India Alliance**, with local support and some funding from IMSc. *Mechanics of Complex Matter: Criticality, Intermittency and Collective Behaviour* was a workshop that provided 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. *Nagarajfest* was a conference on algebraic geometry, commutative algebra and number theory. An ACM-India Summer School on *Graph Theory and Algorithms* was co-organized by IMSc faculty members and held at PSG tech Coimbatore. An international conference on *Algebras, Combinatorics, and Representation Theory* was jointly organized by IMSc and **IISER Thiruvananthapuram**. *The Stellar Legacy of Prof. Meghnad Saha: from Society to the Cosmos* was a conference organized on the occasion of the 125th birth anniversary of Meghnad Saha. The workshop on *Science, Journalism, Media: Communicating Science in a Changing India* brought together scientists and science journalists and led to many fruitful discussions.

We note with a lot of satisfaction that our **outreach programmes** like 'Teachers' Enrichment Workshop', 'Summer School Students Workshop', 'Facets', 'kaNita-kAnakam", 'Enriching Mathematics Education', 'Zero shadow day', 'IMSc Open day', 'UN International Day for Girls and Women in Science' and 'Science at the Sabha' are increasingly popular. Over the years, these events have been attracting more and more students and teachers, mainly from nearby regions, but also some from across the country. The outreach related activities in the Institute are the initiative of several institute members. Their untiring efforts, enthusiastically supported by the IMSc administration, PhD students and postdoctoral fellows, to make scientific research accessible and exciting to students and teachers at various levels, deserves all praise.

Research productivity of the members of the Institute has been excellent throughout the year. Several high quality publications have been reported in national and international journals, and some of the research work carried out has also been presented in international conferences.

A total of 16 students were awarded 'PhD' degree, 3 students have submitted their PhD theses and 7 students were awarded 'MSc by Research' degree, under the supervision of our faculty.

There are several ongoing **collaborations** between other institutions, both national and international, and research groups of IMSc. Among these, we mention a few. *Decongesting India's Transportation Network using mobile devices* is an ITRA-Media Lab Asia Project involving principal investigators from IMSc, IIT Madras and IIM Bangalore. The *India-based Neutrino Observatory* is a multi-institute collaboration of which IMSc is a part. IMSc is also part of the *Belle II Collaboration* which is a **multinational collaborative effort**, involving 60 institutions from all over the world, to understand phenomena accessible at the KEK-B collider in Tsukuba, Japan. As a *Max Planck Partner Group in Mathematical Biology,* IMSc has been collaborating with MPIMIS Leizig on the study of biological networks.

During 2018-2019, a total of 34 lecture courses were conducted at the Institute. Additionally, a course of lectures was conducted for the undergraduate programme of CMI. The institute hosted numerous academic visitors at all levels from around the country and abroad. Many seminars and colloquia were organized, several of which were video-recorded and made publicly available on the Institute's YouTube channel.

We are proud to note the **awards and honors** bestowed on our faculty for their contributions: V. Ravindran was elected Fellow of the Indian National Science Academy, for 2018, by the Indian National Science Academy. Parameswaran Sankaran was elected Fellow of the Indian National Science Academy, for 2018, by the Indian National Science Academy. Areejit Samal was designated Research Ambassador, for the period 2018-2022, by the Deutscher Akademischer Austauschdienst (DAAD) to promote bilateral cooperation between Germany and India. Saket Saurabh was awarded SwarnaJayanti Fellowship, for 2018, by the DST, India. Sayantan Sharma was awarded Ramanujan Fellowship, for 2018, by the SERB, DST, Government of India.

Many improvements to infrastructure were made this year. In particular, a newly expanded library building to house our rapidly growing collection of books and journals was inaugurated.

This report was compiled through the efforts of the IMSc Annual Report Committee comprising of Drs. Areejit Samal, Sayantan Sharma, Shrihari Gopalakrishna, C. R. Subramanian, S. Viswanath, Paul Pandian and Usha Devi. I owe my gratitude to all of them.

**V. Arvind**

June, 2019

# Contents

# 1. The Institute



The Institute of Mathematical Sciences (IMSc), founded in 1962, is a national institution for fundamental research in the Mathematical and Physical Sciences. The Institute is funded by the Department of Atomic Energy of the Government of India. Institute members work primarily in the areas of Mathematics, Theoretical Computer Science, Theoretical Physics and Computational Biology.

The Institute is governed by a Governing Board and an Executive Council. Academic personnel at the Institute are grouped as Faculty, Post-Doctoral Fellows, Junior Research Fellows and Senior 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 financial and administrative matters.

Out of a sanctioned strength of 61 at present 55 faculty members are in position. This year there were 39 post-doctoral fellows from all over the world pursuing research at IMSc. In addition there are about 55 scientific personnel at various levels working here on different projects. The number of doctoral students (JRFs & SRFs) is 155 this year. The Institute has 36 non-academic staff members which includes scientific, administrative and accounts staff.

IMSc has an outstanding scientific library, an excellent computing environment including a tera-flop class cluster computer and a dedicated high-speed network. The Institute hosts several national and international scientific / academic conferences / workshops and meetings every year.

This report briefly describes the programmes and activities of the Institute as well as its achievements in the past year. More details are available in the detailed annual report.

## 1.1  Governing Board

Thiru. **K.P. Anbalagan**,
Hon'ble Minister for Higher Education,
Government of Tamil Nadu, Chennai
(**Chairman**)

Shri. **K.N. Vyas,**
Chairman, Atomic Energy Commission & Secretary to Government of India,
Department of Atomic Energy, Mumbai
(**Co-Chairman**)

Prof. **S. K. Joshi**,
Honorary Scientist Emeritus CSIR,
Vikram Sarabhai Professor,
National Physical Laboratory, New Delhi
(**Member**)

Prof. **Mustansir Barma**,
Former Director, TIFR Mumbai, Professor Emeritus,
TIFR Centre for interdisciplinary Sciences(TCIS),
Hyderabad
(**Member**)

Prof. **Amitava Raychaudhuri**,
Former Director, HRI, Allahabad
Professor Emeritus, University of Calcutta, Kolkata
(**Member**)

Dr. **P. Duraisamy**,
Vice Chancellor,
University of Madras, Chennai
(**Member**)

Prof. **Sudhanshu Jha**,
Former Director, TIFR Mumbai, 402 Vigyanshila,
Juhu-Version Link Road, Seven Bungalow,
Andheri(W), Mumbai
(**Member**)

Shri. **A.R. Sule**, (IDAS)
Joint Secretary (R&D) to Govt. of India,
Department of Atomic  Energy, Mumbai
(**Member**)

Ms. **Richa Bagla**, IAS
Joint Secretary(Finance) to Govt. of India,
Department of Atomic Energy, Mumbai
(**Member**)

Shri. **Mangat Ram Sharma**, IAS
Principal Secretary to Government,
Secretariat, Fort St. George, Chennai
(**Member**)

Prof. **V. Arvind,**
Director,
The Institute of Mathematical Sciences, Chennai
(**Member Secretary**)

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# 1.2  Executive Council

Prof. **S. K. Joshi,**
Honorary Scientist Emeritus CSIR,
Vikram Sarabhai Professor,
National Physical Laboratory, New Delhi
(**Member**)

Prof. **Mustansir Barma**,
Former Director, TIFR Mumbai, Professor Emeritus,
TIFR Centre for interdisciplinary Sciences(TCIS),
Hyderabad
(**Member**)

Prof. **Amitava Raychaudhuri**,
Former Director, HRI, Allahabad
Professor Emeritus, University of Calcutta, Kolkata
(**Member**)

Shri. **A.R. Sule**, (IDAS)
Joint Secretary (R&D) to Govt. of India,
Department of Atomic Energy, Mumbai
(**Member**)

Ms. **Richa Bagla**, IAS
Joint Secretary(Finance) to Govt. of India,
Department of Atomic Energy, Mumbai
(**Member**)

Shri. **Mangat Ram Sharma, IAS**
Principal Secretary to Government,
Secretariat, Fort St. George, Chennai
(**Member**)

Prof. **V. Arvind,**
Director,
The Institute of Mathematical Sciences, Chennai
(**Member Secretary**)

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## 1.2.1 Profiles of Governing Board and Executive Council Members

Thiru **K.P. Anbalagan**, Hon'ble Minister for Higher Education, Government of Tamilnadu, Chennai

(**Chairman**, Governing Board)

He was previously the Information Minister of Government of Tamilnadu.

Shri. **K. N. Vyas**, Chairman, Atomic Energy Commission & Secretary to Govt. of India, Department of Atomic Energy, CSM Marg, Mumbai

(**Co-Chairman**, Governing Board)

Shri Kamlesh Nilkanth Vyas is a Mechanical Engineering graduate from MS University, Vadodara. After completion of the training in the 22nd Batch of the BARC Training School in 1979, he joined Fuel Design Development Section of Reactor Engineering Division of BARC. Shri Vyas has worked for design analysis of nuclear reactor fuels. He was also responsible for design development of a novel fuel for strategic applications. He has worked extensively in thermal hydraulics and stress analysis of critical reactor core components. Mr. Vyas, as an engineer, has played a key role for completion of strategic projects. Shri Vyas has also participated in design analysis of the Test Blanket Module planned to be installed in ITER, France. Shri Vyas has been conferred several awards, which include Indian Nuclear Society Outstanding Service Award 2011, Homi Bhabha Science and Technology Award 2006 , DAE Awards in the years 2007, 2008, 2012 and 2013. He is also a Fellow of the Indian National Academy of Engineers.

Shri K. N. Vyas was Director, Bhabha Atomic Research Centre, before he has taken over the charge of Secretary, Department of Atomic Energy and Chairman, Atomic Energy Commission on 20.09.2018.

Prof. **S. K. Joshi**, Honorary Scientist Emeritus CSIR Vikram Sarabhai Professor National Physical Laboratory Dr. K.S. Krishnan Road New Delhi 110 012.

(**Member**, Governing Board) & (**Chairman**, Executive Council)

Prof. Joshi has held numerous important positions in the field of science in India, including Director General CSIR, and Director, National Physical Laboratory. He is member of several national and international academies, including the Indian National Science Academy and the Third World Academy of Sciences. For his work in physics Prof. Joshi is the recipient of numerous national and international awards, including the Won Watumull memorial

Prize and the Bhatnagar Prize. He is recipient of the "Padma Sri" and the "Padma Bhushan" for his contributions.

Prof. **Mustansir Barma,** Professor Emeritus, TIFR Center for Interdisciplinary Science, No.36/P, Gopanapally Village, Serilingampally Mandal, Ranga Reddy - Dist Hyderabad 500107.

(**Member**, Governing Board & Executive Council)

Prof. Barma was a faculty member at TIFR Mumbai and was Director, TIFR Mumbai. For his contributions to physics Prof. Barma has received numerous awards, including the Bhatnagar prize and the "S.N. Bose Birth Centenary Award". Prof. Barma is member of many national and international science academies including the Indian National Science Academy. For his

Prof. **Amitava Raychaudhuri,** Professor Emeritus, University of Calcutta, Kolkata.

(**Member**, Governing Board & Executive Council)

Prof. Raychaudhuri has held numerous academic positions in India and abroad. He was the 'Sir Tarak Nath Palit Professor' at Calcutta University, and he was Director HRI, Allahabad. For his research contributions in physics, Prof. Raychaudhuri has received several awards, including the 'Bhatnagar Prize' and the 'J.C. Bose fellowship'. He is member of several science academies, including the Indian National Science Academy. Prof. Raychaudhuri was conferred the honour of International Alumnus of the Year by the University of Maryland.

Dr. **P. Duraisamy**, Vice Chancellor, University of Madras, Chennai

(**Member**, Governing Board)

Dr. Duraisamy is a former HOD of Econometrics department in University of Madras and has a PhD from Paris University.

Prof. **Sudhanshu Jha**, 402, Vigyanshila, Juhu-Versova Link Road, Seven Bungalows, Andheri (W) Mumbai.

(**Member**, Governing Board)

Prof. Sudhanshu Jha was faculty member at TIFR, Mumbai and is a former Director, TIFR, Mumbai. For his contributions in physics, Prof. Jha has received many awards including the 'Bhatnagar Prize' and the 'S.N. Bose Medal'.

He is a member of several national and international academies, including the Indian National Science Academy and the Third World Academy of

Shri **A.R. Sule**, Joint Secretary (R & D), Department of Atomic Energy, CSM Marg, Mumbai.

(**Member**, Governing Board & Executive Council)

Ms. **Richa Bagla,** IAS**,** Joint Secretary(Finance) to Govt. of India, Department of Atomic Energy, Mumbai

(**Member**, Governing Board & Executive Council)

Shri. **Mangat Ram Sharma**, IAS, Principal Secretary to Government, Secretariat, Higher Education Dept., Government of Taminadu, Chennai

(**Member**, Governing Board & Executive Council)

Prof. **V. Arvind**, Director, IMSc Chennai

(**Member Secretary**, Governing Board & Executive Council)

Prof. V. Arvind was a faculty member at IIT, Madras and IIT, Delhi prior to joining IMSc as a faculty member.

# 1.2.2 Director's Advisory Committees

## Academic Coordinators Committee

| | |
|---|---|
| Prof. V.S. Nemani | Physics |
| Dr. Indrava Roy | Mathematics |
| Dr. Vikram Sharma | TCS |

## Annual Report Committee

| | |
|---|---|
| Prof. S. Viswanath | Chair |
| Prof. C. R. Subramanian | |
| Prof. Shrihari Gopalakrishna | |
| Dr. Paul Pandian | (Library) |
| Dr. Areejit Samal | |
| Dr. Sayantan Sharma | |

## Approval Coordinators

| | |
|---|---|
| Prof. Sitabhra Sinha | Physics |
| Prof. K. Srinivas | Mathematics |
| Prof. Meena Mahajan | TCS |
| Prof. Gautam I. Menon | Computational Biology |

## Computer Media & Web Committee

| | |
|---|---|
| Dr. Pinaki Choudhuri | Chair |
| Prof. Venkatesh Raman | |
| Prof. K.N. Raghavan | |
| Prof. Rahul Siddarthan | |
| Prof. Satyavani Vemparala | |
| Dr. Sayantan Sharma | |
| Dr. G. Subramoniam, | SO`F' (Systems) |
| Shri. B. Raveendra Reddy | SO`F' (Systems) |
| Mr. Vigneshwar Narayanan | (Student Member) |

## Associateship Programme

| | |
|---|---|
| Prof. V. Arvind | Chair |
| Prof. Venkatesh Raman | TCS |
| Prof. K. Srinivas & | |
| Prof. Pralay Chatterjee | Mathematics |
| Prof. Mukul Laad | Physics |

## Alumni Committee

| | |
|---|---|
| Prof. Partha Mukhopadhyay | Chair |
| Prof. Meena Mahajan | |
| Prof. Sanoli Gun | |
| Dr. Pinaki Choudhuri | (as CC-Chair) |
| Dr. Paul Pandian | Library |
| Shri. B. Raveendra Reddy | |

## Colloquium & Seminar

| | |
|---|---|
| Dr. Ganesh Ramachandran | Physics |
| Prof. Jaya N. Iyer | Mathematics |
| Dr. Vikram Sharma | TCS |

## Events / Outreach

| | |
|---|---|
| Prof. R. Ramanujam | Chair |
| Prof. K.N. Raghavan | |
| Dr. Areejit Samal | |
| Dr. Ganesh Ramachandran | |
| Dr. Sushmita Venugopalan | |

### Internal Complaints Committee (Gender Bias Redressal)

| | |
|---|---|
| Prof. D. Indumathi | Chair |
| Prof. Rahul Siddarthan | |
| Prof. Sanoli Gun | |
| Smt. E. Gayatri | (Accounts Officer) |
| Smt. V. Geetha | (External Member) |
| Shri. S. Vishnu Prasad | Registrar |
| One Student representative | (Nominated by the Chair) |

### Grievance Redressal Committee

| | |
|---|---|
| Prof. Meena Mahajan | Chair |
| Prof. Amritanshu Prasad | |
| Prof. Sanatan Digal | |
| Prof. Sujay Ashok | |

### Guest House Advisory Committee

| | |
|---|---|
| Prof. Pralay Chatterjee | Chair |
| Prof. V. Ravindran | |
| Dr. Indrava Roy | |
| Shri. S. Vishnu Prasad | Registrar |
| (Student Member) | |

### JEST Coordinators

| | |
|---|---|
| Prof. D. Indumathi | Physics |
| Prof. Pralay Chatterjee | Mathematics |
| Prof. Saket Saurabh | TCS |

### Hostel Faculty Counselor

### (This Committee will also serve as the Anti-Ragging Committee)

| | |
|---|---|
| Dr. Manjari Bagchi | Chair |
| Dr. Ganesh Ramachandran | |
| Dr. Vikram Sharma | |

### Housing & Up-Keep

| | |
|---|---|
| Prof. V. Ravindran | Chair |
| Dr. Pinaki Chaudhuri | |
| Dr. C.M. Chandrashekar | |
| Shri. S. Vishnu Prasad | Registrar |
| Smt. R. Indra | Administrative Officer |

### Library Committee

| | |
|---|---|
| Prof. Amritanshu Prasad | Chair |
| Prof. C. R. Subramanian | |
| Prof. Sitabhra Sinha | |
| Prof. Rajesh Ravindran | |
| Dr. Manjari Bagchi | |
| Dr. Paul Pandian | S/O `F' (Library) |
| Mr. K. Chandrashekhar | (Student Member) |

### HBNI Coordinators

| | | |
|---|---|---|
| Prof. Sibasish Ghosh | Physics | Dean, Physical Sciences |
| Prof. Sanatan Digal | Physics | Associate Dean, Physical Sciences |
| Prof. Vijay Kodiyalam | Mathematics | Dean, Mathematical Sciences |
| Prof. Gautam I. Menon | Computational Biology | Dean, Life Sciences |

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**National Science Day Committee**

Prof. K.N. Raghavan

Prof. V. Ravindran

Dr. Vikram Sharma

Dr. Sushmita Venugopalan

**Official Language Implementation Committee [OLIC]**

| | |
|---|---|
| Prof. V. Arvind | Chair |
| Prof. K. Srinivas | |
| Prof. Saket Saurabh | |
| Prof. Mukul Laad | |
| Shri. S. Vishnu Prasad, | Registrar |
| Mr. Vinay Vaibhav, | (Student Member) |

**Mathematics PDF Committee**

Prof. K. Srinivas
Prof. Pralay Chatterjee

**Physics PDF Committee (HEP)**

| | |
|---|---|
| Prof. Indumathi | HEPF Convener |

**Physics PDF Committee(LEP)**

Prof. Sitabhra Sinha
Prof. Sibasish Ghosh
Prof. Satyavani Vemparala
Prof. Ganesh Ramachandran

**Refurbishment Committee**

| | |
|---|---|
| Prof. Saket Saurabh | Chair |
| Prof. Anirban Mukhopadhyay | |
| Dr. Sayantan Sharma | |
| Shri. K. Chandrasekar Architect, | Ex-Chief IGCAR |
| Shri. S. Vishnu Prasad | Registrar |
| Shri. M. Sundar | S/O `C' (Civil) |
| Shri. S. Mohan | S/O `E' (Electrical) |

**Right To Information Act [RTI]**

| | |
|---|---|
| Prof. Venkatesh Raman | Appellate Authority |
| Shri. S. Vishnu Prasad | Public Information Officer |

**Space Planning & Allocation Committee**

| | |
|---|---|
| Prof. V. Arvind | Chair |
| Prof. Gautam Menon | |
| Prof. Indumathi | |
| Prof. Pralay Chatterjee | |
| Dr. C.M. Chandrashekar | |
| Shri. S. Vishnu Prasad | Registrar |

**Summer Programme Co-ordinators**

| Prof. Ramanujam | TCS |
| Prof. Sanoli Gun | Maths |
| Prof. Pinaki Chaudhuri | Physics |

**Tender Committee**

Prof. Ramanujam          Chair
Prof. Satyavani Vemparala

**Institute Seminar Day**

Prof. S. Viswanath
Dr. Arijit Ghosh
Dr. Areejit Samal
Dr. Sayantan Sharma

**Sports/GYM Committee**

Prof. Pralay Chatterjee
Prof. Partha Mukhopadyay
Dr. Vikram Sharma
Dr. Indrava Roy
Dr. Manjari Bagchi

Mr. Rakesh Netha          - Cricket
(Student member)

Mr. Pranendu Darbar          - Foot ball &
(Student member)                  Tennis

Mr. Mrigendra Singh          - Table Tennis
(Student member)

Mr. Anupam Sarkar          - Badminton
(Student member)

## 1.3  Faculty

**COMPUTATIONAL BIOLOGY:**
Menon, Gautam I.
Samal, Areejit
Siddharthan, Rahul
Sinha, Sitabhra

**MATHEMATICS:**
Chakraborty, Partha Sarathi
Chatterjee, Pralay
Gun, Sanoli
Iyer, Jaya N.
Kodiyalam, Vijay
Mohari, Anilesh
Mukhopadhyay, Anirban
Nagaraj, D. S.
Pancholi, Dishant Mayurbhai
Prasad, Amritanshu
Raghavan, K. N.
Roy, Indrava
Sankaran, P.
Srinivas, K.
Sundar, S.
Sushmita Venugopalan
Viswanath, S.

**PHYSICS:**
Adhikari, Ronojoy
Ashok, Sujay K.
Bagchi, Manjari
Chandrashekar, C.M.
Chaudhuri, Pinaki
Date, G.
Digal, Sanatan
Ghosh, Sibasish
Gopalakrishna, Shrihari
Hassan, Syed Raghib
Indumathi, D.
Laad, Mukul S.
Menon, Gautam I.

Mukhopadhyay, Partha
Nemani, Venkata
Suryanarayana
Rajesh, Ravindran
Rama, S. Kalyana
Ramachandran, Ganesh
Ravindran, V.
Ray, Purusattam
Sathiapalan, Balachandran
Sayantan Sharma
Shankar, R.
Siddharthan, Rahul
Sinha, Nita
Sinha, Rahul
Sinha, Sitabhra
Vemparala, Satyavani

**THEORETICAL COMPUTER SCIENCE:**
Arvind, V.
Ghosh, Arijit
Lodaya, Kamal
Mahajan, Meena
Raman, Venkatesh
Ramanujam, R.
Saurabh, Saket
Sharma, Vikram
Subramanian, C.R

## 1.4  Honorary Senior Academic Members

Balasubramanian, R.
Baskaran, G.
Rajasekaran, G.
Simon, R.

## 1.5  Scientific Staff

Subramoniam G.
Raveendra Reddy B.
Paul Pandian M.
Mohan S.

Usha Devi P.
Sundar M.
Maruthu Pandiyan B.

## 1.6  Administrative & Accounts Staff Members

Vishnu Prasad S.
*Registrar*

Gayatri E.
*Accounts Officer*

Indra R.
*Administrative Officer*

Vasudevan, T.V.
Parthiban, V.
Ashfack Ahmed, G.
Geetha, M.
Padmanabhan, T.
Prema, P.
Jayanthi, S.
Baskaran, R.
Balakrishnan, J.
Moorthy, E.
Radhakrishnan, M. G.
Rajendran, C.
Ravichandran, N.
Shankaran, K.P.
Seenivasa Raghavan N.
Otheeswaran Usha
Archana Shukla
Babu, B.
Johnson, P.
Gopinath, S.
Amulraj, D.
Janakiraman, J.
Munuswamy, N.
Rajasekaran, N.
Ramesh, M.
Tamil Mani, M.

## 1.7 Project Staff

**Project Staff
[Non Academic]**

Aiswaryalakshmi  P. L.
Balachander M.
Gayathri S.
Hari Priya T. V.
Hemamalini, A.
Jayakumar P.
Jegannathan J.
Karthik M.
Karthikeyan B.S.
Kirubananth P
Krishna Balaji R.
Mahalakshmi, G.
Mangala Pandi P.
Moovendan M.
Nambirajan E
Narmatha, S.
Parthasarathi N.
Prashanna, K.
Rajkumar, S.
Ramakrishnan S.
Rethinasamy D.
Sadhana R.
Sakthivel Murugan E.
Sathishkumar
Shalieni, D.
Sivasubbu Raj B.
Sreelakshmi P.K
Srinadh, G.
Srinivasan G.
Vaideeswaran
Vignesh Kumar T
Vimalraj J.
Vinoth Babu, M.

**Project Staff
[Scientific/Academic]**

Able E Alias
Archana Mishra
Arya S
Ashwij Mayya

Eleonora Dell' Aquila
Gajendra Singh Badwal
Gayathri, B.
Harish, K.
Janaki Raghavan
Krishanu Deyasi
Md. Izhar Ashraf
Nadeesh Garg
Pradeep Kumar N
Saveetha H.
Shakthi N. Menon
Soumya Easwaran
Sreejith, R. P.
Subathra Vijayakumar
Surendra Singh Badwal
Theerthagiri L.
Varuni Prabhakar
Vinod Kumar T.

## 1.8 Post-Doctoral Fellows

**COMPUTATIONAL BIOLOGY**

Anupama Sharma
Sushmita Ghosh

**MATHEMATICS**

Anuj Jakhar
Arideep Saha
Arjun Paul
Balesh Kumar
Bidyut Sanki
Nirupama Mallick
Rohit Varma
Sarita Agrawal
Selvaraja, S.
Suratno Basu
Pranabesh Das
Poornapushkala  Narayanan
Usha  Keshav  Sangale

**PHYSICS**

Aditya Banerjee
Amit Mukherjee

Aradhana Singh
Aravinda S
Arpita Choudhary
Arunprasath V
Avijit Mishra
Bala Subramanian, P.N.
Bijoy Daga
Debabrata Sinha
George Thomas
Nilanjana Kumar
Prasad V V
Rahul Dandekar
Shreyansh Shankar Dave
Sreeraj T. P.
Srimoy Bhattacharya
Subhroneel  Chakrabarti

**THEORETICAL COMPUTER SCIENCE**

Abhisekh Sankaran
Gurumuruhan Ganesan
Krithika R
Pallavi Jain
Purbita Jana
Vibha  Sahlot

## 1.9 Ph.D. Students

**COMPUTATIONAL BIOLOGY**

Ankit Agrawal
Ashwini, G.
Bodhayan Prasad
Chandrani Kumari
Chandrashekar K. A.
Devanand T.
Farhina Mozaffer
Janani R.
Rakshika Lakshmi, A.
Reshma M
Ria Ghosh
Sreejith, R.P.
Sreevidya T.S
Vadnala Rakesh Netha
Vivek Ananth R. P.

**MATHEMATICS**

Ankur Sarkar
Aritra Bhattacharya
Avijit Nath
Biplab Paul
Chayan Karmakar
Digjoy Paul
Jayakumar R.
Jyothsnaa S.
Karthick Babu C G
Krishanu Roy
Manas Mandal
Mrigendra Singh Kushwaha
Nabanita Roy
Narayanan P. A.
Neelam
Oorna Mitra
Piyasa Sarkar
Pranendu Darbar
Priyamvad Srivastav
Ratheesh T.V
Rupam Karmakar
Sathish Kumar, V.
Siddheswar Kundu
Snehajit Misra
Sridhar P. Narayanan
Sruthy Murali
Sunil L Naik
Tanmoy Bera
Saurav Holme Choudhury
Surajit Biswas
Uday Bhaskar Sharma
Ujjal Das
Vaibhav Krushankant Dimble

**PHYSICS**

Abinash Kumar Nayak
Ajjath A.H.
Akhil Antony
Amir Suhail
Amit Kumar
Amlan Chakraborty
Anand Pathak
Anirban Karan
Ankit Aggarwal
Ankita Chakrabarti

Anupam A. H.
Anupam Sarkar
Anvy Moly Tom
Aparna Sankar
Apurba Biswas, G.
Apurba Dutta
Arindam Mallick
Arindam Mitra
Arjun Hariharan
Arkajyoti Manna
Arnab Priya Saha
Arpan Kundu
Atanu Bhatta
Bhargava B.A.
Bhavya Teja, K.N.
Dheeraj Kumar Mishra
Dhruv Pathak
Dipanjan Mandal
Garima Rani
Gopal Prakash
Himanshu Badhani
Hitesh Garg
Jilmy P. Joy
Jyotijwal Debnath
Kamal Tripathi
Madhusudhan Raman
Mahaveer Prasad
Mamale Vinod Suryakant
Mohammad Shabbir
Nishant Gupta
Pavan Dharanipragada
Pooja Mukherjee
Prabhat Butola
Prafulla Oak
Prateek Chawla
Prasanna Kumar Dhani
Prashanth Raman
Prathik Cherian J.
Pritam Sen
Pulak Banerjee
Raghvendra Singh
Rathul Nath
Ravi T
Ria Sain
Rusa Mandal
Sabiar Shaikh

Sabyasachi Chowdhuri
Sagnik Chakraborty
Sahil
Sanjoy Mandal
Saroj Prasad Chhatoi
Sayantan Ghosh
Semanti Dutta
Shibasis Roy
Shilpa Kastha
Shivam Gola
Shivani Singh
Soumya Sur
Sourav Ballav
Subhankar Khatua
Sujoy Mahato
Surabhi Tiwari
Subashri, V.
Sushovan Mondal
Tanmay Mitra
Tanmay Saha
Tanmoy Sengupta
Thiru Senthil R.
Toshali Mitra
Umang A. Dattani
Varun Gupta
Varun Sethi
Vignesh, B.
Vigneshwar N.
Vigneshwaran K.
Vinay Vaibhav

**THEORETICAL COMPUTER SCIENCE**

Abhishek Sahu
Abhimanyu Choudhury
Abhranil Chatterjee
Anantha Padmanabha M.S.
Anuj Vijay Tawari
Arindam Biswas
Ashwin Jacob
Diptapriyo Majumdar
Gaurav Sood
Jayakrishnan M.
Lawqueen Kanesh
Niranka Banerjee
Prafullakumar Prabhakar Tale

Ramanathan Thinniyam Srinivasan

Ramit Das

Roohani Sharma
Rian Neogi
Sanjukta Roy

Swaroop N.P.
Yogesh Dahiya

## 1.10  Summer Students

Every summer, a small number of students from various Institutes/Universities come to our institute and work on some learning/research projects with some faculty member for a period of four to six weeks. The following students visited the institute during Apr, 2018 - Mar, 2019.

**COMPUTATIONAL BIOLOGY**
Suriya Selvarajan, CMI, Chennai
Madhav Sankaranarayanan, ISI, Kolkata
Pavithra Elumalai, PSG College, Coimbatore
Shreya Lakhera, IISER, Pune
Asha, P., Kumaraguru College of Technology, Coimbatore
Shashank Tiwari, CEBS, Mumbai
Abhirami, B., Sastra University
Sayanur Rahman, IISER, Kolkata
Aishwarya, N., Institute of Bioinformatics and Applied Biotechnology
Aashish Satyajith, CMI

**MATHEMATICS**
Aritam Dhar, IISER, Mohali
Mariam B. Elizabeth, Pondicherry University
Greeshma, K., Calicut University
Deepthy Saji, Pondicherry University
Arnab Roy, IISER, Berhampur
Naman Kumar, IIT, Kanpur
Subham Saha, CMI
Megha Kamath, K., ST. Aloysius, Mangalore
Vishal Gupta, IISER, Bhopal
Suraj Dash, ISI, Bangalore
Shilpi Mandal, University of Hyderabad
T. Sri Harshitha, University of Hyderabad
Amrita Soni, Samrat Prithviraj Chauhan Govt College, Ajmer
Chitra Kumari Sharma, Raj Rishi Govt College
Jenifer Janany, T., St. Mary's College
Naveen Kumar, SPC Govt Ajmer

Vigneshini Bharathi, Ramanujan Institute
Supriyaa, PI, PSG College
Srijan Das, ISI, Bangalore
Mihir Naik, BITS Pilani
Vignesh, ISI, Bangalore
Sujeet Bhalerao, IISER,Pune
Manasa Bhat, SBC, Karkala, Karnataka

**PHYSICS**
Pradhyumna P, Anna University (MIT)
Yuva Priya, M, Madras Christian College
Merlin Varghese, Calicut University
Varun Madan Mohan, IISER, Mohali
Subramanian Bhat, K.N., Central University of Karnataka
Saranyan Sankrith, S, Sairam Institute of Technology
Nithishwar, M.A., IISER, Mohali
Om Gupta, IISER, Kolkata
Archisiman Saha, ISERC, Visva Bharati
Rahul Sharan, IISER, Kolkata
Pitambar Sai Goyal, Loyala, ICAM
Ramakrishnan, University of Madras
Pujarani Swain, Fakir Mohan University, Odisa
Anubhab Sur, IISER, Kolkata
Nidhi Gupta, LNMIIT, Jaipur
Pratyush Kumar, BITS, Pilani, Goa
Sarvesh Srinivasan, BITS, Pilani, Goa
Rishi Gangadhar, G, IISER, Mohali
Vikram Ramesh, IIT, Kharagpur
Fahad, P., Cochin University

**THEORETICAL COMPUTER SCIENCE**

Subhashini, H., PSG College of Technology, Coimbatore

Raj Adhitya Kumar, BITS, Pilani, Hyderabad

Adhitya Subramanian, Shiv Nadar University, Noida

Fazle Rahman Ejazi, IIT Patna

Pradeesh, S., Knowledge Institute of Technology, Salem

Rahul, B.S., BITS Pilani, Goa

Rajhesh, R., PSG College of Technology, Coimbatore

Magilan, S., VIT, Chennai

Mohith Jagalmohanan, NIT, Calicut

Gopinath Das, IIIT Bhubaneswar

Parshudar, P.K., PSG College of Technology, Coimbatore

Ativ Joshi, Ahmedabad University

Anunay Kumar, IIEST, Shibpur

Akhila, K., IIITM, Kerala

Ranjani, G.S., CMI, Chennai

Jiteshwar, C.A., BIT, Mersa, Ranchi

Akash Gupta, Thapar University, Patiala

Pankaj Kumar, CMI

## 1.11 Other Students

Students also do their projects under the supervision of our faculty during the academic year. The following students visited the institute during Apr, 2018 - Mar, 2019.

**MATHEMATICS**

Chopra, Divya, Central University of Rajashtan, Rajasthan

Setia, Swati, HRI Allahabad

D, Kiran, IISER, Bhopal

B. S, Rahul, BITS Pilani, Goa Campus

**PHYSICS**

Sharma, Sanchita, IACS

Lloyd, Juzel, Howard University

Meyers, Natalie Ann, University of Wisconsin-Milwaukee

**THEORETICAL COMPUTER SCIENCE**

Dhamapurkar, Shyam, Pune University

Thatte, Mitali, IISER Pune

Priyanka, J., PSG College of Science and Technology, Coimbatore

# 2. Academic Activities and Programmes

## 2.1 Research Activities

Faculty members at IMSc carry out research in their areas of interest in a self-directed manner, often in collaboration with doctoral students, post-doctoral fellows and researchers from elsewhere. Research output is disseminated primarily as refereed journal articles as well as articles in conference proceedings. The expertise available at the institute is organized below according to the areas of specialization.

### 2.1.1 COMPUTATIONAL BIOLOGY

The field of computational biology lies at the intersection of biological phenomena and measurements, physics, applied mathematics and large-scale computation. The interests of the Computational Biology group at the Institute encompass computational genomics, networks in biology, biophysics, systems biology, infectious disease modelling, computational neuroscience and large-scale molecular dynamics simulations of biologically relevant phenomena.
[Gautam I. Menon, Rahul Siddharthan, Sitabhra Sinha, Areejit Samal]
In 2018-2019, 8 articles were published in peer-reviewed journals.

### 2.1.2 MATHEMATICS

The Mathematics group has wide ranging interests. These specializations are conveniently grouped together under broad headings. A very brief description is provided followed by the names of faculty members currently working in these areas.
In 2018-2019, 9 articles were published in peer-reviewed journals.

- **Algebra and Algebraic Geometry:** Algebra is the study of the properties of mathematical structures involving "algebraic" operations such as addition and multiplication. One of the main motivations to study algebraic structures is to analyze geometric objects such as curves and surfaces via the algebra of functions defined on them. Aspects of algebra being studied at IMSc involve algebraic geometry (study of loci of solutions of polynomial equations), algebraic groups (groups of matrices), and the theory of knots.

  **[Jaya Iyer, Vijay Kodiyalam, D. S. Nagaraj, K. N. Raghavan]**

- **Lie Groups:** The theory of Lie groups deals with the groups of symmetries of continuous mathematical objects. It is one of the most important areas of Mathematics. It is used widely in almost all major branches in Mathematics and in many branches in Physics.

  **[Pralay Chatterjee]**

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● **Number Theory:**

Number theory is concerned mainly with the way prime numbers are distributed in the set of natural numbers. This area has rich interactions with many other branches of mathematics including algebra, complex analysis and geometry. There are also applications to cryptography.
[**K. Srinivas, Anirban Mukhopadhyay, Sanoli Gun**]

● **Operator algebras:**

This subject may loosely be described as the study of 'infinite-dimensional matrices'. It was introduced by von Neumann in order to address some problems arising from quantum mechanics. Even today, it is intimately tied to various branches of physics as well as to other areas of pure mathematics, such as knot theory.
[**Vijay Kodiyalam, Partha Sarathi Chakraborty**]

● **Non-commutative Geometry:**

This subject tries to extend the reach of differential geometry in the setting of operator algebras. Geometry can be loosely defined as the study of cycles and their intersection properties in some suitable homology theory. Noncommutative geometry of Alain Connes can be viewed as the study of some special cycles in the unbounded picture of Kasparov's K-homology. Noncommutative geometry interacts with various branches of Mathematics like discrete groups, topology etc. It also interacts with mathematical physics.
[**Partha Sarathi Chakraborty, Indrava Roy**]

● $C^*$-**dynamical systems and non-commutative probability theory:**

The subject studies an automorphism group action on $C^*$ algebras and its asymptotic behaviour of stationary states with additional symmetries that arise naturally in a given mathematical or physical problems of interest. It uses intuition of non-commutative probability theory and powerful methods of functional analysis to study various ergodic properties of the automorphism group action.
[**Anilesh Mohari**]

● **Representation theory:**

Groups are algebraic structures that arise as symmetries of physical or mathematical objects. Representation theory studies properties of abstract groups via their matrix representations. Representation theory enables many group-theoretic problems to be reduced to problems in matrix algebra, which is very well-understood.
[**A. Prasad, K. N. Raghavan, P. Sankaran, S. Viswanath**]

● **Topology:**

Topology may be described as geometry with or without a notion of distance. It aims to study properties of these objects, of which curves and surfaces are well-known examples, which are invariant under deformations. The subject has wide applications within mathematics as well as in physics.

**[P. Sankaran, Sushmita Venugopalan, Dishant Pancholi]**

## 2.1.3 THEORETICAL PHYSICS

The Theoretical Physics group subsumes a very broad spectrum of specializations. These are conveniently grouped under a smaller number of headings. A very brief description is provided followed by the names of faculty members currently working in these areas. In 2018-2019, 24 articles were published in journals and conference proceedings.

• **High Energy Physics:** Sub-nuclear constituents of nature and their properties are well summarized by the Standard Model. This model describes the strong and electro-weak interactions. The research involves both elaboration of the model as well as constructing theories that go beyond it. The following grouping refers to different aspects that are being pursued at IMSc.

— **Particle Physics Phenomenology:**

The phenomenological aspects of physics at existing and future colliders are studied with a view to test the Standard Model and seek possible signals of New Physics (or Physics beyond the Standard Model), a particular focus being data and results currently coming out of the Large Hadron Collider (LHC) at CERN in Geneva.

**[Shrihari Gopalakrishna, V. Ravindran and Rahul Sinha]**

Predictions of various scattering processes at colliders are being calculated using perturbative QCD, which deals with the strong forces in the standard model. Quantum loop contributions to multileg processes are being included to improve the accuracy of the predictions.

**[D. Indumathi and V. Ravindran]**

Several experiments worldwide are studying the physics of "beauty mesons" (B-physics) in order to explain the observed CP-violation (the dominance of matter over antimatter). Such studies are also important in the search for physics beyond the Standard Model.

**[Rahul Sinha]**

Neutrinos are very weakly interacting particles which have recently been found to possess a mass. There is involvement in the national proposal to build a Indian Neutrino Observatory (INO), and in global efforts using neutrino factories to elucidate the possibility of CP violation in neutrinos, and determining the mass ordering. Theoretical studies of neutrino masses and mixings are pursued.

**[D. Indumathi, Nita Sinha, G. Rajasekaran (Emeritus)]**

Most of the matter in the Universe is "dark". Beyond the standard model candidates for this dark matter are being investigated. Experiments are going-on world-wide to detect this dark matter. IMSc group has interpreted the unexplained Kolar events seen in the Kolar experiments 50 years ago as due to dark matter particles.
**[D. Indumathi, Shrihari Gopalakrishna, G. Rajasekaran (Emeritus)]**

— **Non-Perturbative QCD:**

This deals with widely believed properties of strong forces such as "color confinement", "color superconductivity" and "chiral symmetry breaking". The main themes of research are the QCD phase diagram and exotic transport properties of QCD matter far away from equilibrium. In particular we are looking for signals of QCD (chiral) critical point from first principles lattice gauge theory calculations and understanding the degrees of freedom and the symmetries across the deconfinement transition.
**[Sanatan Digal, Sayantan Sharma]**

— **Gravitational Physics:**

Einstein's theory of gravity has a bearing on the theory of our cosmos and also predicts exotic objects such as neutron stars and black holes. Rotating neutron stars (pulsars) constitute important observational probes of the strong gravity regime. Classical general relativity and one of its quantum versions namely, loop quantum gravity are pursued at IMSc. IMSc members are also interested in the theory and observations of gravitational waves.
**[Manjari Bagchi, Ghanashyam Date]**

— **Astrophysics:**

Astrophysics is in one sense an inter-disciplinary science, where the knowledge in various other areas of physics including particle physics, gravitational physics, statistical physics, etc can be tested and enhanced. IMSc has recently expanded its area of research in astrophysics. So far only pulsar astrophysics is being pursued at IMSc. In addition to gravitational physics, pulsars are also useful to understand the state of matter at extreme densities, evolution of stars, properties of interstellar medium, etc.
**[Manjari Bagchi]**

— **Quantum Field Theory:**

This provides a general theoretical framework for the quantum theory of fields. Apart from the perturbative analyses of quantum field theories used in the theory of scattering processes, their non-perturbative aspects are crucial for a more complete understanding.

There are many different types of quantum field theories such as Conformal Field Theories, Topological Field Theories, Non-commutative Field Theories, Lattice Gauge Theories etc.

**[Sanatan Digal]**

— **String Theory:**

In the quest for a unified framework to understand and unify all interactions, string theory is the leading candidate. At IMSc the focus has been on the loop variables approach, dualities in string theory and supersymmetric gauge theory, the AdS/CFT correspondence, brane physics including cosmology and black hole entropy.

**[Sujay K. Ashok, S. Kalyana Rama, Partha Mukhopadhyay, Balachandran Sathiapalan, Nemani V. Suryanarayana]**

● **Condensed Matter Physics:** Condensed matter physics deals with the understanding of the diverse properties exhibited by the materials in nature; for example, the resistivity of materials can vary over about 20 orders of magnitude depending on the material. Condensed matter physics attempts to understand these behaviour in terms of simpler models which can then be studied using a variety of theoretical and computational tools.

— **High Temperature Superconductivity:**

At very low temperatures, several materials undergo a transition into a superconducting state, in which an electrical current flows without resistance. The properties of materials which superconduct at somewhat higher temperatures, the high-temperature superconductors, is one of the most active areas of research today, since it raises many theoretical questions of principle and has important implications for technology.

**[Mukul Laad, Gautam I. Menon, G. Baskaran (Emeritus)]**

— **Correlated Electronic Systems, Magnetism and the Quantum Hall Effect:**

The interactions between electrons is responsible for magnetism. Such interactions are key to several unusual electronic states. Understanding this problem better would impact our understanding of a host of recently discovered materials with unusual properties.

**[R. Ganesh, Syed Raghib Hassan, Mukul Laad, R. Shankar and G. Baskaran (Emeritus)]**

— **Soft Condensed Matter Physics:**

Soft condensed matter refers to physical systems in which the energy scales required to create sizeable deformations are comparable to temperature. Thus, such systems can exhibit a remarkable variety of complex flow behaviour as well as equilibrium phases under relatively modest perturbations. The physics of glasses is also an active area of research.

**[Gautam I. Menon, Pinaki Chaudhuri, Satyavani Vemparala]**

● **Statistical Mechanics**

Statistical mechanics provides a foundation for thinking about the collective behaviour of large numbers of interacting particles. The behaviour of systems out of thermal equilibrium is of particular interest, featuring problems such as fracture in disordered materials, hysteresis in magnets and surface growth, shock propagation in granular systems, earthquake dynamics and stability of masonry walls. Given the generality of the approach of statistical mechanics, it finds application in a huge range of fields, including study of phase transition and critical phenomena, spin systems, surfaces and networks, fracture in materials, turbulence in liquids, the modeling of biological systems and even explaining socio-economic distributions such as that of income or stock price fluctuations. Cold fermionic atoms at unitarity and their equation of state leading to universal thermodynamics is a field of active study in recent years.

**[Purusattam Ray, R. Rajesh, Gautam I. Menon, Sitabhra Sinha, Satyavani Vemparala]**

● **Theoretical fluid mechanics:** The theoretical study of the mechanics and statistical mechanics of fluids using classical field theories is an area of research that has been revitalised by the necessity to understand fluid flows at scales that span a few microns (as in biofluids and in microfluidic devices) to few thousands of kilometers (as in geophysical flows, such as in the oceans or the atmosphere). Intelligent numerical approximations to the nonlinear governing equations, combined with their computational solutions, are able to shed insight into this fascinating area of theoretical physics. Research from IMSc in the area has appeared in prestigous international journals, including Physical Review Letters and PNAS, been featured in numerous news items, and has led to the establishment of a start-up company for commercializing computational models of fluid flow.

**[Ronojoy Adhikari]**

● **Non-linear Dynamics and Complex Systems:** Nonlinear phenomena are ubiquitous in complex systems all around us - from the cell to society - which are characterized by a large number of interacting elements exhibiting emergence of surprising systems-level behavior that is absent in any of its components. The richness of the collective behavior could come about either through strong nonlinearity in the local dynamics of the elements and/or from the non-trivial topology of the network connecting them. Nonlinear systems exhibit surprising and complex effects that would never be anticipated by a scientist trained only in linear techniques. Prominent examples of these include bifurcation, chaos, and solitons. Surprisingly, diverse non-linear dynamical systems exhibit remarkably similar, sometimes even universal behaviour. Nonlinear science has applications to a wide variety of fields, from mathematics, physics, biology, and chemistry, to engineering, economics, and medicine.

**[Sitabhra Sinha]**

- **Quantum Physics:** This is a grouping of areas not subsumed under the above headings and contains the following specializations.

  — **Quantum Optics:**

  Broadly, this area refers to the study of quantum states of light. At IMSc, the focus in this area has been on specifically non-classical (quantum) aspects of radiation. Other related interests are geometric phases, Wigner distribution functions for finite dimensional Hilbert spaces etc.

  **[Sibasish Ghosh, R. Simon]**

  — **Quantum Entanglement, Quantum Information Theory:**

  Classical states have definite attributes while quantum states can exist as "superpositions" and have non-classical (probabilistic) attributes. This feature affects aspects of information science such as coding/decoding, transmission, computing etc. Aspects of quantum information theory in the context of finite dimensional as well as infinite dimensional quantum state spaces are being studied.

  **[V. Arvind, C. M. Chandrashekar, Sibasish Ghosh, R. Simon]**

- **Interdisciplinary research:** There is an ongoing effort, not belonging to any of the areas above, of an interdisciplinary nature in such diverse areas like the study of Indus script and seals, historical monsoon shifts, modeling of tsunamis, movement of Himalayan glaciers, modeling Indian musical instruments, etc.

  **[R Shankar, Sitabhra Sinha]**

## 2.1.4 THEORETICAL COMPUTER SCIENCE

Theoretical computer science is mainly concerned with the mathematical structure of computations (as distinct from software development). Various aspects of computation are studied by the group at IMSc. A very brief description of these specializations is provided followed by the names of faculty members currently working in these areas.

In 2018-2019, 30 articles were published in journals and conference proceedings

- **Algorithms and Data Structures:** The main goal of this area is the design of efficient methods for solving various computational problems and developing methods for analyzing their performance in terms of the resources used (eg. time, space) and the quality of the solution. It also involves developing means of storing information, with small space requirements, and supporting efficient access and update operations. Another important problem in this area is to develop algorithms for numerical computation minimizing error propagation. This includes devising ways to quickly update a solution when the input undergoes a small local change, without building the solution from scratch.

  **[V. Arvind, Meena Mahajan, Venkatesh Raman, Saket Saurabh, Vikram Sharma, C. R. Subramanian]**

- **Computational Algebra and Geometry:** This area is the study of designing algorithms for various fundamental algebraic and geometric problems. Implementing such

algorithms has always been challenging due to robustness issues. One aim is to overcome this issue as efficiently as possible.

**[Vikram Sharma, Arijit Ghosh]**

● **Computational Complexity:** Broadly speaking, computational complexity theory is the study of bounds on resources such as time and space required for solving computational problems. The theory aims at a classification of problems into various complexity classes defined by resource bounds and seeks to separate them by proving lower bounds and upper bounds on resources required by the problems.

**[V. Arvind, Meena Mahajan]**

● **Design of Efficient and Succinct Data Structures:** Succinct storage and efficient access and update of data that are supplied to and/or generated by an algorithm plays an important role in making it more efficient. This calls for developing means for designing and analyzing tools for succinct storage and efficient access of information

**[Venkatesh Raman]**

● **Game Theory and Security:** With the advent of the worldwide web as a platform of computation, traditional models of distributed systems are being re-examined, incorporating not only co-operation but conflict as well. This brings in game theoretic considerations and information security aspects, raising new questions of interest.

**[R. Ramanujam]**

● **Graph Theory and Combinatorics:** This area is the mathematical study of discrete objects with applications to various branches of Computer Science. It uses tools from various branches of mathematics such as probability theory, algebra, etc.

**[Venkatesh Raman, Saket Saurabh, C. R. Subramanian]**

● **Logic and Formal Models of Computation:** This area is concerned with three main aspects: developing and comparing different mathematical models of computation, developing and analyzing different tools for logical reasoning as well as applying them to computational processes and the connection between automata, Petri nets and algebras on the one hand and logic and program expressions on the other.

**[Kamal Lodaya, R. Ramanujam]**

● **Parameterized and Exact Computation:** Parameterized Computation is the study of computational problems based on the feasibility of designing algorithms for problems where one allows the dependence of running time on the size of a small part of the input to be arbitrary but requires the dependence on the remaining large part be polynomially bounded. It also involves designing such algorithms. Exact Computation is the study of computational problems based on the feasibility of designing algorithms within various degrees of even exponential dependence of the running time on the size of the input.

**[V. Arvind, Meena Mahajan, Saket Saurabh, Venkatesh Raman, C.R. Subramanian]**

● **Probabilistic Combinatorics:** This is the study of analyzing random discrete structures for their typical properties. It also involves applying this paradigm to resolve existential questions related to discrete structures like graphs. It also involves designing and analyzing algorithms with respect to their typical performance when applied to random structures.

**[C.R. Subramanian]**

## 2.2 Research Highlights & Events

**Modular forms**

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

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

Ramanujan's investigations of 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 τ (n) ≠ 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. This uses certain techniques of Ramanujan, some recently developed Sieve theoretic tools and the Sato-Tate conjecture (which is now a theorem).

**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 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 best ever limit of the non-violation of the universality of free fall, one of the fundamental aspects 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 for use by the larger scientific community at: https://github.com/pathakdhruv/GalDynPsr 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.

**Automata, Logic and Concurrency**

Since the 1960s, logic has been related to formal language theory. 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.

**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 other collaborators.

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

This lecture was organized 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.
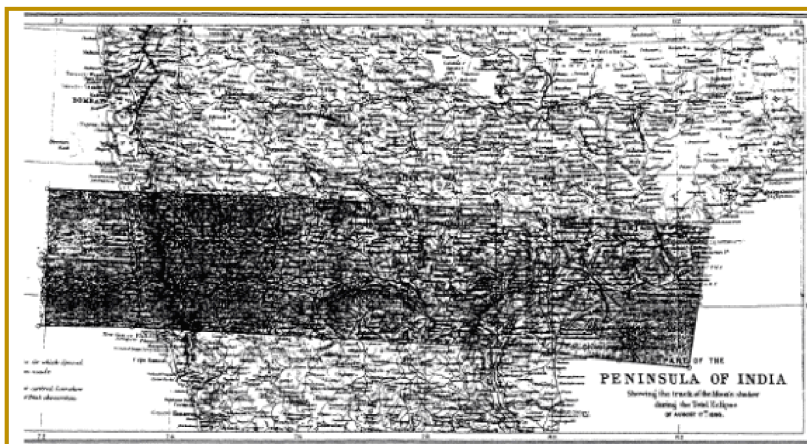


**Image 1:** Path of Totality on 18 August 1868, calculated by Major Tennant

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.

https://www.youtube.com/watch?v=eEbSV6HNWGU
Dr. Niruj Mohan Ramanujam presented this lecture.



**Image 2:** Norman Robert Pogson, Government Astronomer at Madras Observatory
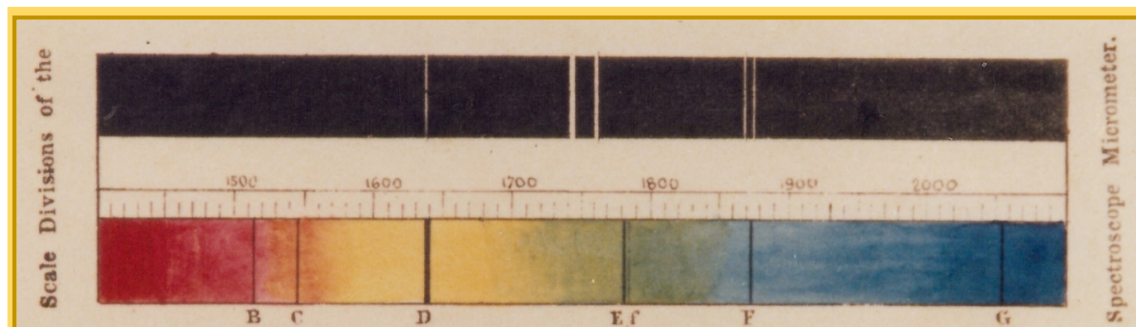


**Image 3:** Scale division of the spectroscope micrometer

### 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 DBTWellcome 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 ippodhu.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/



**Image 4:** Science, Journalism, Media: Communicating Science in a Changing India (20th - 21st Aug 2018)

### 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/

**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.
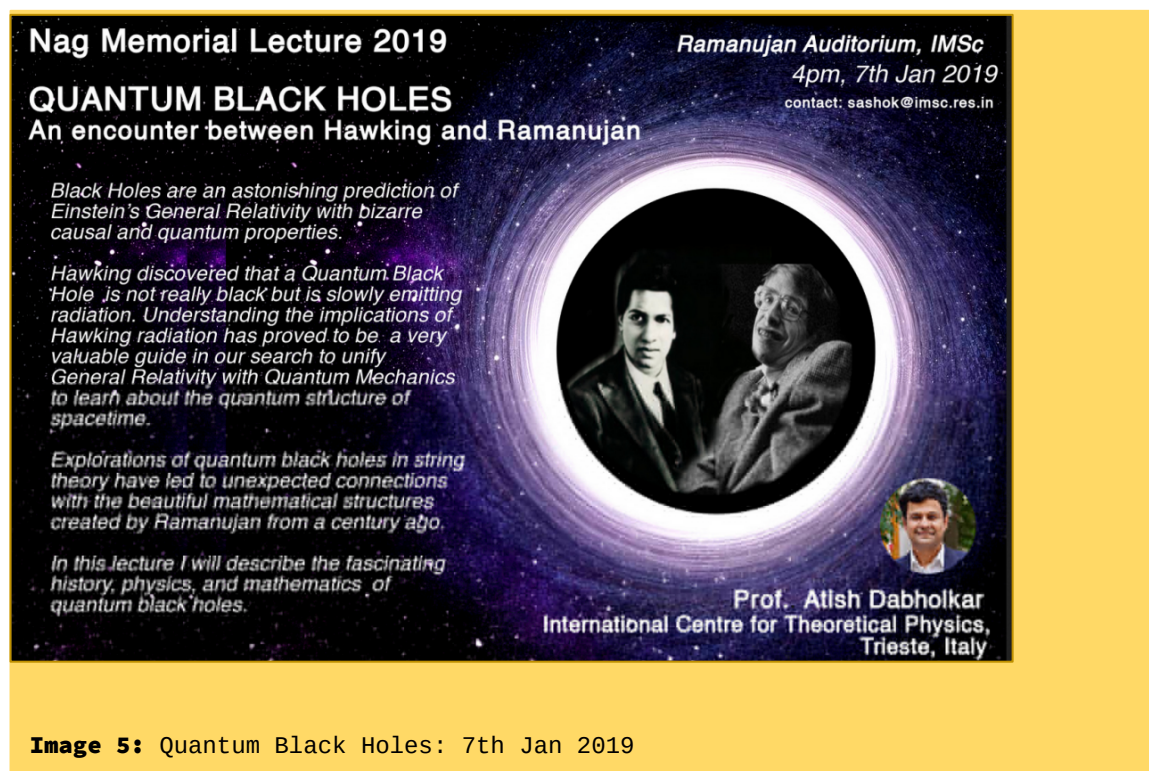


**Image 5:** Quantum Black Holes: 7th Jan 2019

**Mechanics of Complex Matter: 4th to 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 the 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



**Image 6:** Symposium on Regulatory Epigenomics: 10th-13th March 2019

## 2.3 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.

**Sayantan 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 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.

## 2.4  Publications

The list of publications follows the following conventions: firstly, names of (co)authors who are not IMSc members are marked with a superscript **\***; secondly, the citation labels used for cross-referencing with the research summary are constructed from the last name of the first IMSc author and finally the list is ordered alphabetically according to the labels.

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Persistent homology of unweighted complex networks via discrete Morse theory.
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**Shakti Menon, P. Varuni, and Gautam I. Menon**.
Information integration and collective motility in phototactic cyanobacteria.
2019.
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**Renu Maan\*, Garima Rani, Gautam I. Menon, and Pramod Pullarkat\*.**
Modeling cell-substrate de-adhesion dynamics under fluid shear.
*Physical Biology*, **15**, 046006, 2018.

**Areejit Samal, R.P. Sreejith, Jiao Gu\*, Shiping Liu\*, Emil Saucan\*, and Jürgen Jost\*.**
Comparative analysis of two discretizations of Ricci curvature for complex networks.
*Scientific Reports*, **8**, 8650, 2018.

**Emil Saucan\*, Areejit Samal, Melanie Weber\*, and Jürgen Jost\*.**
Discrete curvatures and network analysis.
*MATCH Communications in Mathematical and in Computer Chemistry*, **80(3)**, 605, 2018.

**Vishaka Datta\*, Sridhar Hannenhalli\*, and Rahul Siddharthan.**
Chipulate: A comprehensive chip-seq simulation pipeline.
*PLOS Computational Biology*, **15(3)**, e1006921, 2019.

**Vishaka Datta\*, Rahul Siddharthan, and Sandeep Krishna\*.**
Detection of cooperatively bound transcription factor pairs using chip-seq peak intensities and expectation maximization.
*PLOS One*, **13(7)**, e0199771, 2018.

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# 2.5 Teaching Programmes

An integral part of sustained research activity is training future generations of scientists and mathematicians. At IMSc this is done by supervising postgraduate and doctoral level thesis work. Motivated and bright students at the graduate and post-graduate level are selected every year through a national level Joint Entrance Screening Test followed by an interview. The selected students receive a fellowship throughout their tenure. They undergo one or two years of course-work, followed by doctoral thesis work under the guidance of a faculty member.

During 2018-2019, the student strength was 155, with 33 in Mathematics, 86 in Physics, 20 in Theoretical Computer Science, 16 in Biological Physics and Computational Biology.
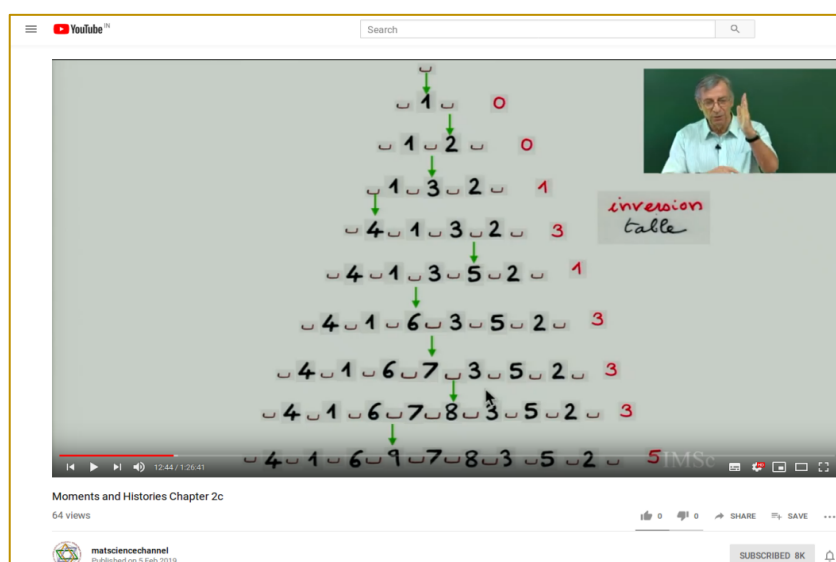


**Image 7:** Video lectures on IMSc YouTube channel

16 PhD students obtained their doctoral degree, and 7 students obtained Masters Degree, during this period. Also 3 students have submitted their doctoral theses, during this year.

During 2018-2019, a total of 34 courses in all disciplines were taught at IMSc in addition to a course of lectures for the undergraduate programme of CMI. Among these was "The Art of Bijective Combinatorics: orthogonal polynomials and continued fractions", taught by our visitor Prof. Xavier Viennot, which was live-streamed on the institute's YouTube channel and made available online in perpetuity.

Apart from this main training activity, IMSc also offers the opportunity of learning for a few students during the summer vacation period. These students spend up to 6 weeks doing projects with faculty members. The faculty also supervises short-term projects during other periods. A total of 81 students availed these opportunities during 2018-2019.

# 2.6  Degrees Awarded

### 2.6.1  Doctoral Degrees Awarded during 2018 – 2019

## Mathematics

| Name | Thesis Titile | Thesis Advisor(s) | University |
|---|---|---|---|
| Arunkumar, G. | Root Multiplicities for Borcherds-Kac-Moody Algebras and Graph Coloring. | Viswanath, S. | HBNI |
| Keshab Chandra Bakshi | On Intermediate Subfactors | Sunder, V. S. | HBNI |

## Physics

| Name | Thesis Titile | Thesis Advisor(s) | University |
|---|---|---|---|
| Aritra Biswas | Phenomenology of the Charm decays | Nita Sinha | HBNI |
| Atanu Bhatta | Holographic Conformal Partial Waves | Nemani Venkata Suryanarayana | HBNI |
| Dhargyal | Phenomenological studies of the observed anomalies in the T sector | Nita Sinha | HBNI |
| Madhusudhan Raman | Modular structures in superconformal field theories | Sujay K. Ashok | HBNI |
| Minati Biswal | $Z\_N$ Symmetry and confinement-deconfinement transition in SU(N)+ Higgs theory | Sanatan Digal | HBNI |
| Prasanna Kumar Dhani | Higher order corrections and soft gluon resummation in perturbative QCD | Ravindran, V. | HBNI |

| Prosenjit Haldar | Study of quantum transport at the Metal-insulator transition in Falicov-Kimball Model within Alloy analogy | Hassan, S.R. | HBNI |
|---|---|---|---|
| Pulak Banerjee | Higher order QCD corrections and resummation effects to the Drell-Yan process in the Standard Model and Beyond | Ravindran, V. | HBNI |
| Rusa Mandal | Rare *B* decay as a probe to beyond Standard Model Physics | Sinha, Rahul | HBNI |
| Sk. Jahanur Hoque | Physics of Gravitational Waves in presence of positive cosmological constant | Date, G. | HBNI |

## Theoretical Computer Science

| Name | Thesis Titile | Thesis Advisor(s) | University |
|---|---|---|---|
| Anuj Tawari | Lower Bounds for Read-Once and Tropical Formulas | Meena Mahajan, B. | HBNI |
| Diptapriyo Majumdar | Classical and Approximate Kernels for Structural Parameters of some graph parameters | Venkatesh Raman | HBNI |
| Joydeep Mukherjee | Approximation Algorithms for Stochastic matchings and independent sets | Subramanian, C. R. | HBNI |
| Ramanathan Thinniyam | Definability and Decidability in First Order Theories of Graph Order | Ramanujam, R. | HBNI |

## 2.6.2  Masters Degree Awarded during 2018 – 2019

### Mathematics

| Name | Thesis Titile | Thesis Advisor(s) | University |
|------|---------------|-------------------|------------|
| Arghya Sadhukhan | General Linear Group and Symmetric Group : Commuting Actions and Combinatorics | Amrithansu Prasad | HBNI |
| Jyothsnaa, S. | Lower bound for heights in abelian extensions and local metric estimates | Sanoli Gun | HBNI |
| Mita Banik | Geodesic and horocycle flows on certain homogeneous spaces | Parameswaran Sankaran | HBNI |
| Souvik Pal | Classification of Complex Semisimple Lie Algebras | Viswanath, S. | HBNI |
| Subham Bhakta | Virtual characters on the theory of Artin $L$- functions | Srinivas, K. | CMI, Chennai |

### Theoretical Computer Science

| Name | Thesis Titile | Thesis Advisor(s) | University |
|------|---------------|-------------------|------------|
| Divyarthi | An improved Dynamic Algorithm for Maximum b-Matching | Vikram Sharma | HBNI |
| Jayakrishnan | Data Structure Lower Bounds Using Communication Complexity | Vikram Sharma & Sayan Bhattacharya | HBNI |

## 2.7  Collaborative Projects

Institute members are also involved in joint projects with colleagues from other national and international institutes. The following projects are ongoing:

- **India-based Neutrino Observatory:**

  India-based Neutrino Observatory: INO project was approved by GoI in January 2015 and was all set for construction. However, due to legal hurdles the project has been delayed. Though the MoEF cleared the project again for the second time in 2018 March following the directive of NGT southern bench, an activist group has filed an appeal twice, with the latest one being presently heard in the Supreme Court of India. Further progress regarding construction will depend on the outcome of this case.

  In spite of the legal hurdles, the R & D efforts are continuing as before. IMSc-IITM group is jointly involved in the theoretical and simulation work in connection with the ICAL detector at INO. In addition INO graduate students attached to IMSc are working on the prototype detector at Madurai and also contributing to the building of the Engineering Prototype under construction.



**Image 8:** Prototype detector at Madurai

A mile-stone of INO was achieved with the establishment of Jaduguda Underground Science Laboratory which aims at performing experiments related to direct search for dark matter candidates and other physics experiments, where low cosmic ray background is essential. Several experiments, such as, a) prototype experiment on direct search for dark matter using scintillation detectors at room temperature, b) direct search for low mass WIMPs as dark matter candidates using superheated

liquid droplet detectors, c) search for high energy gamma rays resulting from post scission acceleration of fission fragments, etc are being planned.

IMSc group is also directly involved in many outreach activities to spread the activities and importance of INO among general public, teachers and students.

(The IMSc group involved in these activities includes D Indumathi, Nita Sinha and G Rajasekaran (Emeritus).)

- **Belle & Belle II Collaboration:**

BELLE is an international collaboration of 371 physicists from 14 countries (Australia, Austria, China, Germany, India, Italy, Japan, Korea, Poland, Russia, Slovenia, Switzerland, Taiwan, and USA) and 60 institutions that are invovled in research pertaining to matter-antimatter differences and the study of other phenomenon accessible at the KEK-B collider operated by High Energy Accelerator Research Organization in Tsukuba, Japan. Rahul Sinha of IMSc was invited to join the Belle collaboration and is a member of Belle since July 2008. Belle II is a new collaboration for the upgraded facility which is under construction.

- **Decongesting India's Transportation Network:**

ITRA-Media Lab Asia Project on De-congesting India's transportation networks using mobile devices. The project envisages the use of mobile phones to estimate congestion and traffic patterns on urban roads. Based on the congestion metrics thus obtained, the project aims to develop algorithms and tools for traffic planning and management, using the mobile phone as a service platform. The proposed solution strategy consists of two distinct focus areas. The first focus area deals with the problem of estimating mobile phone densities to measure prevailing congestion and traffic patterns. The second focus area involves developing algorithms for traffic routing, control and prediction, based on the estimated congestion. The proposed work has enormous potential for applications, such as dynamic route planning, peak hour rush control, routing of emergency vehicles to and from disaster affected areas, evacuation planning, and traffic prediction.

In addition, this work is expected to shed new conceptual insights into the general problem of control of complex networks with strategic agents, by bringing together ideas from several technical disciplines.

- **Max Planck Partner Group in Mathematical Biology**

  Dr. Areejit Samal is leading a partner group funded by the Max Planck Society to strengthen his long-standing collaboration with Prof. Jürgen Jost, Director, Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany. In this partner group, Samal and Jost are porting concepts from geometry to develop new methods for the analysis of complex networks. Research activities of this partner group has been featured in:

  ○ Max Planck Society News
  (https://www.mpg.de/12073239/0607-matn-017649-meaningful-relationships-mathematical-insights-into-the-geometry-of-complex-networks)
  ○ Nature India
  (https://www.natureasia.com/en/nindia/article/10.1038/nindia.2018.84).

## 2.8 Scientific Meetings and Visitor Program

The academic members of the Institute typically participate extensively in a large number of national and international scientific meetings.

An important aspect of research is interaction with peers. IMSc makes it possible for Scientific community of the Country by organising national and international scientific meetings. The Institute contributes towards such activities either by sponsoring them fully or partially. In this year, the following conferences were organized or co-sponsored by the Institute.

- Tenth Summer Training Programme in Mathematics (May 16 – Jun5, 2018)
- ACM-India Summer School on Graph Theory and Algorithms (May 21 – Jun 8, 2018)
- Summer school for MSc students (May 28 – Jun 15, 2018)
- Nagarajfest (Jul 10 – Jul 12, 2018)
- Science Academies Lecture Workshop on Algebra (Aug 16 – Aug 18, 2018)
- Entropy, Information and Order in Soft Matter (Aug 27 – Oct 31, 2018)
- Algebras, Combinatorics, and Representation Theory (Dec 5 – Dec 8, 2018)
- National Mathematics Day: NCM lecture (Dec 22, 2018)
- The Stellar Legacy of Prof. Meghnad Saha: from Society to the Cosmos (Jan 3 – Jan 4, 2019)
- CAALM: Complexity, Algorithms, Automata, Logic Meeting 2019 (Jan 21 – Jan 25, 2019)
- Mechanics of Complex Matter: Criticality, intermittency and collective behaviour (Mar 4 – Mar 7, 2019)

- India-EMBO Symposium on Regulatory Epigenomics: From Large Data to Useful Models (Mar 10 – Mar 13, 2019)

The annual activities included the following:

- Annual K.S. Krishnan Meeting on Quantum Matter and Quantum Entanglement
- Institute Seminar Week

Institute members and visitors discuss their work during weekly seminars. During 2018-2019, about 423 such seminars were held at IMSc.


## 2.8.1 Outreach Activities

Apart from engaging in high quality research and training activities, the Institute also recognizes its responsibility towards enhancing its interactions with society at large.

Currently, this occurs through two programs:

- **Associateship Program:** The Institute has established short-term associateships in Mathematics, Theoretical Physics, Theoretical Computer Science and Computational Biology to enable teachers from colleges and universities to work at the institute. The programme is envisaged to develop interaction between the members of the faculty of the institute and scientists in the university system. Under this programme, an associate can visit the institute once or twice a year, up to a total of 90 days per year, each visit lasting a minimum of three weeks. The tenure of an associate will be for a period of three years and (s)he is expected to visit the institute at least twice during this period.

  The institute will bear the expenses of round-trip travel (by rail) from the Associate's normal place of work to Chennai and will also pay a daily allowance to cover local expenses at Chennai. During their stay at Chennai, Associates will be accommodated in the institute Guest House.

- **Science Popularization:** The Institute organizes Popular Science Lectures from time to time to keep the public informed as well as to enthuse the younger generation. IMSc outreach activities include a range of workshops and programs that bring students and teachers into direct contact with research scientists. Throughout the year, many eminent researchers and educators who visit our campus also give public lectures on various topics. One of our most recent outreach initiatives, "Science at the Sabha", is an annual event for the general public featuring talks on current scientific research.

  Many IMSc members also give talks in schools, colleges, clubs etc in their individual capacities.

In this year, the following conferences were organized by the Institute, towards outreach activities. Details of the events are available at http://www.imsc.res.in/outreach/

**April 2018 – March 2019**

*Zero Shadow Day* (April 24, 2018)

*Summer School Students Workshop* (May 8 – May 17, 2018)

*Teachers Enrichment Workshop* (May 21 – May 26, 2018)

*Teachers Enrichment Workshop* (Jun 18 – Jun 23, 2018)

*Facets* (July 5 – July 6, 2018)

*IMSc Open Day* (Sept 15, 2018)

*Enriching Mathematics Education* (Oct 4 – Oct 5, 2018)

*Kanita-Kaanakam* (Oct 26, 2018)

*Vigyan Pratibha Chennai Region Teachers Workshop* (Nov 15 – Nov 16, 2018)

*Teachers Enrichment Workshop* (Nov 26 – Dec 1, 2018)

*Teachers Enrichment Workshop* (Jan 7 – Jan 12, 2019)

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

*Science at the Sabha* (Feb 24, 2019)

## Zero Shadow Day (24th April 2018)



**Image 9:** Zero Shadow Day, April 24th 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 latitute 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-chennaikids-5156463/).

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

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



**Image 10:** 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! 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.

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

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 Teachers 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.
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.

**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.

**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)



**Image 11:** 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



**Image 12:** News Article on 'Dinamalar Student Edition' - Pattam, 11, dt.30.10.2018 (A Tamil Newspaper)

## Vigyan Pratibha Chennai Region Teachers Workshop (15th - 16th Nov 2018)



**Image 13:** Vigyan Pratibha Chennai Region Teachers Workshop: 15th - 16th Nov 2018

This was the 1st edition of IMSc's teachers regional workshop for Vigyan Pratibha, a Government of India program to nurture of talent in Science and Mathematics among VIII – X students. 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)



**Image 14:** 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 Teachers 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

## 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 Counsulate (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.



**Image 15:** UN International Day for Girls and Women in Science: 11th Feb 2019

## Science at the Sabha (24th Feb 2019)



**Image 16:** 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.

**From Learning to Doing: Science, Education and Public Service in Chennai**



**Image 17:** From Learning to Doing: Science, Education and Public Service in Chennai, Science at the Sabha, 24th Feb 2019

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-abha/article26365816.ece

https://timesofindia.indiatimes.com/city/chennai/science-at-the-sabha-educates-youngsters-and-enthralsold/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)**



**Image 18:** 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

## 2.8.2 Visitors

Research is often a collaborative activity and is boosted by a vibrant visitor program. The Institute hosts a large number of short term and long term visitors. During the year 2018-19, 293 scientists have visited the Institute. A list of a few distinguished visitors to the Institute during this period is given below:

### 2.8.2.1 Faculty Visitors

| | | | |
|---|---|---|---|
| **Johannes Kobler** | Humboldt University | **Anindya S Chakrabarti** | IISER, Pune |
| **Anirban Banerjee** | IISER, Kolkata | | |
| **Ramakrishnan, B** | HRI, Allahabad | **Aritra Banik** | NISER, Bhubaneswar |
| **Sayan Bhattacharya** | Univ of Warwick, UK | **Pushkar Joglekhar** | Vishwakarma Institute of Tech, Pune |
| **Dileep Jatkar** | HRI, Allahabad | | |
| **Xerxes Tata** | Univ. of Hawaii | **Ragavendran, K.** | Kalasalingam University, Krishnankovil |
| **Xavier Viennot** | Labri Bordeaux | | |
| **Purabi Mukherjee** | INSA | | |
| **Krishnaswamy, S** | IMSc Visiting Professor | **Ranjitha, K.** | Samhram Institute of Technology |
| **Hari Dass, N.D** | TIFR, Hyderabad | | |
| **Venkateswaran, T.V.** | Vigyan Prasar, DST, New Delhi | **Ramij Rahaman** | Allahabad University |
| | | **Dibyendu Das** | IIT, Bombay |
| **Golam Mortuza Hossain** | IISER, Kolkata | **Mithun Mitra** | IIT, Bombay |
| | | **Parimala Raman** | Emory University USA |
| **Rohit Dhir** | SRM, Kattankulathur | **Rajeev Singh** | IIT Bhubaneswar, Varnasi |
| **Kanishka Rawat** | College of women, Chandigarh | | |
| | | **Venkateswaran, T.V.** | Vigyan Prasar, DST, New Delhi |
| **Sandipan Sengupta** | IISER, Kolkata | | |
| **Balachandran V.** | GSI, Retd | **Jayanta Bhattacharya** | IACS |
| **Venkateswaran, T.V.** | Vigyan Prasar, DST, NewDelhi | **Marcin Chrzaszcz** | CERN |
| **Sourav Tarafder** | Xavier College, Kolkata | **David, S** | University of Paris |
| **Sasidevan V.** | University of Sciences Tech., Kolkata | **Subinoy Das** | IIA, Bangalore |
| | | **Shivchaitanya K.V. S** | BITS, Pilani |
| **Priyotosh Bandyopadhyay** | IIT, Hyderabad | **Shamik Banerjee** | Institute of Physics, Bhubaneswar |
| **Steven Spallone** | IISER, Pune | | |

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|---|---|---|---|
| **Venkat Guruswami** | Carneqie Mellon University, USA | **Dilip Kumar Maiti** | Vidyasagar University |
| **Pradeesha Ashok** | IIIT, Bangalore | **Saumia P.S** | Institute of Nuclear Physics, Dubai |
| **Raman Sundram** | University of Maryland, USA | **Mayakh Nilay** | University of Illinois, USA |
| **Anirban Banerjee** | IISER, Kolkata | **Nirmalendu Ganai** | Vidyasagar University |
| **Kumar Murty** | University of Toronto | **Venkateswaran T. V.** | Vigyan Prasar, New Delhi |
| **Manickam M.** | KSOM, Kozhikode | | |
| **Vaidy Sivaraman** | University of Central, Florida | **Sasidevan V.** | CUSAT, Kochi |
| | | **Hidenori Sonoda** | Kobe University |
| **Sinnakaruppan S.** | INO Project | **Sunil Simon** | IIT, Kanpur |
| **Matteo Paris** | University of Milan, Italy | **Giovanni Landi** | University of Trieste |
| | | **Ragavendran K.** | Kalasalingam Academy of Research and Education, Krishnan Koil |
| **Subinoy Dasgupta** | University of Calcutta | | |
| **Anilatmaja** | IISER, Thirupathi | | |
| **Manickam M.** | KSOM, Kozhikode | | |
| **Venkatasubramanian C.G.** | IISER, Thirupathi | **Waldschmidt Sankaranarayan** | Emeritus Prof, Paris TIFR, Mumbai |
| **Krishnaswamy, S** | Madurai | **Aparna Baskaran** | Brandeis University |
| **Muthukumar, M** | USA | **Justin David** | IISC, Bangalore |
| **Peter Ngai-sing** | Bates College, USA | **Inderasan Naidoo** | University of South Africa, Johannesburg |
| **Daciberg Goncalves** | University of Sao, Brazil | | |
| **Kumar M. C.** | IIT, Guwahati | **Jayaraman T** | TIFR, Mumbai |
| **Haridass N. D.** | TIFR, Hyderabad | **Araniza Gyangiren-Valencia** | Valencia |
| **Narasimha Kumar** | IIT, Hyderabad | | |
| **Anilatmaja Arya Samayajuta** | IISER, Tirupati | **Deshpande N.G** | University of Oregon |
| | | **Gyan Prakash** | HRI, Allahabad |
| **Prakash Mathews S.** | Saha Institute of Nuclear Physics, Kolkata | **Anirban Kundu** | University of Calcutta |
| | | **Allesandro Vicini** | University of Milano |
| | | **Thorsten Heidersof** | MPI Bonn |
| **Suvrat Raju** | TIFR, Bengaluru | **Adhikari S.D.** | RKMVERI, Belur |
| **Paritosh Pandya** | TIFR, Mumbai | **Antonio Di Nola** | University of Saleno, Italy |
| **Guruprasad Kar** | ISI, Kolkata | | |
| **Kasi Viswanadham** | IISER, Odisa | **Ram Murty** | Queen's University |
| **Ramij Rahaman** | Presidency University | **Kumar Murty** | University of Toronto |
| **Samir Kunkri** | Mahade Bananda Maha Vidhyalaya, West Bengal | **Manickam M** | KSOM, Kozhikode |
| | | **Philopon** | CNRS, France |
| | | **Venkateswaran T.V.** | Vigyan Prasar, New Delhi |
| **Shiv Prakash Patel** | IIT, Delhi | | |
| **Oliver Ramare** | University of Marseille | | |

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|---|---|---|---|
| **Mohan Chintamani** | University of Hyderabad | **Gautami Bhowmik** | University of Lille, France |
| **Paran Kumar** | IIITDM, Kurnal | **Mare Bouroon** | University of Lille, France |
| **Krishnendu. G** | IISER, Mohali | **Pruisken A.M.M.** | University of Amsterdam |
| **Malick R.P.** | BHU, Varanasi | | |
| **Ravindran G.V.** | UMSL, USA | **Parimala Raman** | Emory University, USA |
| **Lakshmi Varahan S** | Univ of Oklahaoma, Norman | **Gyan Prakash** | HRI, Allahabad |
| **Shiv Chaitanya K.V.S** | BITS, Hyderabad | **Jean- Marc Deshouillers** | University of Bordeaux |
| **Moitri Sen** | NIT, Patna | **Xavier Viennot** | CNRS, Bordeaux |
| **Srinivasa Rao, S.** | Seoul, South Korea | **Sheik Abdullah** | Thiagarajar College of Engineering |
| **Surya Ramana D** | HRI, Allahabad | | |
| **Venkatesan Guruswami** | Carneqie Mellon University | **Ramdian Mawia** | ISI, Kolkata |

## 2.8.2.2 Post Doctoral Visitors

| | | | |
|---|---|---|---|
| **Ratnadeep, A.** | ISI, Kolkata | **Shashikant Singh Kunwar** | IIT, Madras |
| **Neelam Dhanda** | IIT, Delhi | | |
| **Nilanjana Kumar** | SINP, Kolkata | **Abhishek Roy** | University of Cologne |
| **Gourav Narain** | Institute of Theo. Physics, China | **Dharmesh Jain** | SINP, Kolkata |
| | | **Prasad V. V.** | Institute of Sciences, Isreal |
| **Gayatri Panickar** | IIT, Guwahati | | |
| **Jai D More** | IIT, Mumbai | **Amit Chakraborty** | IPNS, Japan |
| **Arup Roy** | ISI, Kolkata | **Sumanto Chanda** | SN Bose Center For Basic Centre, Kolkata |
| **Arjit Dutta** | KIAS, Seoul | | |
| **Narayan Rana** | DESY, Germany | **Rahul Srivastava** | IFIC, Spain |
| **Prasanna Venkatesh** | Institute of Quantum optics, Innsbruck | **Minati Biswal** | Institute of Physics, Bhubaneswar |
| **Krishna B.S. Swamy** | IMB, Taiwan | **Sumanta Chakraborty** | IACS, Kolkata |
| **Manirul Ali** | National Tsing University, Taiwan | | |
| | | **Debajyoti Sarkar** | ITPAC University |
| **Dhiraj Hazra** | INFN, Italy | **Arun Kumar** | IISER, Mohali |
| **Dilpreet Kaur** | IISER, Pune | **Arnab Pal** | Aviv University, Isreal |
| **Anosh Joseph** | TIFR, Bangalore | **Diptapriyo Majumdar** | IMSc, Chennai |
| **Nikhil Ramesh** | BITS, Goa | | |
| **Sandipan De** | ISI, Bangalore | **Anirudh Reddy** | Ramar Research Institute, Bangalore |
| **Kajal Das** | Institute of Science, Israel | | |
| | | **Sumanta Pal** | University of Coimbra, Portugal |
| **Balaraju Battu** | CBCS, Allahabad | | |
| **Sambaran Banerjee** | University of Bonn | | |

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|---|---|---|---|
| **Rishu Kumar Singh** | IIT, Mumbai | **Ravi Kunjwal** | Perimeter Institute, Canada |
| **Shashikant Singh Kunwar** | IIT, Madras | **Nivedita Bhaskar** | UCLA, USA |
| **Minati Biswas** | IOP, Bhubaneswar | **Subramani, M** | HRI, Allahabad |
| **Soumyajyoti Biswas** | Max Planck Inst. | **Pranabendu Misra** | University of Bergen, Norway |
| **Santanu Mondal** | Univ. Of Taiwan | | |
| **Kuntal Nayek** | SINP, Kolkata | **Krishnan Rama** | Trivandrum |
| **Satyajit Seth** | IPPP, Durban, UK | **Ajit Coimbatore Balram** | Niel's Bohr Institute |
| **Fahad Panolan** | University of Bergen, Norway | | |
| | | **Prathamesh T.V.H** | University of Innstruct |
| **Vishwas Venkatesh** | University of Creneble | **Srimoy Bhattacharya** | IIT, Guwahati |
| **Kabir Ramola** | Brandeis University | **Sumithra Sankaran** | Institute of Science, Bangalore |
| **Chandan Maity** | ISI, Delhi | | |
| **Roji Pius** | University of California | **Kamalakshya Mahatab** | NTNU, Norway |
| **Gaurav Rattan** | University of Germany | | |
| **Prajwal Nandekar** | Heidelberg University | **Mehedi Masud** | Valencia, Spain |
| **Maguni Mahakhud** | Saha Institute of Nuclear Physics | **Celestine Preetham Lawrence** | Netherlands |
| **Anirudh Reddy** | RRI, Bangalore | | |

### 2.8.2.3 Doctoral Student Visitors

| | | | |
|---|---|---|---|
| **Gayathri, B** | Pondicherry university | **Asweel Ahmed** | Pondicherry University |
| **Suryarao Bethapudi** | IIT, Hyderabad | **Priyanka, J** | PSG College Of Technology |
| **Sathish Kumar, P** | University of Madras | | |
| **Suchetana Goswami** | S.N. Bose Center for Basic Sciences | **Sonika** | IIT, Ropor |
| | | **Lalit Vaishya** | HRI Allahabad |
| **Mahashweta Patra** | IISER Kolkata | **Arpan Das** | Institute of Physics |
| **Aditya Banerjee** | HRI, Allahabad | **Jyothsna** | PSG College of Technology |
| **Nimisha Pahuja** | IISC Bangalore | | |
| **Gayathri Panicker** | IIT, Guwahati | **Jyotirmoy Ganguli** | IISER Pune |
| **Meena, T** | Idhaya College of Women | **Seethalakshmi, K** | IISER Pune |
| | | **Gopalakrishnan** | IIT Bangalore |
| **Vijay Kumar Paliwal** | IIT Jodhpur | **Mitali Thatte** | IISER Pune |
| **Richa Tripathi** | IIT Gandhinagar | **Neha Malik** | IISER Pune |
| **Rusa Mandal** | IMSc | **Gopinath Mishra** | ISI, Kolkata |
| **Manish Kumar Pandey** | HRI, Allahabad | **Sukanya Pandey** | IISER Pune |
| | | **Mrinalini Ranjan** | IISST |
| **Asweel Ahmed** | Pondicherry University | **Anmol Agrawal** | Shankaracharya Group of Institute |
| **Anup Kumar Singh** | HRI Allahabad | | |
| **Harshit Rajgadia** | IIT, Guwahati | | |

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|---|---|
| **Dhamapurkar Shyam Surykant** | University of Pune |
| **Pratibha Choudhary** | IIT, Jodhpur |
| **Gunda Spoorthy** | IISER, Pune |
| **Ankit Sihi** | IIT, Mumbai |
| **Pratyush Kumar** | BITS, Goa |
| **Sreekanth K. Manikandan** | Slockholm University |
| **Abdul Majith** | University of Rome |
| **Meena, T** | University of Rome |
| **Sumit Shaw** | CMI, Chennai |
| **Richa Tripathi** | IIT, Gandhinagar |
| **Fahad, P** | Cochin University |
| **Lalit Kumar Saini** | University of Delhi |
| **Nidhi Gujar** | IBB, Pune |
| **Arindam Mallick** | Kolkata |
| **Tamilmaran, C** | Tamilnadu Agricultural University |
| **Tanmay Mitra** | IMSC |
| **Dilnavas Roshan** | CUSAT, Cochin |
| **Richa Tripati** | IIT, Gandhinagar |
| **Srimoy Bhattacharya** | IIT, Guwahati |
| **Aniruddha Vidyadhar Shirsat** | IISER, Pune |
| **Narendra Hegade** | NIT, Silchar |
| **A.V.S.D. Bharadwaj** | ISI, Bangalore |
| **Shilpa Jangid** | IIT, Hyderabad |
| **Atanu Bhatta** | IMSc |
| **Bidesh Kumar Bera** | ISI, Kolkata |
| **Soumyadeep Chaudhuri** | TIFR, Bangalore |
| **Shivesh Kumar Roy** | IIT, Patna |
| **Theerthagiri, L.** | IMSc |
| **Ajay, K** | IISER, Thiruvananthapuram |
| **Kushal, A** | IISC, Bangalore |
| **Hrushikesh Gore** | University of London |
| **Sabareeswaran** | Bharathidasan University |
| **Mrunal Kamble** | College of Engineering, Pune |

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|---|---|
| **Dilnavas Roshan** | CUSAT, Cochin |
| **Sohan Lal Saini** | College of Engineering, Naland |
| **Nithin, R** | Anna University |
| **Rajesh, G** | Anna University |
| **Sudipta Das** | IISER, Mohal |
| **Magali Le Goff** | University of France |
| **Swati** | HRI Allahabad |
| **Kruttika Bhat, G** | IIITDM, Kanchipuram |
| **Sudharshan, A** | Anna University |
| **Kiran Sharma** | JNU, Delhi |
| **Sivakama--meenakshi. P** | Sastra University |
| **Madhav Sankaranarayanan** | ISI, Kolkata |
| **Richa Tripathi** | IIT Gandhinagar |
| **Kavyaa, K** | Bharathidasan University |
| **Dipayan Chakraborty** | University of Calcutta |
| **Prabir Kumar Dey** | University of Calcutta |
| **Adwait Sengar** | Australia National University |
| **Subramanya Bhat. K.N** | University of Karnataka |
| **Arunima Bhattacharya** | Institute of Nuclear Physics |
| **Balachander, N** | Anna University |
| **Kiran, D** | IISER, Bhopal |
| **Rahul, B.S.** | BITS, Pilani |
| **Fahad, P** | University of Cochin |
| **Pratibha Choudhary** | IIT, Jodhpur |
| **Spoorthy Gunda** | Pune |
| **Nikhil Ramesh** | KK Birla Campus, Goa |
| **Roopesh Mangal** | IISC, Bangalore |
| **Anirbit Mukherjee** | Johns Hopkins University, USA |
| **Kushal, A** | NCBS, Bangalore |
| **Arindam Mallick** | Former Student at IMSc |
| **Dhruba Bora** | IISER, Pune |

### 2.8.2.4 Non Doctoral Student Visitors

| | | | |
|---|---|---|---|
| **Davood Bashir Dar** | Aligarh Muslim University | **Sarvesh Srinivasan** | BITS, Pilani |
| **Pavithra Elumalai** | PSG College of Technology | **Yashwanth S Prabhu** | SV National Institute, Surat |
| **Harish, K** | UIUC | **Smith Sen** | SV National Institute, Surat |
| **Sudharsan . A** | Sree Sasta Institute of Tech, Chennai | **Anupama. B** | Amrita School of Engg, Coimbatore |
| **Arnab Acharya** | IISER, Kolkata | **Murali T.S.** | SSN College of Engg., Chennai |
| **Madhav Reddy. B** | ISI, Kolkata | **Komal Dilip** | IISER, Pune |
| **Vaishali Surianarayanan** | PSG College of Technology | **Divya Chopra** | Central Univ. of Rajasthan |
| **Nidhi Gujar** | IBB, Pune | **Arun Karthiheyan** | Pacchaiappa's College |

# 3. Infrastructure

The Institute has excellent facilities required for cutting-edge research. The two main facilities are the Library and the Computing Environment. The Institute also has an on-campus hostel for students and a guest house for short term and long term visitors. Recreational facilities are also available. The state of the art, 200 seater Ramanujan Auditorium provides the venue for conferences and other public events of an academic nature.

## 3.1 Computer Facilities

**Enhancement of Computer Facility during 2018-19**

- New laptops were issued to newly joined faculty and to those faculty who requested replacement of laptops which are older than 4 years. MacBook Pro 13", Dell XPS, MacBook Pro 15", Mac Air 13 ", Lenovo Yoga L380 laptops were distributed.

- Two new EPSON LCD projectors, two BENQ DLP projectors were installed in the library conference hall and other locations.

- Two Dell Power Edge R740xd servers were installed for data backup purposes. The JEST server was upgraded to higher specification as required.

- Three A3 Laserjet MFP, one A3 Colour laserjet MFP, three A4 laserjet MFP Kyocera model printers enabled with access control system using RFID card reader connecting the LDAP server under Linux in the LAN were deployed by replacing obsolete printers. Also, three HP Laserjet MFP A4 laserjet printers were replaced in the campus.

- The existing 42 Mbps Internet bandwidth service was renewed for one more year through the service provider M/s. Bharti Airtel.

- Obsolete LAN switches were replaced and additional LAN Switches were deployed for the new library building. Established OFC redundant back-bone was established for the LAN services in the IMSc campus. Additional WiFi access-points and controller were installed in the campus to cover-up the black spots.

- Maple software was upgraded to 2018 version and Intel PCL Parallel Studio XE cluster edition was installed in the HPC Cluster.

- Central Computer Facility room was refurbished with Access Control System using RFID reader integrated with LDAP server under Linux O/S.

- About 500 hrs of class room video lectures were recorded and uploaded in the media portal page ([http://ekalavya.imsc.res.in/](http://ekalavya.imsc.res.in/)) after editing and also in IMSc's YouTube channel ("matsciencechannel"). Frequent video conferencing activities were handled with DAE units, national and international institutions. Remote class-room lectures for IIT Jodhpur and other institutions were also handled.

- On successful completion of PoS billing system of cash-less transaction for the canteen using the IMSc ID(RFID) card under OpenERP(ODOO), the automation of "IMSc visitor form" is under testing phase and HR/Payroll module customization are under process.

**Activities :**

A two day training session on E-Procurement(E-Tender process) via the "Central Public Procurement Portal" under NIC, Government of India, was organized at IMSc during 30-31 October 2018 with the DSC tokens for the Officers involved in the tender activities.

Mr. B. Raveendra Reddy, Scientific Officer-F attended the meeting of the Computer and Information Security Advisory Group (CISAG) on 24 April 2018 at BARC, Mumbai.

Ms. T.V. Hari Priya, Administrative Assistant(Systems) and Ms. P.K. Sreelakshmi, Technical Assistant(ERP) attended a training program on "Linux Security and Network programming in C-language", during 19-21 November 2018 conducted by SETS, Chennai.

## 3.2  The Library

The Institute Library holds a total collection of 74775 books and bound periodicals as on March 31, 2019. This includes the addition of 995 volumes during the current year April 2018 - March 2019. The NBHM has recognized this Institute library as the Regional Library for Mathematics. An average of about 5000 outside users in a year from colleges, universities and research institutions from different parts of the country make use of the library facilities for their academic and research information needs.

The library has a well balanced collection both print and online on the major subject areas of research such as Theoretical Physics, Mathematics and Theoretical Computer Science. The library subscribes to over 350 national and international journals.

The library has access to over 3500+ online journals from major publishers such as Elsevier, American Mathematical Society, American Physical Society, Springer Verlag, World Scientific, Institute of Physics, Wiley, etc. Library has also access to Nature online, Science Online, ACM Digital Library, SIAM Journals Archive, Duke Mathematical Journal, and JSTOR Full digital archive. It has also perpetual online access to backfile collection of journals contents from Volume 1 from some of the major publishers like Elesevier under DAE consortium, Springer, World Scientific, Wiley, deGruyter, Cambridge University Press, Turpion, IOP Publishing and Annual Reviews Electronic Backvolume collection. Access to online journals is restricted to members of the Institute.

**Services:**

Apart from developing the collection, the library offers reprographic and inter library loan services. Library has migrated from commercial proprietary software Libsys to open source software Koha on a linux platform, the library catalogue has been computerized and made available online to the readers both within and outside the Institute Campus. The Koha software has been customised in-house to support all the library operations including online request for acquisition of books and status of borrowings, serials management, inventory management etc. Library has implemented RFID based system for self check-in and checkout of library materials. VECC Kolkata has extended their support by providing linux based software applications to use RFID systems. With the help of RFID enabled access control system, the library provides effective 24x7 access to its resources, perhaps the only library of this kind in the country.

The newly expanded library building was inaugurated by the Chairman Shri.K.N. Vyas, DAE, on 25th January 2019, in the presence of Prof. S.K. Joshi, Chairman IMSc Executive Council.

As a result of library building expansion under 12th five year plan, library has now more space available for the users and collections. The new library is housed in three floors with an area of 28,000 sq ft (approximately) fully airconditioned. New furniture is also being added to provide a comfortable user experience. The new expanded library is being made as more inviting with better ambience to support researchers to use more time in the library.
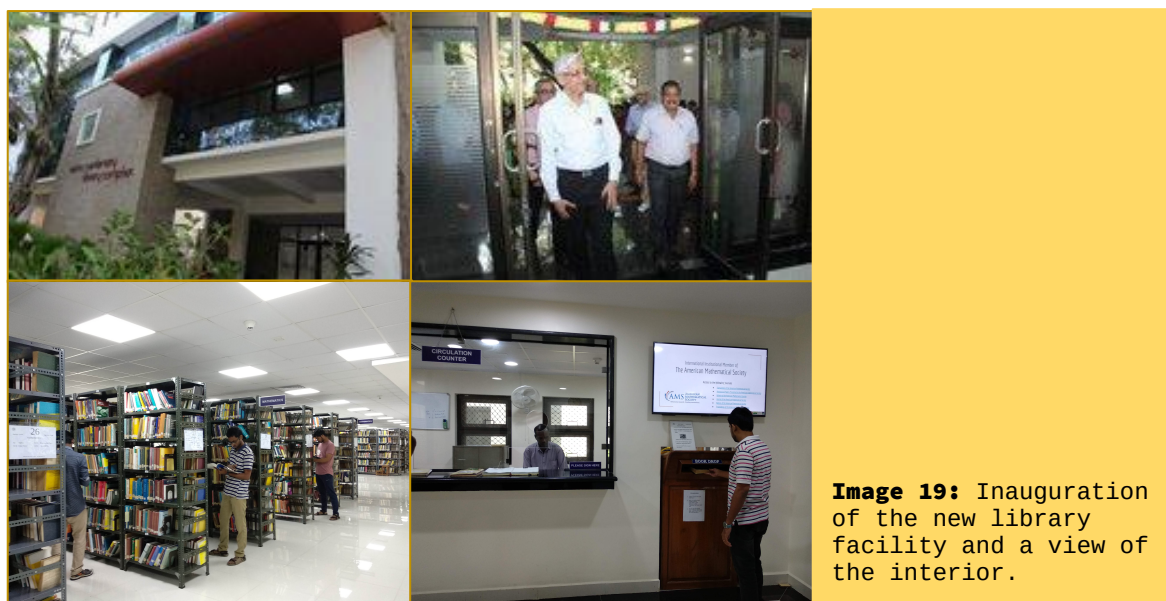


**Image 19:** Inauguration of the new library facility and a view of the interior.

Library has a website dedicated to host all the online information resources and to provide information about the library and its services.

Library is a member of DAE Libraries Consortium that subscribes to SCIENCE DIRECT SERVICE of Elsevier. Library is also coordinating the MathSciNet consortium which provides online access to MathSciNet for participating institutions in the southern region. Library is an institutional member of AMS, MALIBNET, CURRENT SCIENCE Association, and IAPT.

**Acknowledgment:**

The Library gratefully acknowledges the donation of valuable books, journals and other reading materials received during the current year from the persons and organizations mentioned below:

| | |
|---|---|
| Ankit Agarawal, IMSc | Anupama Sharma, IMSc |
| Aradhana Singh, IMSc | Aravinda S, IMSc |
| Diptapiyo Majumdar, IMSc | Ghanashyam Date, IMSc., |
| Kalyana Rama, IMSc | Kamal Lodaya, IMSc |
| Kesavan S, IMSc | Nagaraj, D.S., IMSc |
| Rajasekaran G, IMSc | Srinivasa Rao, K. |
| Sunder, V.S. | |

O.R. Rao, Krishnamurti
Foundation India

| | |
|---|---|
| NBHM | OLIC, IMSc., |

# 4. Audited Statement of Accounts for the year 2018-2019

As per clause 29 of the Constitution and Bye - Laws of the Institute, the Accounts of the Institute shall be audited by Professional Chartered Accountants as prescribed by the law. The audit of the Accounts of the Institute for the Financial year 2018-19 was taken up and complied by Professional Auditors M/s R. Balachandran & Co., Chennai - 600 035. The Report of the Auditors and the Audited Statement of Accounts including the Provident Fund Accounts for the year 2018-19 are attached herewith for reference.

# R. BALACHANDRAN & CO.
## CHARTERED ACCOUNTANTS

**R. BALACHANDRAN**
B.A., B.L., F.C.A., A.C.S. DIRM (ICAI), DISA(ICA)

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Cell: 94442 58090 (D) 98843 50000
Email: rbalaca@gmail.com / rbksr@rediffmail.com

## INDEPENDENT AUDITOR'S REPORT

### REPORT ON THE FINANCIAL STATEMENTS

I have audited the financial statements of M/s. The Institute of Mathematical Sciences (herein after called "The Society"), comprising Balance sheet as at 31st March 2019, Receipts and Payments and the Income and Expenditure for the year then ended, and the relevant schedules to the financial statements.

In my opinion and to the best of my knowledge and according to the explanations given to me, the aforesaid financial statements give the information required in the manner so required and give a true and fair view in conformity with the accounting principles generally accepted in India.

a) In the case of the Balance Sheet, of the state of affairs of the Society as at 31st March, 2019.

b) In the case of the Income and Expenditure Account, of the Excess of Expenditure over Income for the year ended on that date.

### BASIS FOR OPINION

I conducted my audit in accordance with the Standards on Auditing (SAs) issued by ICAI. My responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of my report. I am Independent of the Society in accordance with the code of Ethics Issued by ICAI and I have fulfilled my other ethical responsibilities in accordance with the code of Ethics. I believe that the audit evidence I have obtained is sufficient and Appropriate to Provide a basis for my opinion.

### MANAGEMENT'S RESPONSIBILITY

The management of the Society is responsible for the preparation of these financial statements that give true and fair view of the financial position, financial performance in accordance with the accounting standards. This responsibility includes the design, implementation and maintenance of internal control relevant to preparation and fair presentation of the financial statements that give true and fair view and are free from material misstatement, whether due to fraud or error.

### AUDITOR'S RESPONSIBILITY

My responsibility is to express an opinion on these financial statements based on my audit. I conducted my audit in accordance with the standards on auditing issued by Institute of Chartered Accountants of India. Those Standards require that I comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

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# R. BALACHANDRAN & CO.
## CHARTERED ACCOUNTANTS

**R. BALACHANDRAN**
B.A., B.L., F.C.A., A.C.S., DIRM (ICAI), DISA(ICAI)

Flat 3B, IIIrd Floor, Block III, Bajaj Apartments,
4, Nandanam Extn. 1st, Main Road,
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An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Society's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of the said internal controls. An Audit includes examining the evidence supporting the amounts and disclosures in the financial statements on a test basis. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of the accounting estimates made by Society, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion

Place: Chennai
Date : 19.08.2019

For R.Balachandran & Co
Chartered Accountants
Firm No.323S

R.Balachandran
Chartered Accountant
M.No. 026980
UDIN: 19026980AAAACM3158

# The Institute of Mathematical Sciences, Chennai

## BALANCE SHEET AS AT 31st MARCH 2019

(All amounts in Rs.)

| PARTICULARS | Schedule No. as per the Common Format of accounts | CURRENT YEAR | PREVIOUS YEAR |
|---|---|---|---|
| **CAPITAL FUND AND LIABILITIES** | | | |
| CAPITAL FUND ACCOUNT | 1 | -30,55,26,802 | -13,36,62,222 |
| EARMARKED/ENDOWMENT FUNDS | 3 | 15,15,039 | 13,63,138 |
| CURRENT LIABILITIES AND PROVISIONS | 7 | 96,44,91,807 | 77,41,97,128 |
| **TOTAL** | | **66,04,80,044** | **64,18,98,044** |
| **ASSETS** | | | |
| FIXED ASSETS | 8 | 42,13,39,991 | 32,94,71,459 |
| INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS | 9 | 15,09,107 | 7,79,999 |
| CURRENT ASSETS, LOANS AND ADVANCES | 11 | 23,76,30,946 | 31,16,46,586 |
| **TOTAL** | | **66,04,80,044** | **64,18,98,044** |
| SIGNIFICANT ACCOUNTING POLICIES | 24 | | |
| NOTES ON ACCOUNTS | 25 | | |

For **R. BALACHANDRAN & Co.,**
Chartered Accountants
Firm Reg. No. 000323s

CA. R. BALACHANDRAN
Proprietor. M.No. 026980

Place: Chennai
Date: 19·8·19

[E. GAYATRI]
ACCOUNTS OFFICER

[S. VISHNU PRASAD]
REGISTRAR

[V. ARVIND]
DIRECTOR

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# The Institute of Mathematical Sciences, Chennai

## Income and Expenditure Account for the year ended 31st March, 2019

(All amounts in Rs.)

| PARTICULARS | Schedule No. as per the Common Format of accounts | Current Year | Previous Year |
|---|---|---|---|
| **INCOME** | | | |
| Interest Earned | 17 | 2,43,378 | 7,07,348 |
| Other Income | 18 | 2,00,09,239 | 1,50,33,430 |
| Grant ± in ± Aid | 22 | 39,17,32,588 | 43,97,07,077 |
| **TOTAL (A)** | | 41,19,85,205 | 45,54,47,855 |
| **EXPENDITURE** | | | |
| Establishment Expenses | 20 | 27,59,77,575 | 26,80,93,857 |
| Other Administrative Expenses etc | 21 | 36,73,48,589 | 58,59,48,300 |
| Depreciation | | 7,01,91,033 | 6,47,48,031 |
| **TOTAL (B)** | | 71,35,17,197 | 91,87,90,188 |
| DEFICIT transferred to Capital Fund Account | | -30,15,31,992 | -46,33,42,333 |

[E. GAYATRI]
ACCOUNTS OFFICER

[S. VISHNU PRASAD]
REGISTRAR

[V. ARVIND]
DIRECTOR

For R. BALACHANDRAN & Co.,
Chartered Accountants
Firm Reg. No. 000323s

CA. R. BALACHANDRAN
Proprietor, M.No. 026980

Place : Chennai
Date: 19.8.19

# The Institute of Mathematical Sciences, Chennai

## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31-03-2019

(All amounts in Rs.)

| PARTICULARS | Current Year | | Previous Year |
|---|---|---|---|
| | | | |
| **SCHEDULE: 1 - CAPITAL FUND:** | | | |
| Balance as at the beginning of the year | -13,36,62,222 | | -13,36,62,222 |
| Add : Capital Expenditure incurred during the year | 10,20,62,315 | | |
| Add: Grant-in-Aid reserve as in Schedule no.13 | 2,76,05,097 | | |
| Less: Deficit transferred from I & E account for the year | -30,15,31,992 | -30,55,26,802 | -13,36,62,222 |
| **BALANCE AT THE YEAR END** | | -30,55,26,802 | -13,36,62,222 |

| PARTICULARS | Current Year | | | Previous Year |
|---|---|---|---|---|
| | Capital | Revenue | Total | Total |
| **SCHEDULE: 13 -GRANT-IN-AID RESERVE:** | | | | |
| D.A.E., Govt. of India | | | | |
| Balance as at the beginning of the year | 0 | 0 | 0 | 0 |
| Add : Grant received during the year | 6,41,00,000 | 45,73,00,000 | 52,14,00,000 | 62,49,00,000 |
| Less: Revenue Expenditure incurred during the year | -1,49,02,627 | -37,68,29,961 | -39,17,32,588 | -43,97,07,077 |
| Less: Capital Expenditure incurred during the year | -1,08,96,610 | -9,11,65,705 | -10,20,62,315 | -5,99,51,686 |
| **BALANCE AT THE YEAR END** | 3,83,00,763 | -1,06,95,666 | 2,76,05,097 | 12,52,41,237 |

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# The Institute of Mathematical Sciences, Chennai

## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31-03-2019

(All amounts in Rs.)

| Particulars | Name of the Fund | | | Current Year | Previous Year |
| --- | --- | --- | --- | --- | --- |
| | Apalat Trust Fund | Prof. Alladi Ramakrishnan Endowment Fund | Prof. Nag Memorial Fund | TOTAL | TOTAL |
| **SCHEDULE: 3 – EARMARKED/ENDOWMENT FUNDS** | | | | | |
| a) Opening balance of the funds | 7,18,189 | 75,294 | 5,69,655 | 13,63,138 | 13,56,283 |
| b) Additions to the Funds : | | | | | |
| i. Grants / Contributions | 0 | 0 | 0 | 0 | 0 |
| ii. Income from Investments / Savings Bank A/C | 1,02,610 | 10,733 | 95,643 | 2,08,986 | 57,166 |
| TOTAL (a+b) | 8,20,799 | 86,027 | 6,65,298 | 15,72,124 | 14,13,449 |
| c) Utilisation/Expenditure towards objectives of funds | | | | | |
| i. Revenue Expenditure | | | | | |
| - Scholarships / Awards. | 0 | 0 | 57,085 | 57,085 | 0 |
| - Other expenses | 0 | 0 | 0 | 0 | 50,311 |
| TOTAL (C) | 0 | 0 | 57,085 | 57,085 | 50,311 |
| NET BALANCE AS AT THE YEAR -END (a+b -c) | 8,20,799 | 86,027 | 6,08,213 | 15,15,039 | 13,63,138 |

# The Institute of Mathematical Sciences, Chennai
## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31-03-2019

*(All amount in Rs.)*

| Particulars | Current Year | Previous Year |
|---|---|---|
| **SCHEDULE 7 - CURRENT LIABILITIES AND PROVISIONS** | | |
| **A. CURRENT LIABILITIES** | | |
| 1. Sundry Creditors | 0 | 45,001 |
| 2. Received and Refundable for projects/conferences/programmes/schemes | 6,66,751 | 1,61,31,585 |
| 3. Statutory Liabilities: | | |
| a) Income Tax, Sales Tax & Prof. Tax | 67,033 | 2,725 |
| 4. Other Liabilities | 3,98,25,429 | 3,54,91,646 |
| **TOTAL (A)** | **4,05,59,213** | **5,16,70,957** |
| **B. PROVISIONS** | | |
| 1. Provision for Pension | 80,82,47,643 | 61,48,68,608 |
| 2. Provision for Gratuity | 5,18,23,114 | 4,88,45,087 |
| 3. Provision for Leave Encashment | 6,38,61,837 | 5,88,12,476 |
| **TOTAL (B)** | **92,39,32,594** | **72,25,26,171** |
| **TOTAL (A+B)** | **96,44,91,807** | **77,41,97,128** |

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# The Institute of Mathematical Sciences, Chennai
SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31-03-2019

(All amounts in Rs.)

SCHEDULE 8 - FIXED ASSETS (Capital)

| Description | GROSS BLOCK | | | | Rate under WDV method | DEPRECIATION | | | | NET BLOCK | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cost/valuation as at 01-04-18 | Additions during 2018-19 | Deductions during 2018-19 | Cost/Valuation as at 31-03-19 | | As at 01-04-18 | For the year 2018-19 | Deductions during 2018-19 | Total upto 31-03-19 | As at 31-03-19 | As at 31-03-18 |
| **A. FIXED ASSETS:** | | | | | | | | | | | |
| **1. LAND** | | | | | | | | | | | |
| a) Freehold | 65,26,500 | 0 | 0 | 65,26,500 | 0% | 0 | 0 | 0 | 0 | 65,26,500 | 65,26,500 |
| **2. BUILDING:** | | | | | | | | | | | |
| a) Office Buildings | 14,36,39,066 | 0 | 0 | 14,36,39,066 | 10% | 7,34,52,405 | 70,18,666 | 0 | 8,04,71,071 | 6,31,67,995 | 7,01,86,661 |
| b) Residential Buildings | 1,33,77,773 | 0 | 0 | 1,33,77,773 | 5% | 93,98,396 | 1,98,969 | 0 | 95,97,365 | 37,80,408 | 39,79,377 |
| 3. PLANT MACHINERY & EQUIPMENT | 6,87,82,233 | 0 | 0 | 6,87,82,233 | 15% | 4,07,48,498 | 42,05,060 | 0 | 4,49,53,558 | 2,38,28,675 | 2,80,33,735 |
| 4. VEHICLES | 10,800 | 0 | 0 | 10,800 | 15% | 9,906 | 134 | 0 | 10,040 | 760 | 894 |
| 5. FURNITURE, FIXTURES | 2,09,16,165 | 0 | 0 | 2,09,16,165 | 10% | 1,49,63,919 | 5,95,225 | 0 | 1,55,59,144 | 53,57,021 | 59,52,246 |
| 6. OFFICE EQUIPMENT | 48,93,595 | 0 | 0 | 48,93,595 | 15% | 28,46,582 | 3,07,052 | 0 | 31,53,634 | 17,39,961 | 20,47,013 |
| 7. COMPUTER/PERIPHERALS | 25,47,35,932 | 1,08,96,610 | 0 | 26,56,32,542 | 40% | 24,44,17,109 | 84,86,173 | 0 | 25,29,03,282 | 1,27,29,260 | 1,03,18,823 |
| 8. ELECTRIC INSTALATIONS | 4,02,48,827 | 0 | 0 | 4,02,48,827 | 10% | 2,80,48,608 | 12,20,022 | 0 | 2,92,68,630 | 1,09,80,197 | 1,22,00,219 |
| 9. BOOKS & JOURNALS | 3,61,11,773 | 0 | 0 | 3,61,11,773 | 25% | 3,43,72,887 | 4,34,722 | 0 | 3,48,07,609 | 13,04,164 | 17,38,886 |
| **TOTAL CURRENT YEAR** | 58,92,42,664 | 1,08,96,610 | 0 | 60,01,39,274 | | 44,82,58,310 | 2,24,66,023 | 0 | 47,07,24,333 | 12,94,14,941 | 14,09,84,354 |
| Previous year | 57,35,38,904 | 1,57,03,760 | 0 | 58,92,42,664 | | 41,68,67,020 | 3,13,91,290 | 0 | 44,82,58,310 | 0 | 14,09,84,354 |
| B. CAPITAL, WORK - IN - PROGRESS | | | | | | | | | | 0 | 0 |
| **TOTAL (Plan)** | | | | | | | | | | 12,94,14,941 | 14,09,84,354 |

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# The Institute of Mathematical Sciences, Chennai
## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31-03-2019

(All amounts in Rs.)

**SCHEDULE 8 - FIXED ASSETS(Revenue)**

| Description | GROSS BLOCK | | | | Rate under WDV method | DEPRECIATION | | | | NET BLOCK | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cost/valuation as at 01-04-18 | Additions during 2018-19 | Deductions during 2018-19 | Cost/Valuation as at 31-03-19 | | As at 01-04-18 | For the year 2018-19 | Deductions during 2018-19 | Total upto 31-03-19 | As at 31-03-19 | As at 31-03-18 |
| **A. FIXED ASSETS :** | | | | | | | | | | | |
| **1. LAND** | | | | | | | | | | | |
| a) Freehold | 1 | 0 | 0 | 1 | 0% | 0 | 0 | 0 | 0 | 1 | 1 |
| **2. BUILDING :** | | | | | | | | | | | |
| a) Office Buildings | 7,69,494 | 0 | 0 | 7,69,494 | 10% | 7,43,915 | 2,558 | 0 | 7,46,473 | 23,021 | 25,579 |
| b) Residential Buildings | 0 | 0 | 0 | 0 | 5% | 0 | 0 | 0 | 0 | 0 | 0 |
| 3. PLANT MACHINERY & EQUIPMENT | 44,79,778 | 0 | 0 | 44,79,778 | 15% | 31,71,448 | 1,96,250 | 0 | 33,67,698 | 11,12,080 | 13,08,330 |
| 4. VEHICLES | 19,36,771 | 0 | 0 | 19,36,771 | 15% | 17,43,529 | 28,986 | 0 | 17,72,515 | 1,64,256 | 1,93,242 |
| 5. FURNITURE, FIXTURES | 1,14,33,691 | 0 | 0 | 1,14,33,691 | 10% | 65,62,942 | 4,87,075 | 0 | 70,50,017 | 43,83,674 | 48,70,749 |
| 6. OFFICE EQUIPMENT | 19,51,752 | 76,493 | 0 | 20,28,245 | 15% | 16,43,979 | 57,640 | 0 | 17,01,619 | 3,26,626 | 3,07,773 |
| 7. COMPUTER/PERIPHERALS | 5,31,488 | 0 | 0 | 5,31,488 | 40% | 5,30,836 | 261 | 0 | 5,31,097 | 391 | 652 |
| 8. ELECTRIC INSTALATIONS | 65,20,369 | 14,96,632 | 0 | 80,17,001 | 10% | 44,12,695 | 3,60,431 | 0 | 47,73,126 | 32,43,875 | 21,07,674 |
| 9. BOOKS & JOURNALS* | 56,14,12,288 | 8,95,92,580 | 2,335 | 65,10,02,533 | 25% | 46,46,37,558 | 4,65,91,809 | 2,261 | 51,12,27,106 | 13,97,75,427 | 9,67,74,730 |
| 10. OTHER FIXED ASSETS | 2,80,550 | 0 | 0 | 2,80,550 | 0% | 0 | 0 | 0 | 0 | 2,80,550 | 2,80,550 |
| TOTAL CURRENT YEAR | 58,93,16,182 | 9,11,65,705 | 2,335 | 68,04,79,552 | | 48,34,46,902 | 4,77,25,010 | 2,261 | 53,11,69,651 | 14,93,09,901 | 10,58,69,280 |
| *PREVIOUS YEAR* | *54,50,71,150* | *4,42,47,926* | *2,894* | *58,93,16,182* | | *45,00,92,931* | *3,33,56,741* | *2,770* | *48,34,46,902* | | |
| B. CAPITAL WORK - IN - PROGRESS | | | | | | | | | | 14,26,15,149 | 8,26,17,825 |
| TOTAL (Non-Plan) | | | | | | | | | | 29,19,25,050 | 18,84,87,105 |
| **Total (Capital + Revenue)** | 1,17,85,58,846 | 10,20,62,315 | 2,335 | 1,28,06,18,826 | | 93,17,05,212 | 7,01,91,033 | 2,261 | 1,00,18,93,984 | 42,13,39,991 | 32,94,71,459 |

* An amount of Rs.67141172/- included under additions during the year 2018-19 towards procurement of online subscription of journals.

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# The Institute of Mathematical Sciences, Chennai

**SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31-03-2019**

(All amounts in Rs.)

| Particulars | Current Year | Previous Year |
|---|---|---|
| **SCHEDULE: 9-INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS** | | |
| 1. Apalat Fund | 8,22,962 | 7,05,985 |
| 2. Prof. Alladi Ramakrishnan Endowment Fund | 86,145 | 74,014 |
| 3. Prof. Subhahis Nag Memorial Fund | 6,00,000 | 0 |
| **TOTAL** | **15,09,107** | **7,79,999** |

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# The Institute of Mathematical Sciences, Chennai
## SCHEDULES FORMING PART OF BALANCE SHEET AS AT 31-03-2019

*(All amounts in Rs.)*

| Particulars | Current Year | Previous Year |
|---|---|---|
| **SCHEDULE: 11 - CURRENT ASSETS, LOANS, ADVANCES ETC.** | | |
| **A. CURRENT ASSETS:** | | |
| 1. Cash balances in hand (including cheques/drafts and imprest) | 66,893 | 69,966 |
| 2. Bank Balances : | | |
| a) With Scheduled Banks : | | |
| - On Current Accounts - Institute | 3,39,98,946 | 6,03,08,965 |
| - Projects/Schemes | 450 | 1,42,49,170 |
| **TOTAL (A)** | 3,40,66,289 | 7,46,28,101 |
| **B. LOANS, ADVANCES AND OTHER ASSETS** | | |
| 1. Advances and other amounts recoverable in cash or in kind or for value to be received : | | |
| a) On Capital Account: Advance to Contractors/ suppliers | 38,90,715 | 2,49,745 |
| b) Prepayments | 2,44,676 | 4,22,02,015 |
| c) Loans & Advances to Staff | 2,87,316 | 4,75,151 |
| d) Deposits | 18,94,95,336 | 18,94,64,606 |
| e) STD- LC Margin Money | 4,21,200 | 0 |
| 2. Income Accrued : | | |
| a) On Investments from Earmarked/Endowment Funds | 68,957 | 76,509 |
| b) On Loans and Advances | 1,98,497 | 3,78,511 |
| c) On EB Deposits | 3,92,624 | 3,92,624 |
| 3. Receivables - Project Accounts | 2,42,385 | 2,48,098 |
| - Others | 83,22,951 | 35,31,226 |
| **TOTAL (B)** | 20,35,64,657 | 23,70,18,485 |
| **TOTAL (A+B)** | 23,76,30,946 | 31,16,46,586 |
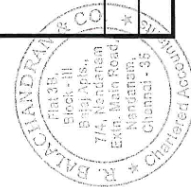
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# The Institute of Mathematical Sciences, Chennai

## SCHEDULES FORMING PART OF INCOME & EXPENDITURE FOR THE YEAR ENDED 31-03-2019

(All amounts in Rs.)

| Particulars | Current Year | | Previous Year | |
|---|---|---|---|---|
| | Plan | Non-Plan | Plan | Non-Plan |
| **SCHEDULE 22-GRANT-IN-AID** | | | | |
| 1) Grant-in-Aid from DAE | 1,49,02,627 | 37,68,29,961 | 1,74,91,687 | 42,22,15,390 |
| 3) Grant-in-Aid from Govt. of TN | 0 | 0 | 0 | 0 |
| TOTAL | 1,49,02,627 | 37,68,29,961 | 1,74,91,687 | 42,22,15,390 |

(All amounts in Rs.)

| Particulars | Current Year | Previous Year |
|---|---|---|
| **SCHEDULE 17-INTEREST EARNED** | | |
| 1) On Term Deposits | 0 | 2,57,986 |
| 2) On Advances to staff members | | |
| a) On HBA | 0 | 0 |
| b) On Car Advance | 0 | 517 |
| c) On Motor-Cycle Advance | 1,134 | 2,255 |
| d) On Personal Computer Advance | 264 | 949 |
| e) On LTC advances | 0 | 0 |
| 3) On Electricity Board Deposits | 2,41,980 | 4,45,641 |
| TOTAL | 2,43,378 | 7,07,348 |

(All amounts in Rs.)

| Particulars | Current Year | Previous Year |
|---|---|---|
| **SCHEDULE 18-OTHER INCOME** | | |
| 1) Consultancy fee | 0 | 0 |
| 1) CHSS Subscription | 26,77,444 | 18,19,543 |
| 2) Licence Fee | 1,53,835 | 1,70,416 |
| 3) Guest House Accommodation Charges | 24,25,939 | 16,92,920 |
| 4) Guest House Canteen Receipts | 86,83,858 | 84,01,650 |
| 5) Xeroxing Receipts | 6,181 | 6,218 |
| 6) Sale of Tender Forms | 44,500 | 1,09,950 |
| 7) Miscellaneous Receipts | 19,95,949 | 15,73,828 |
| 8) Profit on Sale of Old Items (Assets) | 2,261 | 3,72,961 |
| 9) Project Receipts against completed Projects | 0 | 0 |
| 10) CPF Management Contribution lapsed to Management | 40,19,272 | 8,85,944 |
| TOTAL | 2,00,09,239 | 1,50,33,430 |

# The Institute of Mathematical Sciences, Chennai

## SCHEDULES FORMING PART OF INCOME & EXPENDITURE FOR
## THE YEAR ENDED 31-03-2019

(All amounts in Rs.)

| Particulars | Current Year | | Previous Year | |
|---|---|---|---|---|
| | Plan | Non-Plan | Plan | Non-Plan |
| **SCHEDULE 20-ESTABLISHMENT EXPENSES** | | | | |
| 1) Pay & Allowances (Academic Staff) | 0 | 15,42,27,828 | 0 | 14,41,61,048 |
| 2) Post Doctoral Fellowship | 0 | 1,22,14,221 | 0 | 1,42,72,711 |
| 3) Junior Research Fellowship | 0 | 4,30,75,005 | 0 | 4,40,64,471 |
| 4) Pay & Allowances (Admin. Staff) | 92,13,391 | 4,15,29,157 | 86,75,515 | 3,77,08,274 |
| 5) Staff Welfare Expenses | 0 | 81,21,322 | 0 | 91,19,432 |
| 6) Employees Service / Retirement Benefits | 0 | 75,96,651 | 0 | 1,00,92,406 |
| **TOTAL** | 92,13,391 | 26,67,64,184 | 86,75,515 | 25,94,18,342 |

(All amounts in Rs.)

| Particulars | Current Year | | Previous Year | |
|---|---|---|---|---|
| | Plan | Non-Plan | Plan | Non-Plan |
| **SCHEDULE 21 ± OTHER ADMINISTRATIVE EXPENSES** | | | | |
| 1) Visiting Scientist Programme Expenses | 18,14,086 | 66,40,489 | 9,46,483 | 54,59,906 |
| 2) Summer Student Programme Expenses | 0 | 6,55,223 | 0 | 4,44,185 |
| 3) Conferences / Symposia / Workshop Expenses | 7,13,179 | 24,60,466 | 42,68,245 | 15,51,572 |
| 4) Contribution paid to other Institutions / Agencies | 4,10,000 | 10,44,000 | 4,54,289 | 11,51,656 |
| 5) Participation in Conferences | 14,05,892 | 63,61,613 | 18,04,837 | 39,48,383 |
| 6) Internet Connectivity Charges | 0 | 5,13,853 | 0 | 4,87,567 |
| 7) Online Journals, Newspapers & Magazines [Library] | 2,98,954 | 0 | 0 | 71,73,515 |
| 8) SETS - IMSC Center for Crypt Analysis | 0 | 0 | 0 | 0 |
| 8) Travel Expenses | 1,05,999 | 48,02,516 | 1,19,447 | 42,72,782 |
| 9) Rent, Rates & Taxes | 0 | 3,59,178 | 0 | 6,92,374 |
| 10) Electricity Charges | 0 | 2,50,09,287 | 0 | 2,14,00,886 |
| 11) Water Charges | 0 | 27,55,967 | 0 | 37,76,718 |
| 12) Printing & Stationery | 4,341 | 10,03,206 | 68,052 | 7,36,712 |
| 13) Postages | 8,42,157 | 1,97,399 | 0 | 1,51,760 |
| 14) Telephone Charges | 0 | 11,17,175 | 0 | 12,00,133 |
| **C/F** | 55,94,608 | 5,29,20,372 | 76,61,353 | 5,24,48,149 |

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# The Institute of Mathematical Sciences, Chennai

## SCHEDULES FORMING PART OF INCOME & EXPENDITURE FOR
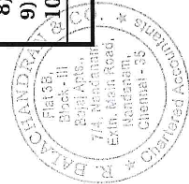### THE YEAR ENDED 31-03-2019

(All amounts in Rs.)
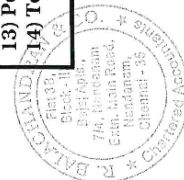
| Particulars | Current Year | | | Previous Year | | |
|---|---|---|---|---|---|---|
| | Plan | Non-Plan | | Plan | Non-Plan | |
| SCHEDULE 21 – OTHER ADMINISTRATIVE EXPENSES Contd¼ | | | | | | |
| B/F | 55,94,608 | 5,29,20,372 | | 76,61,353 | 5,24,48,149 | |
| 15) Security Services | 0 | 1,19,79,563 | | 0 | 1,09,83,250 | |
| 16) Advertisement Charges | 0 | 28,02,171 | | 0 | 20,53,245 | |
| 17) Entertainment & Hospitality Charges | 0 | 13,69,214 | | 0 | 9,97,269 | |
| 18) Catering Expenses | 0 | 97,42,664 | | 0 | 94,87,896 | |
| 19) Guest House/Hostel Maintenance | 0 | 33,30,140 | | 0 | 29,21,696 | |
| 20) Audit Fees | 0 | 88,500 | | 0 | 2,20,390 | |
| 21) Actuarial/Legal Fees | 0 | 29396 | | 0 | 38,940 | |
| 22) Consultancy charges | 0 | 0 | | 0 | 0 | |
| 22) Bank Charges | 0 | 6,770 | | 0 | 8,150 | |
| 24) Repairs & Maintenance | 57,545 | 2,67,27,401 | | 8,46,297 | 2,14,14,388 | |
| 25) Contingent & Miscellaneous Expenses | 37,083 | 10,69,586 | | 3,08,522 | 4,68,961 | |
| 27) Loss on Sale of Assets/Sale of Old Items | 0 | 0 | | 0 | 0 | |
| 28) Projects Payments against completed Projects | 0 | 0 | | 0 | 0 | |
| 29) Publication Charges | 0 | 0 | | 0 | 0 | |
| 26) Prior Period Expenditure | 0 | 0 | | 0 | 6,17,54,714 | |
| 27) Provision for Pension | 0 | 22,59,38,299 | | 0 | 36,78,82,001 | |
| 28) Provision for Gratuity | 0 | 1,16,21,576 | | 0 | 2,64,47,909 | |
| 29) Provision for Leave Encashment | 0 | 1,40,33,701 | | 0 | 2,00,05,170 | |
| TOTAL | 56,89,236 | 36,16,59,353 | | 88,16,172 | 57,71,32,128 | |

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# The Institute of Mathematical Sciences, Chennai

SCHEDULES FORMING PART OF THE ACCOUNTS FOR

THE PERIOD ENDED 31-03-2019

SCHEDULE 24 - SIGNIFICANT ACCOUNTING POLICIES

## 1. ACCOUNTING CONVENTION

The financial statements are prepared on the basis of historical cost convention, unless Otherwise Stated and on the accrual method of Accounting.

## 2. FIXED ASSETS

2.1 Fixed Assets of the Institute are acquired out of grants from the Government of India. Funds utilized for acquisition of assets are shown under Capital Fund.

2.2 Fixed Assets are stated at cost of acquisition inclusive of inward freight, duties and taxes and incidental and direct expenses related to Acquisition.

2.3 Value of assets assigned to the Institute free of cost by Tamil Nadu Government (6.5 acres of land) brought into books of accounts with a Nominal value of Re.1/-

2.4 Books & Periodicals include online journals also.

## 3. DEPRECIATION

3.1 Depreciation is provided on written down value method as per rates specified in the Income Tax Act, 1961 except Library Books and Journals includes online Journals which are depreciated @ 25%.

3.2 No Depreciation is charged to Prof.Chandrasekar's Bust shown under Fixed Assets at a cost of Rs.2,80,550/- as it is similar to archaeological Item.

3.3 Depreciation has been charged for the full year on addition made during the Year.

## 4. INVENTORIES

Consumables, stationery etc. are charged off to the Revenue in the year of Purchase.

## 5. INVESTMENTS

5.1 Investments are valued at cost. Income on investments are accounted on accrual Basis.

5.2 Term Deposits with Banks are classified under Current Assets if the duration of the deposits is less than one year and under Investments if the duration is more than one year.
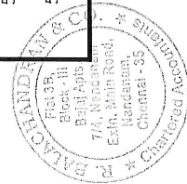
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# The Institute of Mathematical Sciences, Chennai

**SCHEDULES FORMING PART OF THE ACCOUNTS FOR**
**THE PERIOD ENDED 31-03-2019**

## SCHEDULE 24 – SIGNIFICANT ACCOUNTING POLICIES contd...

### 6. GOVERNMENT GRANTS/SUBSIDIES

Recurring (Revenue) and Non Recurring (Capital) grants received from DAE, Govt. of India and Recurring (Non-Plan) Grants received from Government of Tamil Nadu have Been treated as follows:

6.1 The grants are accounted for on realization basis.

6.2 That portion of Plan and Non Plan Funds utilized for Revenue Expenditure is taken to Income & Expenditure account as Income.

6.3 That portion of Plan and Non Plan Funds utilized for Capital Expenditure is treated as Capital Fund.

6.4 The balance available under Plan & Non Plan Grants is exhibited as carried forward balance in the Liabilities side of the Balance Sheet.

### 7. PROJECTS / SCHEMES

The amount received in respect of Externally Funded Projects are kept under separate individual savings bank accounts from the year 2018-19 onwards. Seperate Receipts and Payments are also prepared for individual project wise. As the fund releasing agencies insisted for interest to be Earned and to be shown separately in the statements.

### 8. FOREIGN CURRENCY TRANSACTIONS

Transactions involving in foreign currencies are accounted at the exchange rate prevailing on the date of transaction. The Foreign currency assets and liabilities are restated at exchange rates prevailing at the end of the year and the resultant gain or loss is recognised in the Income and Expenditure Account.

### 9. RETIREMENT BENEFITS.

Provision for Pension, Gratuity and Leave Encashment wherever applicable made are provided on actuarial valuation as at each year end. Since the retirement benefit are paid every year, no separate fund is maintained for this specific purpose.

For BALACHANDRAN & CO.,
Chartered Accountants
Firm Reg. No. 0003235

CA. R. BALACHANDRAN
Proprietor M.No 024980

| [E. GAYATRI] | [S. VISHNU PRASAD] | [V. ARVIND] |
| ACCOUNTS OFFICER | REGISTRAR | DIRECTOR |

Place : Chennai
Date: 19.8.19

# The Institute of Mathematical Sciences, Chennai

## SCHEDULES FORMING PART OF THE ACCOUNTS FOR
## THE PERIOD ENDED 31-03-2019

## SCHEDULE 25 - NOTES ON ACCOUNTS

### 1. CURRENT ASSETS, LOANS AND ADVANCES

The current assets, loans and advances have a value on realization in the ordinary course equal to the aggregate amount shown in the Balance Sheet.

### 2. ASSETS PROCURED OUT OF PROJECT FUNDS

The amount received in respect of Externally Funded Projects are kept under separate individual savings bank accounts from the year 2018-19 onwards. Seperate Consolidated statement of Receipts and Payments are also prepared for individual project wise as the fund releasing agencies insisted for interest to be Earned and to be shown separately in the statements.

### 3. No Grant in aid received from Government of Tamil Nadu during the year 2018-19

### 4. CONFIRMATION OF BALANCES

The balances under Sundry Creditors, Advances and Deposits are subject to Confirmation. Physical Verification of fixed assets is being carried out by the Institute during the year and reconciliation of physical balance and book balance report is pending.

### 5. Corresponding opening figures of accounts have been regrouped and rearranged wherever necessary and amount in rupees has been rounded off To the nearest integer.

### 6. Schedules 1,3,7,8,9,11,13,17,18,20,21 and 22 are annexed to and form an integral part of the Balance Sheet as at 31.3.2019 and the Income and Expenditure Account for the Year Ended on that date.

### 7. During the year 2017-18 we have adjusted all the payments during the previous years 2002-03 to 2016-17 made towards Pension , Encashment of EL and Gratuity amounting to Rs.17,07,20,689/- Against the provision already made and adjusted the capital fund

### 8. Physical Verification of Library Books was carried out by the Institute during the year 2016-17 and reconciliation of physical balance and book balance was done during 2016-17 and the value of missing books was written off as per the procedures during 2016-17. Since this process is being done once in 3 years, during 2018-19 physical Verification was not carried out.

# The Institute of Mathematical Sciences, Chennai

## SCHEDULES FORMING PART OF THE ACCOUNTS FOR
### THE PERIOD ENDED 31-03-2019

**SCHEDULE 25 – NOTES ON ACCOUNTS contd....**

9. Provision for Pension, Gratuity & Leave Encashment was calculated through Actuarial Valuation which worked out to Rs.25.16 crores as per AS15.

10. As per the common format of accounts as envisaged by Ministry of Finance, Controller General of Accounts endorsed by DAE, this Institute is Following the common format of accounts in respect of Central Autonomous Bodies, the Schedules have been re-numbered this year and Schedule Nos.2,4,5,6,10,12,14,15,16,19 & 23 which have no transaction are Treated as "NOT APPLICABLE".

11. Goods and Services Tax we are awaiting the guidance from the Department about applicability of autonomous institutions in the purview of GST.

12. Since IMSc is registered as a Society under Society's Registration Act of TN 1860, submission of every year's annual report & Balance Sheet along With necessary documents is under process.

13. Actuarial valuation for Provision for retirement benefits like Pension, Gratuity and Encashment of EL has been made by M/s. Mithra Consultants, Delhi amounting to Rs.25,15,93,576/-. Retirement benefits actually paid during this year 2017-18 have been properly accounted for while arriving the above said amount.

14. Separate bank account is being maintained for Provident Fund account in the name of "Director, The Institute of Mathematical Sciences ".However no separate PAN no is available for the particular PF a/c. As PAN No. is common for IMSc, TDS deducted on PF deposits also reflected in 26AS of IMSc a/c.

15. Schedule No.13 Grant -in-aid account has been clubed with Schedule no.01 of Capital Fund a/c from the Financial Year 2017-18 and also we are Regrouped the Grant-in-aid A/c

16. Temporary advances paid to staff members to be sqared of at the earliest. However here to tune of Rs.1,19,400/- pending long period.

17. Prime Ministers Relief Fund recovered from the staffs was pending for remittance to the Department (DAE, Mumbai)

18. Reconciliation of Guest House Canteen Receipts & RFID details between Software and Registers is pending for the FY 2018-19. Due to Technical Issues in the Software.

For R. BALACHANDRAN & Co.,
Chartered Accountants
Firm Reg. No. 000323s

CA. R. BALACHANDRAN
Proprietor. M.No. 026980

| [E. GAYATRI] | [S. VISHNU PRASAD] | [V. ARVIND] |
| ACCOUNTS OFFICER | REGISTRAR | DIRECTOR |

Place : Chennai
Date: 17|8|19

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# The Institute of Mathematical Sciences, Chennai

### Receipts and Payments for the year ended 31 March, 2019

(All amounts in Rs.)

## RECEIPTS

| Particulars | Current Year | Previous Year |
|---|---|---|
| **I. OPENING BALANCE:** | | |
| a) Cash Balances | 65,316 | 56,367 |
| b) Bank Balances | | |
| (i) Current Accounts | | |
| SBI, Adyar - Revenue a/c | 3,45,73,086 | 8,52,83,866 |
| SBI, Adyar - Capital a/c | 2,56,62,675 | 1,83,41,373 |
| BOI, Adyar - Project a/c | 450 | 1,80,83,461 |
| BOI, Adyar | 63,352 | 63,352 |
| SBI Online A/c | 9,851 | 10,500 |
| (ii) Term Deposits | | |
| Term Deposits - Earmarked Funds | 0 | 0 |
| **II. Project / Programme / Scheme Receipts** | 1,15,443 | 1,46,69,528 |
| **III. Grants Received** | | |
| a) From DAE, Govt. of India (Capital) | 6,41,00,000 | 15,99,00,000 |
| b) From DAE, Govt. of India (Revenue) | 45,73,00,000 | 46,50,00,000 |
| **IV. Interest Received** | | |
| a) On Bank Deposits | 0 | 2,51,839 |
| b) On Advances to Employees | 0 | 0 |
| c) On Earmarked Fund Investments | 0 | 0 |
| **V. Other Income** | | |
| a) CHSS Subscription | 10,20,940 | 3,22,611 |
| b) Licence Fee | 1,920 | 5,572 |
| c) Guest House Accommodation charges | 11,62,689 | 8,14,220 |
| d) Guest House/ Canteen Receipts | 33,44,182 | 40,72,013 |
| e) Xeroxing Receipts | 6,181 | 6,218 |
| f) Miscellaneous Receipts | 17,19,049 | 15,18,352 |
| **VI. Other receipts** | 7,09,30,141 | 2,99,84,934 |
| **TOTAL** | 66,00,75,276 | 79,83,84,206 |

## PAYMENTS

| Particulars | Current Year | Previous Year |
|---|---|---|
| **I. Expenses** | | |
| a) Establishment Expenses | 6,56,52,493 | 6,78,26,117 |
| b) Research & Academic Activity Expenses | 3,59,16,593 | 4,86,32,939 |
| c) Administrative expenses | 11,05,56,855 | 8,69,38,735 |
| **II. Earmarked Fund related expenditures** | 0 | 0 |
| **III. Payments made against funds for various Projects/Programmes/Scheme** | 1,15,443 | 1,77,53,858 |
| **IV. Plan Expenditure (Revenue & Capital)** | 8,98,75,065 | 10,07,00,061 |
| **V. Other Payments** | 32,34,71,338 | 40,18,75,473 |
| **VI. CLOSING BALANCE:** | | |
| a) Cash Balances | 66,893 | 69,966 |
| b) Bank Balances | | |
| (i) Current Accounts | | |
| SBI, Adyar - Revenue a/c | 2,70,33,641 | 3,45,73,086 |
| SBI, Adyar - Capital a/c | 68,052 | 2,56,63,035 |
| BOI, Adyar - Project a/c | 450 | 1,42,49,171 |
| BOI, Adyar | 68,49,228 | 63,353 |
| SBI Online A/c | 48,024 | 9,851 |
| (ii) Term Deposits | | |
| Term Deposits - Earmarked Funds | 0 | 28,561 |
| Term Deposits – LC Margin Money | 4,21,200 | 0 |
| **TOTAL** | 66,00,75,276 | 79,83,84,206 |

## The Institute of Mathematical Sciences, Chennai
### Provident Fund and New Pension Scheme Account
BALANCE SHEET AS AT 31ST MARCH, 2019

(Amount in Rs.)

| LIABILITIES | | Current year | Previous Year |
|---|---|---|---|
| **MEMBERS ACCOUNT** | | | |
| **I) Provident Fund Account:** | | | |
| Opening Balance | 11,03,35,189 | | |
| Add: - Sub/Transfer/Refunds | 2,59,92,030 | | |
| - Interest Credited | 83,48,479 | | |
| | 14,46,75,698 | | |
| Less: Adv/Withdrawals/Transfer | 3,92,19,151 | | |
| Closing Balance | 10,54,56,547 | 10,96,96,197 | 11,38,28,833 |
| **II) New Pension Scheme Account:** | | | |
| Opening Balance | 34,93,642 | | |
| Add: - Sub/Transfer/Refunds | 4,55,122 | | |
| - Interest Credited | 2,90,886 | | |
| | 42,39,650 | | |
| Less: Adv/Withdrawals/Transfer | - | | |
| Closing Balance | 42,39,650 | | |
| **SURPLUS / DEFICIT ACCOUNT** | | | |
| **PF account :-** | | | |
| Surplus as per previous year | 83,32,554 | | |
| Less : Deficit transferred from income and Expenditure account | -5,71,415 | 77,61,139 | 83,32,554 |
| **NPS account :-** | | | |
| Surplus as per previous year | 1,71,541 | | |
| Less: Deficit transferred from Income And Expenditure a/c | -96,835 | 74,706 | 1,71,541 |
| **Total** | | 11,75,32,042 | 12,23,32,928 |

| ASSETS | | Current year | Previous Year |
|---|---|---|---|
| **BANK BALANCE** | | | |
| SB A/C, Adyar Branch - PF A/c | 2,10,147 | | |
| SB A/C, Adyar Branch – NPS A/c | 18,920 | 2,29,067 | 20,85,918 |
| **INVESTMENTS - PF A/c** | | | |
| With Banks | 10,41,17,374 | 10,41,17,374 | 10,58,05,889 |
| **INVESTMENTS – NPS A/c** | | | |
| With Banks | 40,99,655 | 40,99,655 | 33,64,691 |
| **INTEREST ACCRUED BUT NOT RECEIVED ON** | | | |
| --- PF a/c | 88,90,165 | | |
| --- NPS a/c | 1,95,781 | 90,85,946 | 1,10,76,430 |
| **Total** | | 11,75,32,042 | 12,23,32,928 |

For R. BALACHANDRAN & Co.,
Chartered Accountants
Firm Reg. No. 0003235

CA. R. BALACHANDRAN
Proprietor, M.No. 026980

Place : Chennai
Date :

[GAYATRI E]
ACCOUNTS OFFICER

[S VISHNU PRASAD ]
REGISTRAR

[V ARVIND]
DIRECTOR

The Institute of Mathematical Sciences, Chennai

Provident Fund and New Pension Scheme Account

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH,2019

(Amount in Rs.)

| EXPENDITURE | Current Year | | Previous Year | INCOME | Current year | | Previous Year |
|---|---|---|---|---|---|---|---|
| To INTEREST | | | | By INTEREST | | | |
| - Credited to PF members | 83,48,479 | | | - Savings Bank Account - PF A/c | 3,35,499 | | |
| - Credited to NPS members | 2,90,886 | 86,39,365 | 78,35,025 | - Savings Bank Account – NPS A/c | 10,227 | 3,45,726 | 2,37,697 |
| | | | | - Earned and accured on Invesments PF a/c | 74,41,565 | | |
| To Record Keeping Charges | | 6,806 | 7,165 | - Earned and accured on Invesments NPS a/c | 1,90,630 | 76,32,195 | 1,13,35,996 |
| To Deficit trfd.to Balance Sheet (PF a/c) | | -5,71,415 | 36,64,964 | | | | |
| To Deficit trfd.to Balance Sheet (NPS a/c) | | -96,835 | 66,539 | | | | |
| Total | | 79,77,921 | 1,15,73,693 | Total | | 79,77,921 | 1,15,73,693 |

For R. BALACHANDRAN & Co.,
Chartered Accountants
Firm Reg. No. 000323s

CA. R. BALACHANDRAN
Proprietor. M.No. 026980

Place: Chennai
Date:

[GAYATRI E]
ACCOUNTS OFFICER

[S VISHNU PRASAD ]
REGISTRAR

[V ARVIND]
DIRECTOR

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## The Institute of Mathematical Sciences, Chennai
### Provident Fund and New Pension Scheme Account
RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR ENDED 31ST MARCH,2019

(Amount in Rs.)

### RECEIPTS

| RECEIPTS | Current year | Current year | Previous Year |
|---|---:|---:|---:|
| **OPENING BALANCE** | | | |
| **Provident Fund A/c** | | | |
| SBI, Adyar, SB A/C | | 20,64,513 | 35,06,354 |
| Investments | | 9,09,54,102 | 8,14,54,102 |
| **New Pension Scheme A/c** | | | |
| SBI, Adyar, SB A/C | | 21,405 | 1,38,577 |
| Investments | | 32,75,970 | 26,36,351 |
| **MEMBERS SUBSCRIPTION** | | | |
| **Provident Fund A/c** | | | |
| - CPF/GPF Members | 1,46,09,340 | | 2,01,20,181 |
| - Loans/withdrawals Refunded | 0 | 1,46,09,340 | |
| **New Pension Scheme A/c** | | | |
| - NPS Members | 58,60,636 | 58,60,636 | 59,14,339 |
| **MANAGEMENT CONTRIBUTION** | | | |
| **Provident Fund A/c** | | | |
| - CPF Members | 8,54,160 | 8,54,160 | 20,16,228 |
| **New Pension Scheme A/c** | | | |
| - NPS Members | 58,60,636 | 58,60,636 | 59,14,339 |
| **INTEREST RECEIVED ON** | | | |
| **Provident Fund A/c** | | | |
| Savings Bank Account - PF | 3,35,499 | | |
| Investments - PF | 12,51,647 | 15,87,146 | 2,10,274 |
| **New Pension Scheme A/c** | | | |
| Savings Bank Account | 10,227 | 10,227 | 32,460 |
| Investments | 0 | 0 | - |
| **Total** | | **12,50,98,135** | **12,19,43,205** |

### PAYMENTS

| PAYMENTS | Current year | Current year | Previous Year |
|---|---:|---:|---:|
| **PAYMENTS TO MEMBERS** | | | |
| Settlement on Termination of Service | 2,23,65,389 | | |
| Amount Withdrawn by members | 13,18,670 | | |
| Refundable Advances | 9,87,290 | 2,46,71,349 | 1,34,02,580 |
| **TRANSFERRED TO NPS** | | | |
| **TRUSTEE ACCOUNT** | | | |
| - Members | 1,12,72,056 | | |
| - Interest Credited to Members | 0 | 1,12,72,056 | 1,13,31,526 |
| Record Keeping charges (NPS) | | 6,806 | 7,165 |
| **EMPLOYER'S CPF CONTRI.** | | | |
| **REFUNDED** | | | |
| - IMSc Account | 40,19,272 | 40,19,272 | 8,85,944 |
| **CLOSING BALANCE** | | | |
| **Provident Fund A/c** | | | |
| - SBI, Adyar | 2,10,147 | 2,10,147 | 20,64,513 |
| - Investments | 8,11,68,493 | 8,11,68,493 | 9,09,54,102 |
| **New Pension Scheme A/c** | | | |
| - SBI, Adyar | 18,920 | | |
| - Investments | 37,31,092 | 37,50,012 | 32,97,375 |
| **Total** | | **12,50,98,135** | **12,19,43,205** |

For R. B. I. CHANDRAN & Co.,
Chartered Accountants
Firm Reg. No. 0003235

CA. R. BALACHANDRAN
Proprietor, M.No. 026980

Place : Chennai
Date :

[GAYATRI E]
ACCOUNTS OFFICER

[S VISHNU PRASAD]
REGISTRAR

[V ARVIND]
DIRECTOR

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# The Institute of Mathematical Sciences, Chennai

## Consolidated statement of External Projects Receipts and Payments for the year ended 31 March, 2019

**RECEIPTS**

| Sl. | NAME OF THE PROJECT | On Savings Bank a/c Rs. | on Current Account Rs. | Grant-in-Aid Rs. | Investment Made Rs. | Registration Fees Rs. | Advance Received Rs. | Interest On FD a/c Rs. | Interest On SB a/c Rs. | TOTAL Rs. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | DAE – SRC Outstanding Investigator Awards SCH. Prof Ronojoy Adhikari | 26,84,700 | 0 | 23,50,000 | 50,00,000 | 0 | 0 | 70,591 | 87,522 | 1,01,92,813 |
| 2 | DST – SERB DISTINGUISHED FELLOWSHIP – PROF G BASKARAN | 27,531 | 20,340 | 20,00,000 | 0 | 0 | 0 | 0 | 8,266 | 20,56,137 |
| 3 | DST – SERB DISTINGUISHED FELLOWSHIP – PROF R SIMON | 19,958 | 1,500 | 28,20,000 | 0 | 0 | 0 | 0 | 324 | 28,41,782 |
| 4 | DST – STARTUP GRANT NEXT GENERATION METABOLIC DR AREEJIT SAMAL | 1,69,068 | 0 | 4,00,000 | 0 | 0 | 0 | 0 | 5,797 | 5,74,865 |
| 5 | DST – J C BOSE FELLOWSHIP PROF V S SUNDER | 7,19,568 | 0 | 7,00,000 | 0 | 0 | 0 | 10,524 | 10,889 | 14,40,981 |
| 6 | DST – J C BOSE FELLOWSHIP PROF ROMESH K KAUL | 13,36,410 | 0 | 0 | 0 | 0 | 0 | 0 | 22,330 | 13,58,740 |
| 7 | DST – SWARNAJAYANTHI FELLOWSHIP DR AMRITANSHUPRASAD | 1,65,981 | 61,400 | 7,00,000 | 0 | 0 | 0 | 0 | 4,208 | 9,31,589 |
| 8 | DST – SWARNAJAYANTHI FELLOWSHIP DR PARTHASARATHI CHAKRABORTY | 2,20,609 | 25,000 | 0 | 0 | 0 | 0 | 0 | 3,280 | 2,48,889 |
| 9 | GOOGLE INC AWARD DR RONOJOY ADHIKARI | 4,22,693 | 0 | 0 | 4,00,000 | 0 | 0 | 6,015 | 7,163 | 8,35,871 |
| 10 | IFCPAR MOD SOFT MIC PROF PINAKI HCAUDHURI | 5,91,509 | 5,671 | 7,00,384 | 4,00,000 | 0 | 0 | 5,648 | 7,204 | 17,10,416 |
| 11 | IFCPAR SUMS OF THE PROF PROF R BALASUBRAMANIAN | 34,555 | 0 | 31,612 | 0 | 0 | 0 | 0 | 687 | 66,854 |
| 12 | ITRA De-Congesting India's trans. networks using Mobile devices – Prof Sitabhra Sinha | 74,488 | 32,500 | 2,22,083 | 0 | 0 | 0 | 0 | 2,240 | 3,31,311 |
| 13 | JAWHARLAL NEHRU FELLOWSHIP PROF S R S VARDHAN | 25,50,823 | 0 | 0 | 4,00,000 | 0 | 0 | 35,297 | 43,528 | 30,29,648 |
| 14 | Max Planck Partner Group – IMSC- DR AREEJIT SAMAL | 13,97,327 | 32,650 | 16,14,545 | 0 | 0 | 0 | 14,116 | 17,426 | 30,76,064 |
| 15 | NNMCB VIDEO RECORDING – PROF SITABHRA SINHA | 1,34,610 | 30,000 | 0 | 0 | 0 | 0 | 0 | 3,607 | 1,68,217 |
| 16 | SERB – RAMANUJAN FELLOWSHIP – DR AREEJIT SAMAL | 66,312 | 46,800 | 7,00,000 | 0 | 0 | 0 | 0 | 6,224 | 8,19,336 |
| 17 | SERB – RAMANUJAN FELLOWSHIP – DR C M CHANDRASHEKAR | 3,21,501 | 20,800 | 7,60,000 | 0 | 0 | 0 | 904 | 7,570 | 11,10,775 |
| 18 | TPSC | 1,477 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 1,516 |
| 19 | NSA SRINIVASAN RAMANUJAN RESEARCH PROF R BALASUBRAMANIAN | 7,92,385 | 0 | 23,29,805 | 0 | 0 | 0 | 5,019 | 6,058 | 31,33,267 |
| 20 | NBHM SOUTHERN REGIONAL LIBRARY MEETING PROF K N RAGHAVAN | 4,75,029 | 0 | 0 | 0 | 0 | 0 | 6,634 | 7,993 | 4,89,656 |
| 21 | DST SERB NATIONAL FELLOWSHIP DR PALLAVI JAIN – N PDF | 1,09,667 | 0 | 10,96,538 | 0 | 0 | 0 | 0 | 7,236 | 12,13,441 |
| 22 | DST SERB NATIONAL FELLOWSHIP DR SHRADDHA SRIVASTAVA – N PDF | 1,93,503 | 0 | 11,20,137 | 0 | 0 | 0 | 0 | 16,265 | 13,29,905 |
| 23 | INDO GERMAN MAX PLANCK TRAVEL GRANT PROF AREEJIT SAMAL | 18,131 | 0 | 56,869 | 0 | 0 | 0 | 0 | 240 | 75,240 |
| 24 | WATERLOO ALGORITHAMS COOL PROF C M CHANDRASHEKAR | 4,04,165 | 0 | 4,21,997 | 0 | 0 | 0 | 4,509 | 6,776 | 8,37,448 |
| 25 | INDO – ITALIAN PRE. PHY LHC V RAVINDRAN | 3,60,000 | 0 | 0 | 0 | 0 | 0 | 4,509 | 5,858 | 3,70,367 |
| 26 | NCM TEW WORKSHOPS | 0 | 0 | 7,89,000 | 0 | 0 | 0 | 0 | 2,617 | 7,91,617 |
| 27 | DST PRECISION THEORY LARGE COLL, PROV V RAVINDRAN | 0 | 0 | 9,49,000 | 0 | 0 | 0 | 0 | 18,441 | 9,67,441 |
| 28 | SERB – Explicit formulas for a class of general L functions Dr K Srinivas | 0 | 0 | 2,20,000 | 0 | 0 | 0 | 0 | 4,105 | 2,24,105 |
| 29 | SERB – Lagrangian floer Theory - Dr Sushmita Venugopalan | 0 | 0 | 2,20,000 | 0 | 0 | 0 | 0 | 4,628 | 2,24,628 |
| 30 | SERB GO -GE. ET GR. AND AP TO HR IN THE PROF INDRAVA ROY | 0 | 0 | 2,20,000 | 0 | 0 | 0 | 0 | 4,628 | 2,24,628 |
| 31 | DBT – Mechanobiology of cell adhesion and cytoskeleton under dynamic Dr G I Menon | 0 | 0 | 7,34,000 | 0 | 0 | 0 | 0 | 15,443 | 7,49,443 |
| 32 | DAE – RAJA RAMANNA FELLOWSHIP – PROF ROMESH K KAUL | 0 | 0 | 13,50,000 | 0 | 0 | 0 | 0 | 12,895 | 13,62,895 |
| 33 | DST JC BOSE FELLOWSHIP PROF R BALASUBRAMANIAN | 0 | 0 | 19,00,000 | 0 | 0 | 0 | 0 | 27,190 | 19,27,190 |
| 34 | INDIA I EMBO SYM. REG., EL PROF RAHUL SIDDHARTHAN | 0 | 0 | 31,30,157 | 0 | 1,69,000 | 17,00,000 | 0 | 17,361 | 50,16,518 |
| 35 | SERB-VAJRA FACULTY SCHEME PROF C M CHANDRASHEKAR | 0 | 0 | 13,06,500 | 0 | 0 | 0 | 0 | 3,943 | 13,10,443 |
| 36 | DAE – VIGYAN PRATIBHA | 0 | 0 | 1,00,00,000 | 0 | 0 | 0 | 0 | 12,055 | 1,00,12,055 |
| 37 | Women Scientist Scheme A (WOS-A) fellowship to Dr Arpita Choudhary | 0 | 0 | 8,30,000 | 0 | 0 | 0 | 0 | 0 | 8,30,000 |
| 38 | SERB RAMANUJA N FELLOWSHIP – DR SAYANTAN SHARMA | 0 | 0 | 7,60,000 | 0 | 0 | 0 | 0 | 0 | 7,60,000 |
| 39 | SERB TARE PRUECT DR SUNITHA V – DR AREEJIT SAMAL | 0 | 0 | 3,35,000 | 0 | 0 | 0 | 0 | 0 | 3,35,000 |
| 40 | SERB GSC GAME THEORY DR SITABHRA SINHA | 0 | 0 | 2,20,000 | 0 | 0 | 0 | 0 | 0 | 2,20,000 |
| 41 | SERB AF COEFFICIENTS M FORM.. DR SANOLI GUN | 0 | 0 | 2,20,000 | 0 | 0 | 0 | 0 | 0 | 2,20,000 |
| 42 | SERB TARE PROJECT DR SWAPAN KUMAR MAJHI – DR V RAVINDRAN | 0 | 0 | 3,35,000 | 0 | 0 | 0 | 0 | 0 | 3,35,000 |
| | | 1,32,92,000.88 | 27,66,661 | 4,15,42,627.46 | 62,00,000 | 1,69,000 | 17,00,000 | 1,63,766 | 4,12,036 | 6,37,56,091.34 |

[GAYATRI E.] ACCOUNTS OFFICER

[S. VISHNU PRASAD] REGISTRAR

[V. ARVIND] DIRECTOR

CA. R. BALACHANDRAN
Proprietor, M.No. 026980
CHARTERED ACCOUNTANT
Firm Reg. No. 000325

Place: Chennai
Date: 14.8.19

# The Institute of Mathematical Sciences, Chennai

## Consolidated statement of External Projects Receipts and Payments for the year ended 31 March, 2019

| Sl. | NAME OF THE PROJECT | Revenue Expenditure (Rs.) | Investment Made (Rs.) | Capital Expenditure (Rs.) | Refund of Unspent Balance (Rs.) | Closing Balance On Bank accounts (Rs.) | TOTAL (Rs.) |
|---|---|---|---|---|---|---|---|
| 1 | DAE – SRC Outstanding Investigator Awards SCH. Prof Ronojoy Adhikari | 184 | 50,00,000 | 0 | | 51,92,629 | 1,01,92,813 |
| 2 | DST – SERB DISTINGUISHED FELLOWSHIP – PROF G BASKARAN | 19,44,029 | 0 | 0 | | 1,12,108 | 20,56,137 |
| 3 | DST – SERB DISTINGUISHED FELLOWSHIP – PROF R SIMON | 11,56,185 | 0 | 1,30,267 | | 15,55,330 | 28,41,782 |
| 4 | DST – STARTUP GRANT NEXT GENERATION METABOLIC DR AREEJIT SAMAL | 4,48,769 | 0 | 1,26,092 | | 4 | 5,74,865 |
| 5 | DST – J C BOSE FELLOWSHIP PROF V S SUNDER | 1,22,908 | 7,00,000 | 1,01,800 | 5,16,273 | 0 | 14,40,981 |
| 6 | DST – J C BOSE FELLOWSHIP PROF ROMESH K KAUL | 1,22,664 | 0 | 1,17,300 | 11,08,144 | 10,632 | 13,58,740 |
| 7 | DST – SWARNAJAYANTHI FELLOWSHIP DR AMRITANSHUPRASAD | 5,48,940 | | | | 3,82,649 | 9,31,589 |
| 8 | DST – SWARNAJAYANTHI FELLOWSHIP DR PARTHASARATHI CHAKRABORTY | 1,35,030 | | | | 1,13,860 | 2,48,890 |
| 9 | GOOGLE INC AWARD DR RONOJOY ADHIKARI | 50 | 4,00,000 | | | 4,35,821 | 8,35,871 |
| 10 | FCPAR MOD SOFT MIC PROF PINAKI HCAUDHURI | 6,67,399 | 4,00,000 | | | 6,43,017 | 17,10,416 |
| 11 | FCPAR SUMS OF THE PROF PROF R BALASUBRAMANIAN | 27,970 | 0 | | | 38,884 | 66,854 |
| 12 | ITRA De-Congesting India's trans. networks using Mobile devices – Prof Sitabhra Sinha | 3,23,819 | | | 7,489 | 3 | 3,31,311 |
| 13 | JAWHARLAL NEHRU FELLOWSHIP PROF S R S VARDHAN | 190 | 4,00,000 | | | 26,29,458 | 30,29,648 |
| 14 | Max Planck Partner Group – IMSC- DR AREEJIT SAMAL | 9,69,257 | | | | 21,06,807 | 30,76,064 |
| 15 | NNMCB VIDEO RECORDING – PROF SITABHRA SINHA | 30,018 | | | | 1,38,199 | 1,68,217 |
| 16 | SERB – RAMANUJAN FELLOWSHIP – DR AREEJIT SAMAL | 6,39,336 | | | | 1,80,000 | 8,19,336 |
| 17 | SERB – RAMANUJAN FELLOWSHIP – DR C M CHANDRASHEKAR | 4,79,716 | | 5,37,372 | | 93,687 | 11,10,775 |
| 18 | TPSC | 18 | | | | 1,498 | 1,516 |
| 19 | INSA SRINIVASAN RAMANUJAN RESEARCH PROF R BALASUBRAMANIAN | 29,33,596 | | | | 1,99,671 | 31,33,267 |
| 20 | NBHM SOUTHERN REGIONAL LIBRARY MEETING PROF K N RAGHAVAN | 2,480 | | | | 4,87,176 | 4,89,656 |
| 21 | DST SERB NATIONAL FELLOWSHIP DR PALLAVI JAIN – N PDF | 10,45,254 | | 93,776 | | 74,411 | 12,13,441 |
| 22 | DST SERB NATIONAL FELLOWSHIP DR SHRADDHA SRIVASTAVA – N PDF | 8,40,064 | | 2,00,000 | | 2,89,841 | 13,29,905 |
| 23 | INDO GERMAN MAX PLANCK TRAVEL GRANT PROF AREEJIT SAMAL | 70,494 | | | 4,674 | 72 | 75,240 |
| 24 | WATERLOO ALGORITHAMS COOL PROF C M CHANDRASHEKAR | 6,05,613 | | | 57,900 | 1,73,935 | 8,37,448 |
| 25 | INDO – ITALIAN PRE. PHY LHC V RAVINDRAN | 1,38,112 | | | | 2,32,255 | 3,70,367 |
| 26 | NCM TEW WORKSHOPS | 6,95,944 | | | | 95,673 | 7,91,617 |
| 27 | DST PRECISION THEORY LARGE COLL, PROV V RAVINDRAN | 2,16,636 | | | | 7,50,805 | 9,67,441 |
| 28 | SERB – Explicit formulas for a class of general L functions Dr K Srinivas | 2,18,617 | | | | 5,488 | 2,24,105 |
| 29 | SERB – Lagrangian floer Theory - Dr Sushmita Venugopalan | 70,479 | | | | 1,54,150 | 2,24,629 |
| 30 | SERB GO .GE. ET.GR. AND AP TO HR IN THE PROF INDRAVA ROY | 18 | | | | 2,24,610 | 2,24,628 |
| 31 | DBT – Mechanobiology of cell adhesion and cytoskeleton under dynamic Dr G I Menon | 18 | | | | 7,49,425 | 7,49,443 |
| 32 | DAE – RAJA RAMANNA FELLOWSHIP – PROF ROMESH K KAUL | 12,56,423 | | | | 1,06,472 | 13,62,895 |
| 33 | DST JC BOSE FELLOWSHIP PROF R BALASUBRAMANIAN | 3,72,897 | | 1,27,440 | | 14,26,853 | 19,27,190 |
| 34 | INDIA I EMBO SYM. REG . EL PROF RAHUL SIDDHARTHAN | 46,53,642 | | | | 3,62,876 | 50,16,518 |
| 35 | SERB-VAJRA FACULTY SCHEME PROF C M CHANDRASHEKAR | 13,10,442 | | | | 1 | 13,10,443 |
| 36 | DAE – VIGYAN PRATIBHA | 43,822 | | | | 99,68,233 | 1,00,12,055 |
| 37 | Women Scientist Scheme A (WOS-A) fellowship to Dr Arpita Choudhary | 1,40,540 | | | | 6,89,460 | 8,30,000 |
| 38 | SERB RAMANUJA N FELLOWSHIP – DR SAYANTAN SHARMA | 0 | | | | 7,60,000 | 7,60,000 |
| 39 | SERB TARE PRJECT DR SUNITHA V – DR AREEJIT SAMAL | 0 | | | | 3,35,000 | 3,35,000 |
| 40 | SERB GSC GAME THEORY DR SITABHRA SINHA | 0 | | | | 2,20,000 | 2,20,000 |
| 41 | SERB AF COEFFICIENTS M FORMS – DR SANOLI GUN | 0 | | | | 2,20,000 | 2,20,000 |
| 42 | SERB TARE PROJECT DR SWPANKUMAR MAJHI – DR V RAVINDRAN | 0 | | | | 3,35,000 | 3,35,000 |
| | | 22231573.08 | 6900000 | 1434047 | 1694480 | 31495995.33 | 63756095.41 |

[GAYATRI E.]
ACCOUNTS OFFICER

[S. VISHNU PRASAD]
REGISTRAR

[V. ARVIND]
DIRECTOR

Chartered Accountants
Firm Reg. No. 000323s

CHARTERED ACCOUNTANT
CA. R. BALACHANDRAN
Proprietor, M.No 024980

Place: Chennai
Date