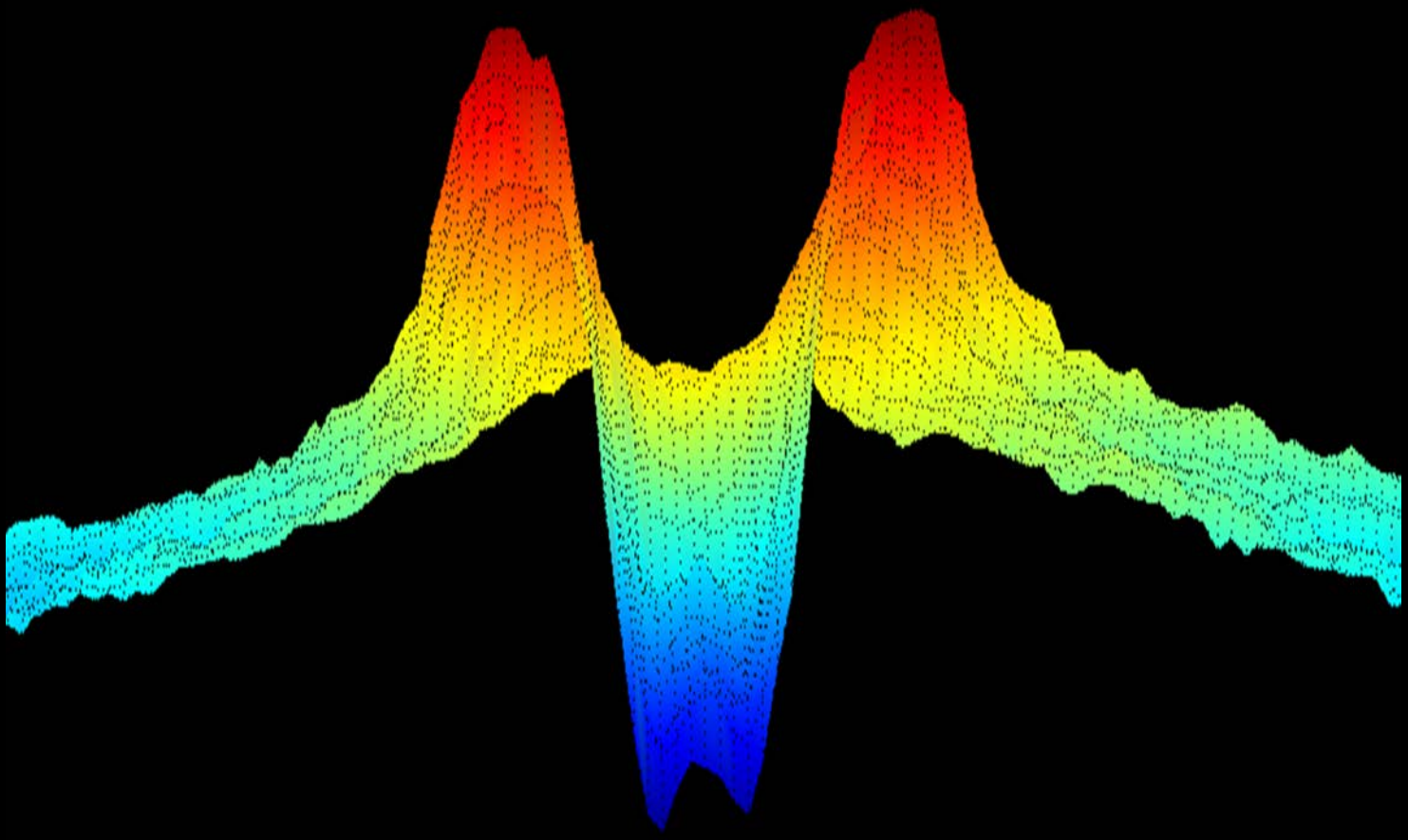
Annual Report

2015-16



Indian Institute of Science Education and Research Mohali

in pursuit of knowledge

IISER Mohali Sports Complex

Newly constructed Academic Block-II at night

Administrative Building

Visitors' Hostel at IISER Mohali

Cover art **Superconductivity in a Dirac Semimetal: Critical current and Andreev reflection on Cd_3As_2 point-contacts from Goutam Sheet's lab**.

Photo credits **Samrat Mukhopadhyay, Chinmaya Krishna, Akshay Gaikwad, Shivananda Grover.**

Compiled by **Amit Kulshrestha, Shravan Kumar Mishra and Purnananda Guptasarma.**

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Annual Report

2015-16

Indian Institute of Science Education and Research Mohali

Woods in the campus : Nature at her best

A pair of *Common Hoopoe* [1] at IISER Mohali

[1] In Great Backyard Bird Count 2015, there were 77 species of birds seen in Punjab. Of that, 74 species were traced in IISER Mohali campus.

Contents

Preface

From a humble beginning in a small room in the basement of the library building of MGSIPAP complex in Sector 26, Chandigarh to its present campus in Sector 81, SAS Nagar, IISER Mohali has come a long way in the last nine years. Construction of Phase I is over. The campus is looking green and most of the facilities are in place. Four batches of BS-MS graduates have come out of IISER Mohali in the last four years. We have about 1100 students on roll as of now. About 110 students will graduate in May 2016. Of them, about 25 would be PhD scholars.

The academic infrastructure of the institute is largely in place. Recently, we have started moving into the Academic Block 2. Furnishing will hopefully be completed by the end of this summer. We have added several pieces of sophisticated equipment in the last one year. The STM facility is being set up with funds from nano-mission. The TEM facility will be added soon. We are running short of accommodation for our students. Hopefully, the Government will provide us with funds and permission to start constructing some more hostels. After a gap of nearly two years, we have started adding some more bright young minds to the faculty. Several INSPIRE faculty fellows have joined the institute. They are adding value to themselves and to the institute. From two research publications in the first year, the number has increased nearly to 150 last year. According to the Web of Science, the total number of publications since the inception of IISER Mohali is about 640. The institute could submit the data for national ranking recently, thanks to the efforts of Professor Sanjay Mandal. Unfortunately, we were listed under the engineering colleges. Hopefully, we will be listed under an appropriate category next year. What is heart-warming is that Nature Index has listed recently the IISERs as No. 4, after all the IITs as No. 1, all CSIR labs as No. 2, and Indian Institute of Science, Bangalore as No. 3. Not bad for a group of institutions that are less than 10 years old!

Pursuit of excellence has become a way of life at IISER Mohali. Our students go to conferences and present their work. Some of them get best paper awards. Time and again, our students and faculty have shown that they are second to none. Drs. Lolitika Mandal and Sudip Mandal and their students published a landmark paper in Developmental Cell and the discovery of a new quantum matter by Dr. Yogesh Singh and colleagues was published in Nature Physics. The discovery of superconductivity in a Dirac semimetal by Dr. Goutam Sheet and collaborators was published in Nature Materials. An undergraduate student was a co-author of this paper. One of the visiting colleagues, Dr. Jaswant Yadav and his international collaborators announced the discovery of a fast radio burst in their paper in Nature published in December 2015. A paper by Dr. Kamal Priya Singh and his PhD student in Physical Review Letters announced the verification of a hundred years old Minkowski conjecture that photons gain momentum inside a water droplet.

More and more research projects from IISER Mohali are getting funds from outside agencies. Dr. Sabyasachi Rakshit has got a Wellcome-DBT grant to understand the role of peptides in hearing. Dr. Kamal Priya Singh has got a DST-MPG partner group funded recently.

The work of our colleagues is getting recognized by their peers. Dr. Santanu Pal got the NASI Young Scientist Platinum Jubilee award and the INSA Young Scientist Medal last year. Dr. Kausik Chattopadhyay got the National BioScience Career Award for the year 2014. Professor Sudesh Kaur Khanduja received the V. V. Narlikar Memorial Lecture Award from INSA for the year 2015. Professor T. R. Rao received the INSA Teacher Award in December 2015. Professor Sudeshna Sinha was awarded the J. C. Bose National Fellowship by the Department

of Science and Technology, New Delhi.

Our alumni are performing well. Some of the BS-MS graduates have chosen to stay back for their PhD programme in IISER Mohali. Some of them go abroad for higher studies in some of the best institutions in the world.

The number of patents filed by our colleagues is increasing slowly. Drs. S. Rakshit and K. P. Singh and Professor A. K. Bachhawat have filed a patent each. Our interaction with industry is increasing. Professor P. Guptasarma, who is also the Dean Research and Development has effected a know-how transfer to a company in Sector 82, Mohali. Although the first cheque of royalty received was for Rupees one lakh only, the amount, I am sure will increase in the years to come. As a part of the Startup India announced by the Honorable Prime Minister of India, IISER Mohali has been awarded a ₹ 5 crore grant for setting up a Technology Business Incubator (TBI). We plan to take the TBI-IISERM society route to set up the TBI. Hopefully, some of our graduates will become entrepreneurs. It is not necessary that only engineers have to become entrepreneurs. When our graduates become job creators rather than job seekers, IISERs can be said to have succeeded in more ways than one. One of our graduates has set up a company called SEELablet.

Interaction with the neighbours is essential for our growth. We plan to join hands with the Indian School of Business in setting up the TBI. We are about to sign an MoU with the Semiconductor Complex, Mohali. We are already an active partner in CRIKC, the Chandigarh Region Innovation Knowledge Cluster.

Globalisation of IISERs is essential for them to be counted globally, IISER Mohali has joined Belle I/II collaboration. Dr. Sharvan Sehrawat organized the first Global Initiative of Academic Network (GIAN) workshop on Emerging and Prevalent Infections, along with his mentor Professor Barry T. Rouse of the University of Tennessee, USA. Somdatta Sinha organized the Santa Fe Winter School on Complex Systems in December 2015. The National String Theory meeting took place in the same month at IISER Mohali. The international conference on Gravitation and Cosmology was hosted by Professor J. S. Bagla and his colleagues.

We had the privilege of hosting Professor Venki Ramakrishnan, Nobel Laureate in Chemistry. In addition to giving a Public Lecture at the institute, he addressed the students of the first INSPIRE camp held in our campus in the first week of January 2016. Professor Arvind has been organizing several Outreach activities. He organized Ishan Vikas, a two week camp for students from North-East. He also organized a DST workshop for children in July 2015.

Now it is official. Gender parity is becoming a reality at IISER Mohali; 40% our students are girls and 20% of faculty are women.

Peer reviews of all departments have been carried out recently. We are about to undertake a peer review of the institute as a whole soon. We also plan to undertake an appraisal of IISER Mohali created in the project mode nine years ago. Time has come to review the BS-MS curriculum that was developed nearly a decade ago. The review committee will take input from our alumni also to ensure that we change with time.

The Annual Report in your hands reflects the academic and other activities of the institute in the last one year. IISERs have become a brand name. But, in today's competitive world, we have to keep running to stay in the same place. If we want to move up the ladder, we have to work harder and be more innovative. Hopefully, our students and faculty will continue to excel in their activities and nothing will stop us from becoming No. 1 in whatever we do.

N. Sathyamurthy
Director, IISER Mohali

1 Board of Governors

Dr. K. K. Talwar (Chairman)
Pocket 14, Sector 8
Dwarka Phase I, New Delhi 110077

Shri Vinay Sheel Oberoi, IAS (Member)
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Ministry of Human Resource and Development,
Shastri Bhavan
New Delhi 110001.

Shri Sarvesh Kaushal, IAS (Member)
Chief Secretary, Government of Punjab
Punjab Civil Secretariat
Chandigarh 160 001

Professor Anurag Kumar (Member)
Director, Indian Institute of Science
Bangalore 560 012

Shri J. Sathyanarayana, IAS (Member)
Secretary, Department of Electronics and Information Technology
Electronics Niketan, Lodhi Road
New Delhi 110 003

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Krishi Bhavan
New Delhi - 110 114

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Nangal Road, Rupnagar
Punjab 140 001.

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Financial Advisor, Dept. of Higher Education,
Ministry of Human Resource and Development,
Shastri Bhavan
New Delhi 110 001.

Professor N. Sathyamurthy (Member)
Director, IISER Mohali, Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P.O. Manauli 140 306.

Professor K. S. Viswanathan (Member)
IISER Mohali, Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P.O. Manauli 140 306.

Professor Kapil H. Paranjape (Member)
IISER Mohali, Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P.O. Manauli 140 306.

Dr. P. Bapaiah (Secretary)
Registrar, IISER Mohali, Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P.O. Manauli 140 306.

2 Academic Senate

Professor N. Sathyamurthy (Chairman)
Director, IISER Mohali
Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P. O. Manauli 140 306.

Professor Arun K. Grover (Member)
Vice-Chancellor
Panjab University, Chandigarh 160 014.

Professor M. K. Surappa (Member)
Professor, Indian Institute of Science
Bangalore 560 012.

Professor Lilavati Krishnan (Member)
Retd. from IIT Kanpur
21, Joy Builders Colony
Old Palasia, Indore 452 001.

Professor Anand K. Bachhawat (Member)
IISER Mohali, Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P. O. Manauli 140 306.

Professor Arvind (Member)
IISER Mohali, Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P. O. Manauli 140 306.

Professor Kapil H. Paranjape (Member)
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Professor Sudeshna Sinha (Member)
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Professor Jasjeet S. Bagla (Member)
IISER Mohali, Knowledge City
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P. O. Manauli 140 306.

Professor Somdatta Sinha (Member)
IISER Mohali, Knowledge City
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Professor Sudesh Kaur Khanduja (Member)
IISER Mohali, Knowledge City
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Professor Charanjit S. Aulakh (Member)
IISER Mohali, Knowledge City
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P. O. Manauli 140 306.

Professor P. Guptasarma (Member)
IISER Mohali, Knowledge City
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Professor K. S. Viswanathan (Member)
IISER Mohali, Knowledge City
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Professor Sanjay Mandal (Member)
IISER Mohali, Knowledge City
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Dr. Ramandeep Singh Johal (Member)
IISER Mohali, Knowledge City
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Dr. N. G. Prasad (Member)
IISER Mohali, Knowledge City
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Professor I. B. S. Passi (Member)
Honorary Professor
IISER Mohali, Knowledge City
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Professor Ramesh Kapoor (Member)
IISER Mohali, Knowledge City
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Professor C. G. Mahajan (Member)
IISER Mohali, Knowledge City
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Professor T. R. Rao (Member)
IISER Mohali, Knowledge City
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Professor H. L. Vasudeva (Member)
IISER Mohali, Knowledge City
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Dr. H. K. Jassal (Member)
IISER Mohali, Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P. O. Manauli 140 306.

Dr. P. Bapaiah (Secretary)
Registrar, IISER Mohali, Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P. O. Manauli 140 306.

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3 Research Advisory Committee

- **Professor A. K. Grover**, Vice-Chancellor, Panjab University, Chandigarh (Chairperson)
- **Professor Alok Bhattacharya**, School of Life Sciences, JNU, New Delhi
- **Professor A. K. Ganguli**, Director, INST, Mohali
- **Professor R. J. Hans-Gill**, Emeritus Professor, CAS in Mathematices, Panjab University, Chandigarh
- **Professor P. Guptasarma**, Dean (R&D), IISER Mohali (Convenor)

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4 Administration

Director	**Professor N. Sathyamurthy**
Dean Faculty	**Professor Kapil H. Paranjape**
Dean Academics	**Dr. Chanchal Kumar (till Dec. 2015)**
	Dr. Ramandeep S. Johal (from Jan. 2016)
Dean Students	**Professor K. S. Viswanathan (till Dec. 2015)**
	Dr. N. G. Prasad (from Jan. 2016)
Dean R&D	**Professor Anand K. Bachhawat (till Dec. 2015)**
	Professor P. Guptasarma (from Jan. 2016)
Registrar	**Dr. P. Bapaiah**
Assistant Registrars	**Shri Sandeep Ahlawat**
	Shri Mukesh Kumar
Deputy Librarian	**Dr. P. Visakhi**
Executive Engineer cum Estate Officer	**Shri Praveen Kumar Srivastava**
Honorary Counsellor	**Mrs. Suguna Sathyamurthy**
Counsellor	**Ms. Yogeet Brar**
Wardens (Boys)	**Dr. P. Balanarayan**
	Dr. Dipanjan Chakraborty
	Dr. Aribam Chandrakant
	Dr. Abhishek Chaudhuri
Wardens (Girls)	**Dr. Rachna Chaba**
	Dr. H. K. Jassal
	Dr. Arunika Mukhopadhyay
	Dr. Mahak Sharma
Medical Officer	**Dr. Gurpreet Singh**
Medical Consultants	**Dr. S. K. Aggarwal**
	Dr. Virpal J. Singh
Veterinarian (Animal House)	**Dr. Chander Shekhar**
Scientific Officer / Computer Centre	**Dr. Paramdeep Singh Chandi**
Software Engineer / Computer Centre	**Ms. Garima Kaushik**
Software Assistant / Computer Centre	**Ms. Sangeetha Gurusamy**
Assistant Security Officer	**Shri Kamal Jeet**
Assistant Engineer (Electrical)	**Shri Atul Kadwal**
Assistant Engineer (Civil)	**Shri Rajeev Kumar**

Personal Secretary (Director's Office)	**Ms. Amandeep Saini**
Personal Assistant (Registrar's Office)	**Ms. Poonam Rani**
	Ms. Yashoda Negi
Accountants	**Shri Sachin Jain**
	Shri Raman Kumar
Library Information Assistants	**Shri Peeyush Dwivedi**
	Shri Shameer K. K.
Office Assistants	**Ms. Kavita Pandey**
	Ms. Deepika
	Shri Tarandip Singh
	Ms. Neena Kumari
	Shri Charanjit Singh
	Shri Mansa Ram Gupta
Physical Education Instructor	**Shri Kirpal Singh**
Data Entry Operators	**Ms. Bhupali Sharma**
	Shri Sukhpreet Singh
Technical Scientific Assistants	**Shri Rakesh Kumar**
	Shri Ramesh Kumar
Scientific Assistants	**Shri Bhavin R. Kansara**
	Shri Jayaraju Battula
	Shri Kongari Ranjith Kumar (relieved on deputation)
Technical Assistants	**Shri Avtar Singh**
	Shri Triveni Shanker Verma
Lab Technicians	**Shri Anupam Pandey**
	Ms. Shikha Gupta
	Shri Mangat Ram
	Shri Tejinder Kumar
Lab Assistants	**Shri Ganesh Lal Meena**
	Shri Prahlad Singh
	Shri Balbir Singh
	Shri Inderjit Singh
Staff Nurse	**Shri C. Periyasamy**
Peon	**Shri Bhopal Singh**

5 Faculty

5.1 Faculty Members

1. **R. Vijaya Anand** (Associate Professor, Chemistry)
   Synthetic organic chemistry
2. **Chandrakant S. Aribam** (Assistant Professor, Maths)
   Number theory
3. **Arvind** (Professor, Physics)
   Quantum information theory, Quantum optics
4. **Charanjit S. Aulakh** (Professor, Physics)
   Theoretical High Energy Physics
5. **S. Arulananda Babu** (Associate Professor, Chemistry)
   Synthetic organic chemistry
6. **Kavita Babu** (Assistant Professor, Biology)
   Neurobiology
7. **Anand K. Bachhawat** (Professor, Biology)
   Glutathione and Sulphur Metabolism in Yeasts
8. **Jasjeet Singh Bagla** (Professor, Physics)
   Cosmology, Astrophysics
9. **P. Balanarayan** (Assistant Professor, Chemistry)
   Computational & Theoretical Chemistry
10. **Ritajyoti Bandyopadhyay** (Assistant Professor, Humanities and Social Sciences)
    Urban History, Informal Economy and Infrastructure Studies
11. **Samarjit Bhattacharyya** (Assistant Professor, Biology)
    Neurobiology
12. **Rachna Chaba** (Assistant Professor, Biology)
    Bacterial Genetics and Physiology
13. **Dipanjan Chakraborty** (Assistant Professor, Physics)
    Soft Condensed Matter, Statistical Physics
14. **Kausik Chattopadhyay** (Associate Professor, Biology)
    Structure-Function Studies on Pore-Forming Protein Toxins
15. **Abhishek Chaudhuri** (Assistant Professor, Physics)
    Soft condensed matter physics
16. **Parth R. Chauhan** (Assistant Professor, Humanities and Social Sciences)
    Paleoanthropology & Archaeology
17. **Rhitoban Ray Choudhury** (Assistant Professor, Biology)
    Evolution, Genetics and Genomics
18. **Angshuman Roy Choudhury** (Assistant Professor, Chemistry)
    X-ray Crystallography

19. **Adrene F. D'cruz** (Assistant Professor, Humanities and Social Sciences)
English Literature

20. **Arijit Kumar De** (Assistant Professor, Chemistry)
Ultrafast non-linear spectroscopy and fluorescence microscopy

21. **Kavita Dorai** (Associate Professor, Physics)
Biomolecular NMR, Quantum computing

22. **Krishnendu Gongopadhyay** (Associate Professor, Mathematics)
Groups, Geometry & Dynamics

23. **Samrat Ghosh** (Assistant Professor, Chemistry)
Materials chemistry

24. **Ujjal K. Gautam** (Assistant Professor, Chemistry)
Functional Nanomaterials and applications

25. **Purnananda Guptasarma** (Professor, Biology)
Protein Engineering & Structural Biochemistry

26. **Manjari Jain** (Assistant Professor, Biology)
Behavioural Ecology & Evolutionary Biology

27. **Harvinder Kaur Jassal** (Assistant Professor, Physics)
General Relativity and Cosmology

28. **Ramandeep Singh Johal** (Associate Professor, Physics)
Statistical Physics, Thermodynamics and Quantum Theory

29. **Ramesh Kapoor** (Professor, Chemistry)
Inorganic chemistry

30. **Rajeev Kapri** (Assistant Professor, Physics)
Statistical Mechanics

31. **Sudesh Kaur Khanduja** (Professor, Mathematics)
Valuation theory

32. **Amit Kulshrestha** (Associate Professor, Mathematics)
Quadratic forms, Central simple algebras and related structures

33. **Chanchal Kumar** (Associate Professor, Mathematics)
Algebraic Geometry and Combinatorial Commutative Algebra

34. **Sanjeev Kumar** (Assistant Professor, Physics)
Condensed Matter Theory: Correlated electron systems, disordered systems

35. **C. G. Mahajan** (Professor, Physics)
Atomic/Molecular Spectroscopy

36. **Alok Kumar Maharana** (Assistant Professor, Mathematics)
Algebraic Geometry

37. **Lolitika Mandal** (Assistant Professor, Biology)
Hematopoiesis, Cardiogenesis and Molecular pathways in stem and progenitor cell development in Drosophila

38. **Sanjay Mandal** (Professor, Chemistry)
Organometallic Chemistry, Nanomaterials, and X-ray Diffractometry

39. **Sudip Mandal** (Assistant Professor, Biology)
Mitochondrial regulation of cellular function

40. **Shravan Kumar Mishra** (Assistant Professor, Biology)
RNA Splicing

41. **Arunika Mukhopadhaya** (Associate Professor, Biology)
Immunology

42. **Samrat Mukhopadhyay** (Associate Professor, Biology/Chemistry)
Protein folding, Misfolding, Prion & Amyloid biology

43. **S. K. Arun Murthi** (Assistant Professor, Humanities and Social Sciences)
Philosophy of Science

44. **Santanu Kumar Pal** (Associate Professor, Chemistry)
Liquid Crystals, Interfacial Phenomena, Colloid and Gel Chemistry, Chemical and Biological Sensing, Nanoscale Science and Engineering

45. **Yashonidhi Pandey** (Assistant Professor, Mathematics)
Algebraic Geometry

46. **Shashi Bhushan Pandit** (Assistant Professor, Biology)
Computational structural and systems biology, protein-ligand interactions, metabolomics

47. **Kapil Hari Paranjape** (Professor, Mathematics)
Geometry

48. **N. G. Prasad** (Associate Professor, Biology)
Evolutionary genetics

49. **V. Rajesh** (Assistant Professor, Humanities and Social Sciences)
History

50. **Sabyasachi Rakshit** (Assistant Professor, Chemistry)
Single Molecule Manipulation & Imaging and Nanobiology

51. **Rajesh Ramachandran** (Assistant Professor, Biology)
Cellular basis of tissue regeneration

52. **Ramesh Ramachandran** (Associate Professor, Chemistry)
Development of Solid-state NMR methods, Quantum mechanics

53. **Anu Sabhlok** (Associate Professor, Humanities and Social Sciences)
Postcolonial studies, feminist geography, Political-economy of contemporary India, Globalization , Identity (gender and nation), Participatory Action Research, Ethnography

54. **Lingaraj Sahu** (Assistant Professor, Mathematics)
Operator Theory, Operator Algebras

55. **Kuljeet Singh Sandhu** (Assistant Professor, Biology)
Systems Biology of Gene Regulation

56. **N. Sathyamurthy** (Professor, Chemistry)
Molecular Reaction Dynamics and Potential Energy Surfaces

57. **Sharvan Sehrawat** (Assistant Professor, Biology)
Immunology and immunopathology

58. **K. R. Shamasundar** (Assistant Professor, Chemistry)
Quantum Chemistry

59. **Mahak Sharma** (Assistant Professor, Biology)
Cell Biology

60. **Goutam Sheet** (Assistant Professor, Physics)
Condensed Matter Physics and Scanning Probe Microscopy

61. **Kamal P. Singh** (Associate Professor, Physics)
Ultrafast Quantum Dynamics and Stochastic nonlinear dynamics

62. **Mahender Singh** (Assistant Professor, Maths)
Topology and Groups

63. **Mandip Singh** (Assistant Professor, Physics)
Quantum Optics and Bose Einstein Condensation

64. **Sanjay Singh** (Associate Professor, Chemistry)
Synthetic Inorganic and Organometallic Chemistry

65. **Yogesh Singh** (Assistant Professor, Physics)
Experimental Condensed Matter Physics

66. **Bärbel Sinha** (Assistant Professor, Earth & Environmental Science)
Environmental Science

67. **Somdatta Sinha** (Professor, Biology)
Mathematical & Computational Biology

68. **Sudeshna Sinha** (Professor, Physics)
Nonlinear Dynamics, Chaos, Complex Systems, Networks, Computation

69. **Vinayak Sinha** (Associate Professor, Earth & Environmental Science)
Environmental Science: Atmospheric Chemistry Field Experiments

70. **Varadharaj R. Srinivasan** (Assistant Professor, Mathematics)
Differential Algebra

71. **Sripada S. V. Rama Sastry** (Assistant Professor, Chemistry)
Synthetic Organic Chemistry

72. **Sugumar Venkataramani** (Assistant Professor, Chemistry)
Physical Organic Chemistry

73. **Ananth Venkatesan** (Assistant Professor, Physics)
Mesoscopic Electronic & Electromechanical systems

74. **K. S. Viswanathan** (Professor, Chemistry)
Spectroscopy

75. **Ram Kishor Yadav** (Assistant Professor, Biology)
Plant Developmental Genetics

76. **K. P. Yogendran** (Assistant Professor, Physics - *relieved on deputation*)
Quantum Aspects of Gravity

5.2 Honorary Faculty

1. **Raghvendra Gadagkar** (Professor, Biology) *Ecology*
2. **Anil Kumar** (Professor, Physics) *NMR Spectroscopy*
3. **I. B. S. Passi** (Professor, Mathematics) *Algebra*
4. **T. Ramasami** (Professor, Chemical Sciences) *Chemistry*
5. **Ashok Sahni** (Professor, Earth & Environmental Sciences) *Earth Sciences*

5.3 Visiting Faculty

1. **Sudesh Kaur Khanduja** Visiting Professor, Mathematics
2. **Meera Nanda** Visiting Faculty, History & Philosophy of Science
3. **T. R. Rao** Visiting Professor, Biology
4. **H. L. Vasudeva** Visiting Professor, Mathematics

5.4 Adjunct Faculty

1. **Paramvir Singh Ahuja** (Biotechnology) Former Director General, CSIR
2. **Praveen Chaddah** (Physics) Former Director, UGC-DAE consortium for scientific Research
3. **Ashok K. Ganguli** (Chemistry) Professor, INST Mohali
4. **Amitabh Joshi** (Biology) Professor, JNCASR, Bangalore
5. **N. Mukunda** (Physics) Indian Academy of Sciences, Bangalore
6. **Jayant Udgaonkar** (Biology) Senior Professor, NCBS Bangalore
7. **T. Padmanabhan** (Physics) Distinguished Professor, IUCAA, Pune

5.5 INSPIRE Faculty Fellows

1. **Anoop Ambili** Earth & Environmental Sciences
2. **Anandam Banerjee** Mathematics
3. **Vishal Bhardawaj** Physics
4. **Satyajit Guin** Mathematics
5. **Smriti Mahajan** Physics
6. **Manimala Mitra** Physics
7. **Lakshmi Narayanan** Earth & Environmental Sciences
8. **Ketan Patel** Physics
9. **Monika Sharma** Chemistry
10. **Sudhanshu Shekhar** Mathematics
11. **Divya Srivastava** Physics

6 Events : 2015-16

6.1 Meetings of Institute Bodies

During 2015–16, various administrative bodies of the Institute met for deliberations.

Board of Governors Meetings	20^{th} meeting of the Board of Governors	08/05/2015
	21^{st} meeting of the Board of Governors	29/05/2015
	22^{nd} meeting of the Board of Governors	28/08/2015
	23^{rd} meeting of the Board of Governors	17/12/2015
Finance Committee Meetings	17^{th} meeting of the Finance Committee	08/05/2015
	18^{th} meeting of the Finance Committee	28/08/2015
	19^{th} meeting of the Finance Committee	17/12/2015
Academic Senate Meetings	17^{th} meeting of the Academic Senate	19/05/2015
	18^{th} meeting of the Academic Senate	29/07/2015
	19^{th} meeting of the Academic Senate	16/12/2015
	20^{th} meeting of the Academic Senate	06/01/2016
Research Advisory Committee Meeting	8^{th} meeting of the Research Advisory Committee	18/05/2015

6.2 Convocation 2015

The Fourth Convocation of IISER Mohali was held on May 29, 2015, with Professor M. S. Valiathan as the Chief Guest. Professor K. K. Talwar, Chairman Board of Governors, presided over the function. 73 graduates

received their BS-MS degrees, 2 received MS degrees and 8 received PhD degrees. The Director congratulated the graduates and also the award and medal winners. In his address, the Director pointed out some of the breakthrough research that has come out of IISER Mohali and congratulated the faculty and students who were co-authors of the seminal papers.

Chairman, BoG declaring the convocation closed

6.3 Foundation Day 2015

Professor M. M. Sharma, FRS, Former Director, Institute of Chemical Technology, Mumbai, delivered the Foundation Day Lecture on September 27, 2015, focusing on excellent research that could be carried out in the laboratory and how the same could be extended in industry with fruitful results for society. He urged the faculty and students to excel in their pursuit of knowledge and also try to convert knowledge into wealth.

6.4 Independence Day 2015

Sixty-ninth Independence Day of the Nation was celebrated in the Institute on August 15, 2015. Director hoisted the flag and gave away prizes for best academic performance in various academic programs. Following students received awards.

CNR Rao Foundation Prize for the Best Performing First Year student of the BS-MS program in the second semester of the academic session 2014-15.

- Shruti Jose Maliakal (MS14024)

Certificate of Academic Excellence for the Best Performing students (second, third & fourth year of the BS-MS program) in the second semester of the academic session 2014-15

2013 Batch

- Simran S. Tinani (MS13010)
- Saloni Rose (MS13019)

- Parvathy S (MS13020)
- Divita Gupta (MS13056)

2012 Batch : Biology

- Tejasvinee Atul Mody (MS12023)
- Vaishnavi Sridhar (MS12083)

2012 Batch : Chemistry

- Neeru Mittal (MS12080)
- Aayush (MS12087)

2012 Batch : Mathematics

- Dony Varghese (MS12075)

2012 Batch : Physics

- Vishnu P. K (MS12127)

2011 Batch : Biology

- Yosman Bapat Dhar (MS11060)
- Arsila Ashraf P K (MS11068)

2011 Batch : Chemistry

- Srijit Mukherjee (MS11006)
- Shwetha S (MS11045)

2011 Batch : Physics

- Atul Singh Arora (MS11003)

Certificate of Academic Excellence for the Best Performing Students (first & second year of Integrated PhD program) in the second semester of the academic session 2014-15

2014 Batch : Biology

- Prarthna Saraswat (MP14021)

2014 Batch : Chemistry

- Surbhi Garg (MP14004)

2014 Batch : Mathematics

- Jitendra Rathore (MP14009)

2013 Batch : Chemistry

- Indu Bala (MP13009)

6.5 Republic Day 2016

Sixty-seventh Republic Day of the Nation was celebrated in the Institute on January 26, 2016. Director hoisted the flag and gave away prizes for best academic performance in various academic programs. Following students received awards.

CNR Rao Foundation Prize for the Best Performing First Year student of the BS-MS program in the first semester of the academic session 2015-16.

- Hayman Gosain (MS15125)

Certificate of Academic Excellence for the Best Performing students (second, third & fourth year of the BS-MS program) in the first semester of the academic session 2015-16

2014 Batch

- Jorawar Singh (MS14085)

2013 Batch : Biology

- Jayesh Kumar S (MS13054)
- Sumanjit Datta (MS13111)

2013 Batch : Chemistry

- Amala Raj (MS13068)

2013 Batch : Mathematics

- Simran S Tinani (MS13010)

2013 Batch : Physics

- Shreyan Ganguly (MS13149)

2012 Batch : Biology

- Tejasvinee Atul Mody (MS12023)
- Lata Kalra (MS12092)

2012 Batch : Chemistry

- Neeru Mittal (MS12080)

2012 Batch : Mathematics

- Dony Varghese (MS12075)

Certificate of Academic Excellence for the Best Performing Students (first & second year of Integrated PhD program) in the first semester of the academic session 2015-16

2015 Batch : Chemistry

- Ipsita Pani (MP15002)

2015 Batch : Mathematics

- Damanvir Singh Binner (MP15017)

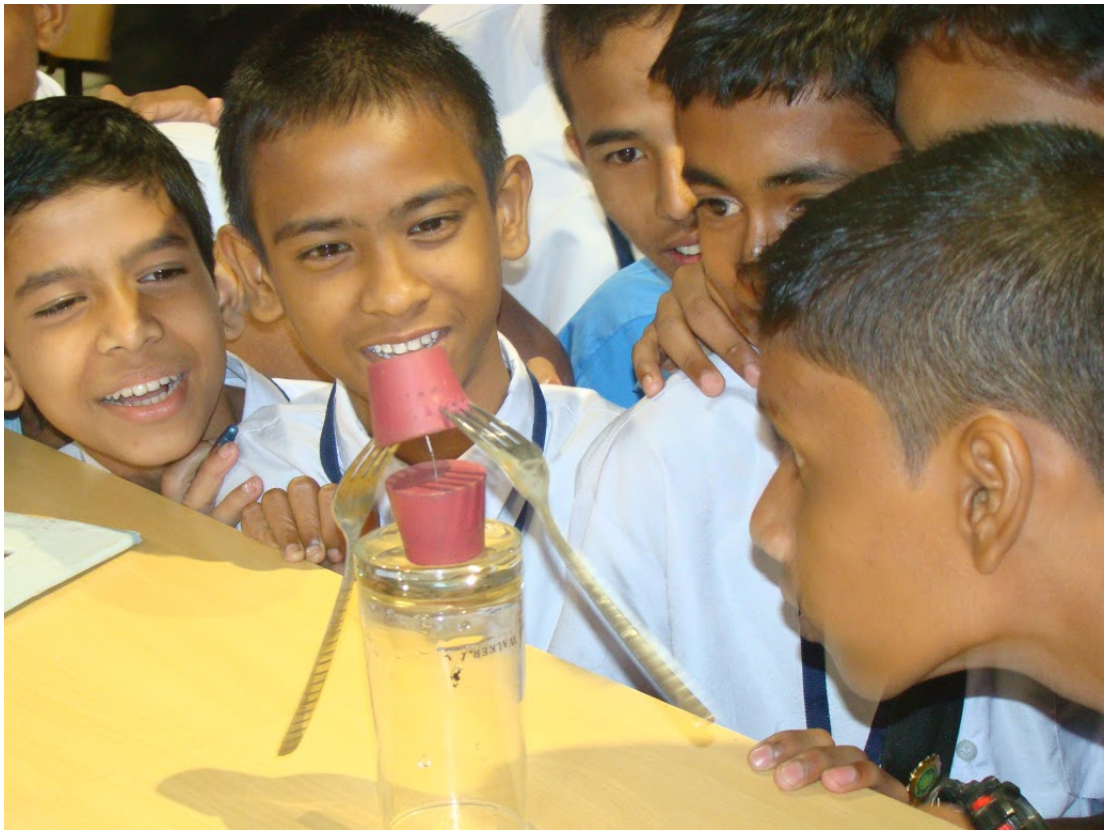
2014 Batch : Chemistry

- Surbhi Garg (MP14004)

2014 Batch : Mathematics

- Jitendra Rathore (MP14009)

6.6 Outreach Activities



6.6.1 Visits by School and College Students

During the year, a large number of students from schools and colleges in the region, visited IISER Mohali. The groups were taken around to visit various research facilities at IISER Mohali and they also interacted with scientists and students at the Institute.

6.6.2 Teachers Training Programs

Teachers training programs were organized at IISER Mohali in collaboration with SISE (State Institute of Science Education Punjab). Particularly noteworthy was the program for Mathematics teachers, organized during Oct 14-15, 2015.

6.6.3 DST Child Scientists camp

A science camp was organized during June 22-July 4, 2015 for Child Scientists selected by DST in the Children Science Congresses held in the previous two years. This was the first camp of its type, where each Child Scientist undertook a two-week long research project with an IISER scientist. The camp was very well received by the Child Scientists as well as IISER faculty. These Child Scientists came from all over the country and stayed at IISER Mohali. Apart from the research projects, they attended lectures by scientists and science demonstration sessions by IISER students.

6.6.4 Open Day

Open Day was celebrated on September 27, 2015, the Foundation Day of IISER Mohali. The program was organized by IISER Mohali students for the school students of the region and was co-ordinated by Dr. N. G. Prasad and Dr. Vinayak Sinha on behalf of the Institute Outreach Committee. More than 200 school children from 18 schools in the tricity region and places as distant as Yamunanagar participated in the program. The Institute declared an Open Day to provide an opportunity for city residents and school students alike to visit the institute research facilities and interact with IISER Mohali faculty and students. A variety of events were held including science quizzes, group discussions and a treasure hunt. In addition, several non-competitive events

such as science and maths demonstrations, documentary screening, superstition busting chemical demonstrations and poster presentations were also organized for the visitors. In the evening, prize winning school students were awarded prizes by the Chief Guest of the Foundation Day, Professor M. M. Sharma in the institute auditorium.

6.6.5 DST INSPIRE Internship Camp

A DST INSPIRE internship camp was organized for about 200 students during January 2-6, 2016. The highlight of the camp was the lecture by Nobel Laureate Professor V. Ramakrishnan. A unique feature of the camp was that the participating students conducted 20 experiments over 06 days. Elaborate experiment kiosks were setup in the Lecture Hall Complex of IISER Mohali.

6.6.6 Ishan Vikas camp

A camp was organized under the Ishan Vikas program of the MHRD for 30 students from the North-East during July 4-16, 2015. During this camp, the students from the North-East attended lectures by scientists from IISER Mohali and the region. They participated in science demonstration sessions by IISER students and faculty. For their cultural integration, a trip to important historical and cultural sites in Punjab was organized. The cultural activities included them producing a play and IISER Mohali students organizing a National Integration session with them everyday.

6.6.7 Rashtriya Avishkar Abhyan

IISER Mohali is acting as the mentor Institution for UT Chandigarh and the state of Punjab for the RAA (Rashtriya Avishkar Abhiyan). In this context a program for 500 rural school students was organized on February 28, 2016 where school teachers trained by IISER Mohali showcased their demonstration experiments. This program is likely to continue in the coming years and IISER Mohali will continue to provide mentorship to UT and Punjab.

Outreach session in progress

Launch of Rashtriya Avishkar Abhiyan

National Science Day

Director interacting with school children

6.7 Teachers' Day

Teachers' Day was celebrated in the Institute on September 05, 2015. The Best Teacher Award for the year 2015 was shared by Dr. Mahak Sharma (Department of Biological Sciences) and Dr. Abhishek Chaudhuri (Department of Physical Sciences).

6.8 Students Activities

IISER Mohali students have been involved in a vast variety of academic, cultural and sports activities over the past year. Most of the academic and cultural activities are organized by the various clubs, while the sports activities are organized by the sports secretary and the sports instructor.

Special cultural activities including singing, dance and drama were organised on the occasions of Independence day and Republic day. Additionally, a cultural evening and musical evening were also held. The annual cultural fest of IISER Mohali, *Insomnia 2016* was held in March.This saw participation from many different colleges in various science and cultural events. Parikrama, one of the most respected rock bands of India, was invited for a special musical performance.

Other than these, activities like quizzes, talks/seminars, painting competition, T-shirt painting, sky-watching sessions, subject based Dumb charades, debates, essay/poetry competition, etc were organised regularly by the students. While our Bhangra team went on the state finals in the *MTV Colors of Youth : Season 5*, our quizzing team won the regionals of *Tata Crucible Campus Edition 2016*.

Our students won a number of prizes in the Inter IISER Sports Meet 2015 held at IISER Bhopal in December 2015. These include prizes in football, lawn tennis, volleyball, athletics, badminton, cricket and table tennis.

7 Scientific Meetings/Conferences/Workshops

7.1 Complex Systems Winter School

IISER Mohali organized jointly with the Santa Fe Institute (SFI), USA, the first *India Complex Systems Winter School*, where 61 participants from Australia, Bangladesh, China, France, Hungary, Mexico, New Zealand, The Netherlands, UK, USA and India participated. Given the interdisciplinary nature of the topic, participants ranged from young faculty in management studies, policy research to undergraduate students in biology and computer science. The intensive two-week course was taught by 11 faculties from different Institutions in USA and associated with the SFI, and 5 from India. The aim of the course was to introduce the methodology to study complex behavior in mathematical, physical, living, and social systems. The theoretical lectures consisted of nonlinear dynamics, network theory, statistical physics and complex networks, computational complexity, agent based computational economics, ergodicity economics, econophysics, social network analysis of human behavior, cognitive science and social minds, evolution of gene networks, microbial ecology, and infectious disease. There were extensive discussions among the participants and faculty, who also organized evening tutorials and discussions on relevant papers and mathematical tools. Professor Somdatta Sinha was the course director.

7.2 Global Initiative for academic Network (GIAN) Course

A GAIN course on *Emerging and Prevalent Infections : Our preparation to tackle* was conducted from January 27, 2016 to February 6, 2016 at IISER Mohali in collaboration with a renowned international viral immunologist Lindsey Young distinguished Professor Barry T Rouse of the University of Tennessee. The national faculty who delivered lectures during the course were Drs Sharvan Sehrawat (IISER Mohali), Arunika Mukhopadhyay (IISER Mohali), Satish Devdas (ILS, Bhubaneswar), Javed N Agrewala (IMTECH, Chandigarh), Pardip Sen (IMTECH, Chandigarh), Rajeev Kaul (Delhi University South Campus, Delhi) and Bhuvanesh Kumar (DIHAR Base Lab, Chandigarh). The aim of the course was to educate participants on burning issues related to emerging and prevalent infections as to how effectively these diseases could be managed to minimize destruction of life. Major topics covered during the course include biology, epidemiology and pathogenesis of viral, bacterial and parasitic infections, viruses as factor in cancers and autoimmune diseases, tumor virology, recent developments in technologies for achieving timely diagnosis, production of vaccines and therapeutics. The number of participants was 35 that include both from within and outside IISER Mohali. Graduate and postgraduate students, post-doctoral fellows, young faculties from different universities, biomedical and veterinary scientists participated in the course.

7.3 Workshop on Higher Education and Research Opportunities in Germany

The German House for Research and Innovation - DWIH New Delhi, a consortia of leading German research institutes and universities and IISER Mohali organised a one day workshop on August 22, 2015 entitled "Higher Education and Research Opportunities in Germany" at the Indian Institute of Science Education and Research (IISER) Mohali. The event's objective was to apprise young Indian scientists and researchers about research and training opportunities available to them at German institutions. The event was co-ordinated by Dr. Vinayak Sinha on behalf of IISER Mohali. IISER Mohali PhD students helped provide all logistical support to the DWIH and assisted with the registrations. The sessions were attended by about 500 post-graduate students, doctoral students, researchers as well as faculty and senior scientists from the member institutions that form the Chandigarh Region Innovation and Knowledge Cluster (CRIKC).

In his introductory remarks, Mr. Stephan Lanzinger, Counsellor and Head of Science & Technology Section at the German Embassy in India spoke at length on the Indo-German cooperation in Science and Technology. Professor Sanjay Mandal, Coordinator, Opportunity Cell IISER Mohali then introduced the audience to the IISER curriculum, system and vision. This was followed by individual presentations made by the DWIH consortium members such as the German Research Foundation (DFG), German Academic Exchange Service (DAAD), Freie

Universität Berlin, University of Cologne (UoC), University of Göttingen (UoG), Heidelberg Centre South Asia (HCSA), Forschungszentrum Jülich and Technical University of Munich (TUM), who highlighted specific higher education and research opportunity programs fostered by their institutes in India. Following the presentations, the students had direct interaction with the consortium members regarding further queries on the application processes and research opportunities. Dr. Alexander P Hansen, Director, DFG India Office delivered the vote of thanks and expressed his gratitude to IISER Mohali for the excellent organization of the workshop.

7.4 International Conference on Gravitation and Cosmology

The International Conference on Gravitation and Cosmology (ICGC) was held at IISER Mohali during Dec.14-18, 2016. ICGC is a series of international meetings, held once in four years, and organized by the Indian Association for General Relativity and Gravitation (IAGRG). The first meeting was organized in 1987 in Goa and the meeting in 2015 was the 8th meeting in the series.

The year 2015 was the centenary of Einstein's general theory of relativity. A special session was organized in the conference to mark the centenary and the contribution of Indian relativists.

The program of the conference consisted of twenty plenary lectures on different aspects of gravitation like gravitational waves, cosmology, quantum gravity, etc. There was a public lecture for general audience. There were three parallel sessions on (1) Classical Gravity and Gravitational Waves, (2) Cosmology, and, (3) Quantum Gravity and Early Universe. More than fifty talks were given in the parallel sessions. More than thirty papers were presented as posters.

A total of 160 participants attended the conference. More than fifty participants from different universities and institutes all over the world made up the international component of the conference. The presentations from the conference and other details are available at http://www.icgc2015.in/

Professor J. S. Bagla was convener of the local organization committee with Drs. H. K. Jassal and K. P. Yogendran as members. The scientific organization was managed by seventeen member SOC with Professors Sukanta Bose and J S Bagla as co-chairs.

7.5 Annual Conference of the Ramanujan Mathematical Society

The Department of Mathematical Sciences at IISER Mohali hosted the 30th Annual Conference of the Ramanujan Mathematical Society during May 15–17, 2015. The meeting was attended by around 150 delegates. The meeting had several parallel sessions on various areas of mathematics. The highlight of this meeting was a one day workshop titled Some high points of Undergraduate Mathematics education. The meeting was preceded by a two day conference on Morse Functions and Handle-body Decomposition of Manifolds.

7.6 Arabidopsis 2016

IISER Mohali and NABI Mohali jointly organized the national conference *Arabidopsis 2016* during March 20–22, 2016 in the IISER Mohali campus. The meeting had many high quality talks focused on basic plant sciences involving Arabidopsis. In his opening address, the keynote speaker, Dr. Imran Siddiqi, emphasized the importance of the model plant Arabidopsis in discovering new mechanisms of gene regulation. He presented his findings related to gene regulation control in meiosis during pollen development.

7.7 India Today

A one day meeting on contemporary issues in the country was organized on November 19, 2015. The speakers were Professor K. Satchidanandan, Dr. R. Umamaheshwari and Dr. Meera Nanda.

7.8 National Conference on Ethology and Evolution 2015

A national conference on Ethology and Evolution was organized during October 30 – November 01, 2015. The conference was open to faculty, post-docs and students who are interested in ethology and evolution. However, given that IISERs were set-up with a mandate towards undergraduate research and education, we encouraged undergraduate and graduate students' participation in the meet to showcase their research work and get feedback from the scientific community. A total of 120 participants attended the conference which included 3 invited plenary speakers, 6 invited young scientist and 90 students (PhDs and undergraduate) and the remaining were early career researchers. The participants were from institutes all over the country. These include: all 5 IISERs (Mohali, Kolkata, Pune, Trivandrum and Bhopal), NCBS, IISc, WII, JNCASR, KFRI, Periyar University, BHU, Gurukul Kangri University, Delhi University, Bangalore University, University of Hyderabad and Madurai Kamaraj University.

Three plenary speakers were invited for the conference who were experts in the field of Ethology and Evolutionary Biology, namely, Professor Mewa Singh, Life-Long Distinguished Professor, University of Mysore, Professor Uma Shankar, Professor, University of Agricultural Sciences and Professor Amitabh Joshi, Professor, JNCASR. Apart from this, six invited lectures were delivered by young scientists including Dr. Praveen Karanth, IISc Bangalore, Dr. Ullasa Kodandaramaiah, IISER TVM, Dr. Anuradha Bhat, IISER Kolkata, Dr. Sutirth Dey, IISER Pune, Dr. TNC Vdya, JNCASR, Dr. Bodhisatta Nandy, BHU, Varanasi.

7.9 Advanced Techniques in Protein Design and Engineering

The Center for Protein Science, Design and Engineering (CPSDE), a center of excellence under Frontier Areas of Science and Technology (COE-FAST) MHRD, conducted its first national workshop on "Advanced Techniques in Protein Design and Engineering" at IISER Mohali during March 15–19, 2016. The aim of this workshop was to provide basic knowledge as well as exposure to advanced techniques used in rational protein design and protein characterization. The workshop had lectures on computational aspect of protein design and structural studies. There were both lectures and demonstrations showing advanced protein characterization techniques such as x-ray crystallography, small-angle x-ray scattering, surface plasmon resonance, fluorescence spectroscopy, isothermal titration calorimetry and atomic force microscopy. The workshop had 38 participants from all over India.

7.10 Recent Advances in Applications of Transmission Electron Microscope

The meeting focused on recent developments in TEM as a research facility with talks by distinguished researchers in the area with lectures for non-specialists.

7.11 Biology Research Seminar Day : Winter 2015

Doctoral students (Amandeep Kaur, Saurabh Pandey and Saikat Ghosh) and research associate (Yogesh Dahiya) of the department of biological sciences organized "Biology Research Seminar Day - Winter 2015" on December 11, 2015 in the lecture hall complex of IISER Mohali.

The talks were from senior doctoral students that included Sukhdeep Kumar (Guptasarma lab), Prabhat Kumar Mahato (Bhattacharyya lab), Vinesh Shenoi (Prasad lab), Sanica Sakharwade (Arunika Mukhopadhaya lab), Satish Kumar Tiwari (Lolitika Mandal lab), Ashish Toshniwal (Sudip Mandal lab), Avinash Chandel and M. Zulkifli (Bachhawat lab), and post-doctoral research associates that included Pratima Pandey (Babu lab), Rajbir Kaur (Ray Choudhury lab), and Monika Mahajan (Yadav lab).

A research associate chaired each session. Notable features of the event were quality science from young scientists, very tightly maintained schedule with an enthusiastic participation of faculty and students in the discussions. The event ended with a high tea hosted by the faculty for the students and research associates.

7.12 Learning from the Utopian City

International workshop on 'Learning from the Utopian City' was held at IISER Mohali from February 28th and 29th, 2016. The workshop brought together Indian and international academics, policy makers, bureaucrats, urban activists and NGOs on the same platform to deliberate upon the contested histories and imagined futures for the city of Chandigarh. Ideas of Chandigarh as a 'heritage city' and as 'a smart city' were examined.

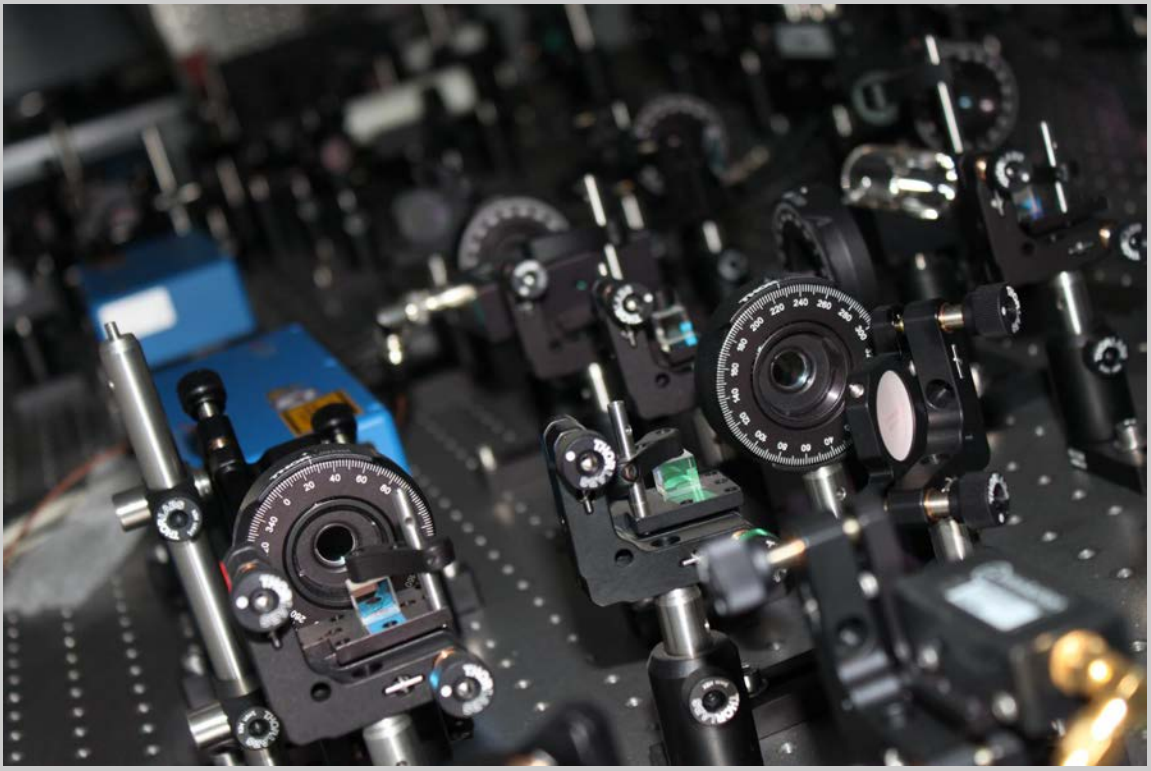
The workshop was part of a larger series of workshops conducted in India (at Varanasi, Navi Mumbai and Nashik) and a conference at the University of Leeds, UK. They were part of a project on Utopian Cities funded by the Arts and Humanities Research Council (AHRC), UK and Indian Council of Historical Research (ICHR). Dr. Anu Sabhlok is the India PI for this project and Dr. Ayona Datta (University of Leeds) is the UK PI.

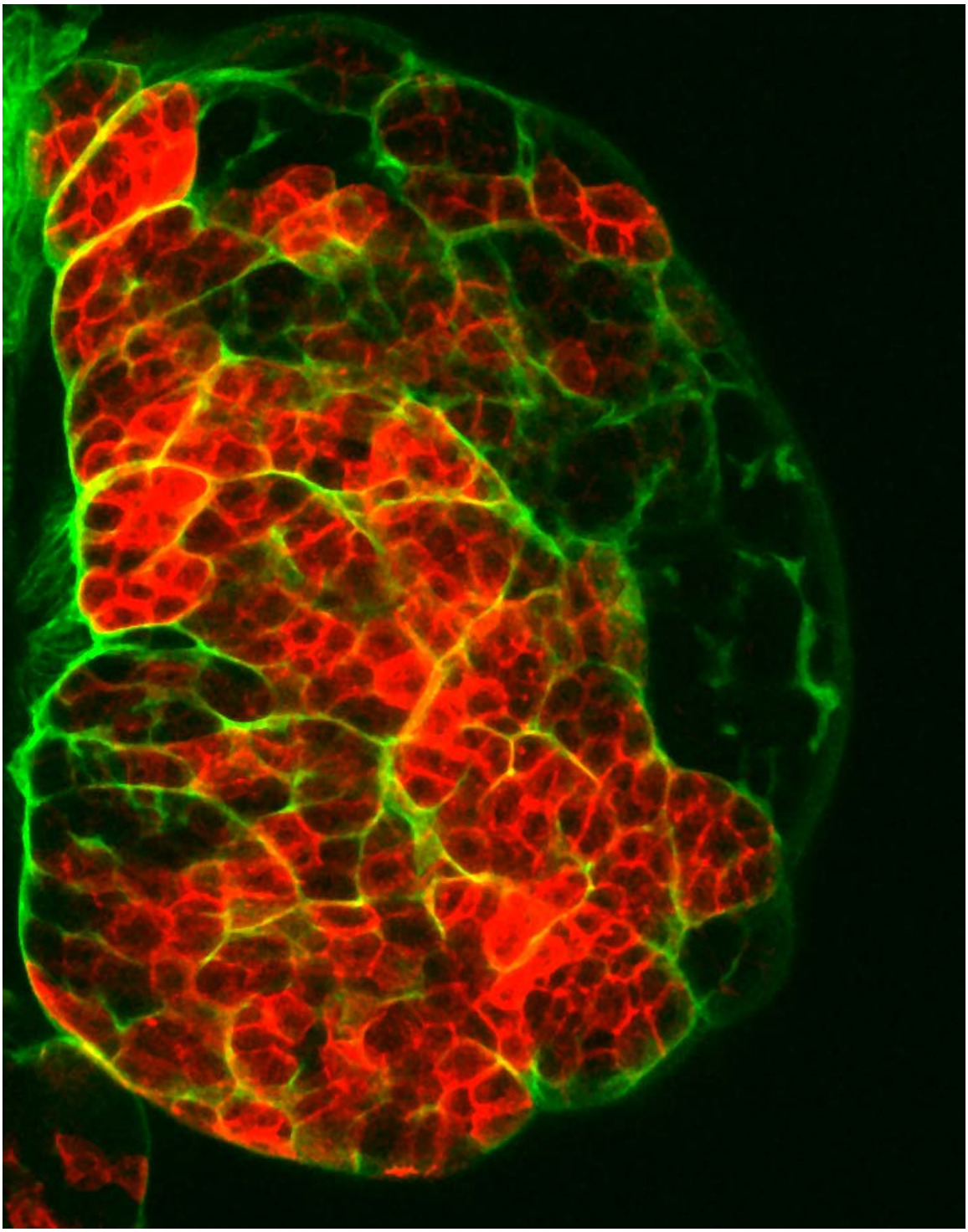
7.13 International Workshop and Meeting on Biosphere

This workshop and meeting on Biosphere-Atmosphere Interactions and its Impacts on Climate and Air Quality was organized at IISER Mohali by the Department of Earth and Environmental Sciences and the Integrated Land Ecosystem-Atmosphere Processes Study (ILEAPS) and Future Earth and World Climate Research Program (WCRP) on March 21, 2016. The topics covered during the workshop included:

- Scientific research and capacity building efforts in the area of Biosphere-Atmosphere Interactions and its Impacts on Climate and Air Quality.
- Global change and sustainability science.
- Engagement of Indian community with top global scientists in ecosystem research to cultivate the next generation of international researchers in India.
- Promote networking between national and international scientists. The inaugural address was given by Dr. Thorsten Kiefer (Director of Future Earths Paris Hub) while the key note address was delivered by Professor Alex Guenther from the University of California , Irvine, USA. A total of 24 invited experts from India and abroad delivered lectures and chaired the sessions.

8 Research Activities





8.1 Department of Biological Sciences

8.1.1 Summary of the research work

Kavita Babu : Cell Adhesion Molecules (CAMs) are known to play important roles at synapses, which are the sites of communication between neurons and their targets. They are required for various aspects of synapse function including maintaining the integrity and promoting the stability of the synapse as well as linking the pre-synaptic and post-synaptic membranes. CAMs have also been shown to be required for target recognition and the differentiation of pre- and post-synaptic structures (Yamamgata M. et al., Current Opinion in Cell Biol. 2003, 15:621-632).

Kavita Babu's Laboratory aims to study the function of Cell Adhesion Molecules on synapse development and activity at the C. elegans neuromuscular junction (NMJ). Her group is performing experiments that will allow for identifying CAMs that regulate the body wall NMJ and interneuron synapses in C. elegans. Kavita had previously done an RNAi screen for changes in aldicarb sensitivity on a set of cell adhesion molecules picked out from the C. elegans genome (Babu K. et al., Neuron 2011, 71(1):103-116). Aldicarb is an acetylcholine esterase inhibitor that causes hypercontraction of muscles in wild type animals. Mutants with defects in synaptic transmission could have altered responses to aldicarb (Miller K.G. et al., PNAS 1996, 93(22): 12593-8). Kavita's Laboratory is currently characterizing some of the Cell Adhesion Molecules that she had found in her earlier screen, that show either enhanced sensitivity or resistance to aldicarb. They use techniques including cell biological assays like imaging, behavioral assays and genetics to understand how these Cell Adhesion molecules affect the C. elegans nervous system.

Anand K. Bachhawat : Glutathione degradation plays an important role in glutathione and redox homeostasis and thus it is imperative to understand its mechanism in detail. We have described ChaC2 as a new enzyme for glutathione degradation in the cytosol of mammalian cells, distinct from the recently described ChaC1.ChaC2 has lower catalytic efficiency and functions like a housekeeping enzyme in eukayotic cells.

Samarjit Bhattacharyya : Our lab is interested in understanding the cellular and molecular mechanisms of receptor-trafficking in the central nervous system (CNS). Normal signaling depends on accurate localization of such receptors in specific regions of the cell, and the process of receptor trafficking plays a critical role in controlling this localization. Despite the obvious significance of this process, we know very little about the proteins that mediate trafficking of neurotransmitter receptors in the brain, the regulatory mechanisms that control these proteins and the functional consequences of these regulatory mechanisms. Currently, our primary focus is to investigate the endocytic membrane trafficking of AMPARs and mGluRs, two important classes of glutamate receptors that play a pivotal role in synaptic plasticity and neural development. These receptors have also been implicated in various neuropsychiatric disorders. The trafficking of these receptors are thought to be critical for virtually all forms of experience-dependent plasticity, including learning and memory and are believed to play crucial role in various neuropsychiatric disorders. We use various systems starting from non-neuronal cell lines, neuronal cell lines to primary neurons and employ various techniques ranging from cell biology, biochemistry to molecular biology to address these questions.

Rachna Chaba : Metabolism provides energy, creates building blocks, and regulates macromolecular processes. Integrating metabolism with stress responses provides the robustness that enables bacterial survival in diverse nutrient and toxic environments, key to their success as commensals, pathogens and industrial workhorses. My research group at IISER-Mohali is interested in studying metabolic pathways and stress responses in bacteria, with a special focus on Long chain fatty acid (LCFA) metabolism. LCFAs are carboxylic acids with a long unbranched aliphatic chain and are used as a tremendous source of metabolic energy by several bacteria including many important pathogens. My lab has utilized high-throughput quantitative genetic screening methodology (response of every gene deletion strain, $\approx$ 4000 strains, to chemical perturbations), to identify novel players and stress response pathways in LCFA metabolism in E. coli. The information extracted from genetic screening has been integrated with knowledge from other high-throughput datasets to generate testable hypotheses about the function of novel genes, the process they participate in, and interconnections between pathways. Such an analysis has provided us lead in two different directions. First, we find that LCFA metabolism generates oxidative stress in E.

coli. We are currently investigating the reason for LCFA-mediated oxidative stress and the strategies employed by bacteria to avoid damage during LCFA metabolism. Second, we have identified a putative transcriptional regulator to be required for successful growth of the bacteria on LCFAs. We are performing a detailed characterization of the predicted regulator in order to understand its role in LCFA metabolism. Our work intends to provide new information regarding LCFA metabolism that can be harnessed to design novel antibacterials.

Kausik Chattopadhyay : Pore-forming protein toxins (PFTs) represent a special class of membrane damaging cytolytic proteins, and they are found in wide spectrum of organisms ranging from bacteria to humans. They exert their toxic effects by punching 'holes' into target cell membrane, thus destroying the natural permeability barrier function of the cell membrane. PFTs are, in general, synthesized as water-soluble monomeric molecules, and in contact with target cell membranes they form membrane-inserted oligomeric pores. However, in spite of sharing this overall general scheme, PFTs differ significantly from each other in the intricate details of their pore formation mechanisms. A major mechanistic challenge associated with the membrane pore formation process by PFTs is elucidating the folding pathways that ensure thermodynamic compatibility of the water-soluble monomeric and the membrane-inserted oligomeric form of the toxin with aqueous and lipid milieu, respectively. One of the major research interests of my group is focused on studying structure-function relationship of some of the prominent bacterial PFTs. The critical issues we address are:

(i). Mechanistic details of oligomeric membrane channel formation by PFTs.

(ii). Mechanism(s) associated with cellular responses triggered by PFTs.

Rhitoban Ray Choudhury : Our lab is generally interested in evolutionary genetics with a strong emphasis on genomics and symbiosis. The model organism is the tiny parasitoid wasp genera called Nasonia which feed mostly on pupa of different flies. This is a group of four species and have their genomes sequenced and also has many different molecular tools available for genetic research. One of the two broad areas of study in the lab is to identify gene(s) responsible for specific phenotypes using Nasonia as a model system. The other broad area of research involves working with a bacteria called Wolbachia. These bacteria are extremely wide-spread in nature and infects every two out of three insects. Wolbachia causes several unique reproductive alterations in their insect hosts such as feminization of males, induction of parthenogenesis, male killing and cytoplasmic incompatibility. The lab is interested in trying to find the genetic and genomic basis of these phenotypes. The lab has been successful in obtaining Nasonia strains from India and is now genetically characterizing them for further studies. A recent area of investigation has been the role of fungi and bacteria in fungus-growing termites. These insects have figured out agriculture for over thirty million years and now use a monoculture of a specific fungus for food. The research in the lab has been focused on how such monocultures can survive in the presence of many invasive fungal and bacterial infections.

Purnananda Guptasarma : Our laboratory's main interests lie in understanding and engineering the manner in which globular proteins fold; in why (and how) they misfold; in what these misfolded forms do (to cause human disease) or can be made to do (e.g., conduct electricity); in what determines the thermodynamic and kinetic stabilities of the folded, native forms of globular proteins (especially those evolved to function in extremophile microbes); and in developing protein engineering approaches through which the activities and functions of globular proteins and enzymes can be altered through rational and/or combinatorial mutagenesis. Our group commonly employs (and also occasionally develops) preparative and analytical methods/approaches deriving from different forms of electronic and vibrational spectroscopy, mass spectrometry, biomolecular chromatography, electrophoresis, computation, calorimetry, microscopy, and recombinant DNA-based experimentation, and also certain other tools/techniques of organic and physical biochemistry. In addition, he also loves to dwell upon (and occasionally contribute to) current understanding of the mechanistic basis of regulation of gene expression, and the cellular and molecular basis of development.

During the last academic year, work has been continuing in our laboratory on structural and functional studies, and engineering, of mesophile DNA-binding nucleoid-associated proteins such as *Escherichia coli* HU-A

and HU-B, cadherins involved in cell-cell interactions, and hyperthermophile and mesophile proteins and enzymes such as glucano-transferases, DNA polymerases, ligases, lyases, proteases, aminopeptidases, glycosyl hydrolases, triosephosphate isomerases, and on other subjects such on the mechanism of action of anionic surfactants on protein amyloid transformations, on the redesign of interferon-gamma into a form with higher solubility, and on the interaction of arsenic with estrogen and proteins.

Manjari Jain : Currently, we are using an integrated taxonomic approach to address the problem of species delineation. Towards this, we are using behavioural, molecular, taxonomic and acoustic data in order to define species boundaries in a group of field crickets belonging to the genus Teleogryllus that are distributed across the Indian subcontinent. Influence of changing environment on animal behaviour: Another major focus of the lab is on examining how anthropogenic changes in the environment influence animal behaviour. For this, we have been studying the calling behaviour of field crickets under natural and artificial light conditions. There are strong indications that seemingly small changes in light conditions can significantly alter the behaviour of nocturnal animals such as crickets.

Lolitika Mandal : Our research group has demonstrated the presence of active hematopoietic sites in Drosophila, which can give rise to new blood cells and can respond to immune challenges. Embedded within a functional network of Laminin and collagen IV like protein this hematopoietic hub seems to be simpler version of the vertebrate bone marrow.

Given the fact that the vertebrate bone marrow is not easily accessible, these findings has establish Drosophila adult hematopoiesis as a simpler yet genetically amenable model to tease out normal and aberrant hematopoiesis, and queries related to cell migration, stem cell biology, immunity, wound healing and aging.

Sudip Mandal : Our group is interested in understanding how fundamental cell biological processes are controlled by mitochondrial function. For our molecular genetic analysis we employ Drosophila melanogaster as our model organism. Currently we are investigating the role of mitochondria in regulationg cell growth and differentiation.

Shravan Kumar Mishra : Synthesis of proteins in the cell starts with the amino acid methionine. Sometimes, however, a non-methionine amino acid is desired at the amino-terminus of proteins for function. How do our cells get proteins starting with non-methionine amino acids, if needed? In the recent past, we have shown that cleavage of ubiquitin-like fusions from the precursor of a protein produces the protein starting with a non-methionine amino acid. We have identified a ubiquitin-fold containing protein, Ubl8, that is conserved from Schizosaccharomyces pombe to humans. This protein is synthesized as a precursor with ubiquitin fold at the amino-terminus and a C-terminal uncharacterized region. Despite being distinct from canonical ubiquitin, the ubiquitin fold of Ubl8 precursor is processed by ubiquitin-specific proteases. Thus, the ubiquitin-like processing makes the C-terminal domain of Ubl8 to start with a non-methionine amino acid for optimum function. In addition, this processing also makes this protein optimally stable by targeting for degradation.

Gene expression in eukaryotes, for example, humans, passes through the process of RNA splicing. In this process, any undesired pieces of pre-messenger RNAs are removed following transcription. However, improper removal of introns impedes production of right kind of proteins in the cell. We ask: how does the cell ensure correctly and timely excision of introns from pre-messenger RNAs? We have identified a factor that functions to remove introns in a timely manner from a selected subset of pre-messenger RNAs. The C-terminal domain of aforementioned Ubl8 participates in RNA splicing in an intron-specific manner. The processing enzymes of Ubl8 also function similarly as intron-specific RNA splicing factors. The protein and its processing enzymes are required for splicing of genes involved in processes like DNA replication, transcription and telomeric silencing. We are continuing to study role of Ubl8 and its processing enzymes in these processes.

Arunika Mukhopadhaya : Our overall research interest is focused towards elucidating the immunomodulatory role of porin family of outer membrane proteins from the Gram negative pathogenic bacteria. In our recent studies, we have shown how Vibrio cholerae porin OmpU exerts immunomodulatory functions in the context

of host innate immune system. Toward exploring the implications of V. cholerae OmpU for the host-pathogen interaction processes, we have also shown that OmpU can trigger a unique 'caspase-independent programmed cell death' upon translocating to the host cell mitochondria. Our studies have provided novel insights regarding OmpU functionalities in the context of host-pathogen interaction processes and immunity.

Samrat Mukhopadhyay : Amyloids are ordered protein aggregates that are implicated in a variety of debilitating human disorders such as Alzheimer's, Parkinson's and prion diseases. My laboratory utilizes a diverse array of methodologies to unravel the key molecular events that are crucial in amyloid formation from a number of proteins. We have recently shown the presence two distinct types of inter-convertible oligomers during the misfolding event of the human prion protein. Our results demonstrate that highly ordered large beta-rich oligomers represent benign (off-pathway) intermediates, whereas, structurally labile small oligomers are capable of switching to an ordered amyloid-state that exhibits profound toxicity to mammalian cells.

Shashi Bhushan Pandit : The main research interest of our group is to understand structural/sequence basis of enzyme promiscuity, ligand-protein interactions and modeling of multi-domain proteins with an aim to develop robust computational prediction methodologies. Microorganisms show remarkable resilience towards deletion of genes involved in metabolic pathways. Usually, this is attributed to enzyme's capability to catalyze alternate substrate/reaction (promiscuous activity). Hence, including these promiscuous reactions in metabolic pathway reconstructions can provide complete metabolic capability of an organism. Recently, using chemoinformatics approach we have developed a method to predict putative promiscuous reactions using molecular reaction signatures. In this approach, we assumed that enzymes would accommodate any substrate and catalyze the same. To evaluate this assumption, we are systematically investigating the structural and sequence properties of enzymes or substrates binding sites, which could confer them promiscuity. Furthermore, we will investigate the mechanistic aspect of enzyme promiscuity and study their evolution. In addition to this, we will study the role of protein dynamics in ligand-protein interactions. Many enzymes are multi-domain proteins. In order to investigate domain-domain structural roles, we are developing tools for tertiary structure prediction of multi-domain proteins employing our recently developed method TASSER (Threading ASSembly and Refinement).

N. G. Prasad : We are interested in understanding the effects of sexual conflict on aging and immune response. Theory predicts that intersexual conflict promotes increased investment in sexual activity under certain conditions. Hence when these conditions are satisfied, increased investment in reproduction related activity should divert resources away from other activities involved with somatic maintenance. Further, sexual conflict may also influence the sex specific gene regulation, especially the ones involved in metabolic and immune path ways. Hence it follows that with resource acquisition having an upper limit, sexual conflict will influence both aging and immunity. We are testing these hypotheses using classical laboratory selection and cytogenetic cloning approaches. Our results suggest that the costs of increased immunity are not paid in terms in life-history traits and that sexes within the same population can evolve different mechanisms of immunity, thereby affecting the evolution of immune response.

Rajesh Ramachandran : We are trying to understand the mechanisms of retina regeneration in lower vertebrates like zebrafish using genetic, cellular, molecular and pharmacological approaches. The benefit of such study is to enable us to find reasons why mammalian retina do not regenerate. The knowledge in the field eventually may enable us to coax a human retina to regenerate after a damage. We have created several transgenic zebrafish lines that can be used to better understand the molecular mechanisms that leads to regeneration in an orchestrated manner. It would be one of the easier way for in vivo monitoring of the regeneration cascade as well. We would also started our exploration into mammalian retina using lessons from zebrafish which is necessary for further advancing to human studies.

Sharvan Sehrawat : In a quest to clear infections of various kinds, the host responds to the insults and induces activation of cells of innate and adaptive immune system that eradicate invading pathogens. At the same time regulatory mechanisms also operate to curtail excessive inflammatory responses. The timely induction of an adaptive immune response and its maintenance in the memory phase forms the basis of lasting protective immunity

against infectious diseases and provides clue for successful vaccination. After receiving help from CD4 T cells, pathogen-specific CD8 T cells are appropriately activated to control the spread of intracellular pathogens such as viruses. Animal models are used to investigate host-pathogen interaction. Employing various molecular and immunological approaches, we try to understand the host-pathogen interaction. We are also putting efforts in developing novel animal models to study immunity and immunopathology during viral infections.

We have cloned and expressed MHC class I heavy chains of different MHC molecules of zebrafish. Thus, Uda, Uba, Ull as well as β_2 microglobulin of zebrafish have been amplified and cloned. For the generation of detector reagents, heavy chains of MHC have been modified in such a way that it has a C terminal biotinylation sequence that can be biotinylated in a sequence specific manner using biotin ligase enzyme (BirA). This trick affords us to produce the protein with biotin as a handle. Then fluorescent-labeled streptavidin can be used to generate a tetramer not only to increase the affinity of interaction but also to use it a detector reagent directly. However there is one issue here. The heavy chain and beta 2 microglobulin are normally expressed in bacterial expression system and invariably are expressed in inclusion bodies. Therefore, after purification of inclusion bodies, refolding in an oxidised and reduced glutathione buffer was performed to generate the heterotrimeric complex consisting of peptide of choice (specific for the MHC haplotype), heavy chain and beta 2 microglobulin. We have successfully generated a monomer of this complex for zebrafish MHC class I molecules and then generated a fluorescent tetramer from this monomer. The peptide used for generating this complex was SSIEFARL, one of the immunodominant peptides for HSV I in C57BL/6 mice. This tetramer was used in initial studies to demonstrate that virus-specific CD8 T cells can be detected in zebrafish using cytofluorimetrically. Although it was little surprising for to observe that a peptide immunodominant in mice for one MHC haplotype could also be use for generating a zebrafish tetramer. The sequence analysis was performed on the residue of mouse MHC (H-2Kb) that interacts with the peptide SSIEFARL and compared it with that of Uda. Indeed quite a significant numbers of residues in both MHC molecules were similar with respect to their composition and position suggesting indeed this same peptide could serve as an immunodominant peptide for Uda. Generation of these reagents already put us in a good steed to jumpstart the project.

Kuljeet Singh Sandhu : Genome needs mechanisms to coordinate the expression of thousands of genes. The genome-wide maps of transcription, TF binding, chromatin modifications present a linear 1-dimensional information of genome regulation and until recently it remained unclear how the genome communicates with itself to regulate the essential genomic functions like transcription and replication. The recent boom in the proximity ligation based molecular techniques has highlighted the role of three dimensional folding of chromatin fiber in bringing together the related genes and their regulatory elements in the nuclear space. However, the studies so far had been focused on relatively short range interactions and the role of super-long range or the trans (inter-chromosomal) interactions are not well understood. We are interested in understanding the fundamental principles, evolutionary constraints and the functional/developmental dynamics of super-long range trans chromatin interactions in the nuclear space. The work would help understanding principles of genome regulation, which has implications in understanding the complex disorders.

Mahak Sharma : The primary research interests of my laboratory focus on studying the molecular mechanisms regulating vesicular trafficking towards late endosomes and lysosomes. Regulation of lysosomal degradation pathway has garnered recent attention due to its crucial role in termination of growth factor signaling as well as in mediating autophagic clearance of misfolded proteins. Lysosomes also mediate clearance of microbial pathogens phagocytosed by specialized cells such as macrophages. HOPS (HOmotypic fusion and Protein Sorting) is an evolutionarily conserved hexameric protein complex that regulates cargo trafficking to the lysosome. Unlike yeast where the mechanism of HOPS action is well understood in vesicle tethering and fusion, not much is known about how mammalian HOPS complex regulates lysosomal trafficking. In a recent study from my laboratory (Khatter et al., Journal of Cell Science 2015) we have identified that small GTP-binding protein Arl8b directly interacts with and targets human HOPS complex to lysosomal membranes. We also found that HOPS complex regulates destruction of internalized epidermal growth factor receptor (EGFR) in lysosomes. EGFR is a potent cancer-causing gene (oncogene) that drives tumor progression and thus proteins regulating EGFR destruction such

as HOPS complex can inhibit tumor growth. Previous studies had shown that HOPS complex subunit Vps41 is required for the clearance of misfolded aggregates of alpha-synuclein that result in neuronal cell death in patients with Parkinson's disease. We find that a previously-reported single nucleotide variant of Vps41 present in a small percentage of the human population cannot interact with Arl8b and therefore does not localize to lysosomes. In the future, it will be important to know if this population has a higher risk of diseases including Parkinson's and cancer that can be caused due to interference with functions of lysosome.

Several intracellular pathogens including Mycobacterium, Coxiella and Salmonella hijack the endocytic machinery of the cell for their advantage to establish a replicative niche inside the host cells. Our recent work suggests that Salmonella encodes effector proteins to recruit HOPS complex on Salmonella-containing vacuole (SCV). HOPS complex is essential to mediate fusion of SCV with late endocytic compartments that in turn is crucial for survival and replication of Salmonella inside the host cells.

Somdatta Sinha : The focus of our theoretical research is to understand the logic and design of biological processes at different spatiotemporal scales. Towards this we have continued our research in the areas of - (a) Protein structure-function analysis; (b) Evolution of biochemical pathways; and (c) Metapopulation dynamics. We have used a combined computational approach, integrating the coarse-grained graph theoretic and fine-grained molecular dynamics simulation methods, to analyse protein structures at different length scales to understand the "small" allosteric conformational changes that underlie new functional properties in proteins of similar three-dimensional structures. We have studied bacterial Lipase A and its thermostable mutants, and Anthranilate Synthase, and elucidated their structural features and mechanism of regulation for functional alterations. A large phylogenetic analysis of the aromatic amino acid biosynthesis pathway was undertaken in many bacteria and archaea to understand the evolution of intracellular biochemical pathways at the systems (network) level. We also studied the transient and long term dynamics in ecologically relevant meta-population models and found that the propensity to form transient and long-term spatiotemporal patterns in dynamics of groups of subpopulations depends on the types of nonlinearity in population regulation. The presence of "Chimera"-like states have also been shown to exist in these metapopulations.

Ram Yadav : Our laboratory is involved in understanding the development of shoot apical meristem (SAM). We use genetics, genomics, live imaging and high throughput biology methods to discover the novel regulatory mechanisms underlying SAM development. Plants are distinctive in various ways when compared with animals. Plants produce biomass one thousands times more than their animal counterparts. Humans and animals, to sustain them on the planet earth, are using a large part of this biomass as food and fodder. The activity of SAM derives eighty percent of this biomass. This extraordinary ability of biomass production comes from the stem cells, which resides at the tip of the SAM. Stem cells self-renew within the central zone and differentiate in to progenitors in the periphery of shoot. Using Arabidopsis thaliana as a model organism he is trying to address two key questions. How stem cells get specified? How do they differentiate in to organ primordia? His current work focuses on the role of WUSCHEL (WUS) in regulating the differentiation of stem cell progenitors. He identified from the microarray studies that WUS represses a large number of genes including three key genes encoding enzymes for auxin biosynthesis. Promoter reporter expression and in situ hybridization studies revealed that two genes are expressed in the differentiating progenitors cells. Interestingly the expression of both genes is attenuated in the stem cells and niche cells. To test further the importance of auxin in stem cell differentiation, ectopic expression of the auxin biosynthesis genes was carried out under the stem cell (CLAVATA3) and niche cell (WUS) specific promoters. The overexpression of auxin biosynthesis genes led to the termination of shoot early in development. Moreover, putative binding sites were predicted and verified for WUS binding by protein-DNA interaction assay. Taken together, this work suggests that WUS not only promotes stem cell fate but it also directly control the transition of stem cell progenitors in to differentiated cells in the SAM.

8.1.2 Visits of faculty members

- **Kavita Babu**
  - visited *Banaras Hindu University (BHU), Varanasi (India)* during September 5-7, 2015.
  - visited *Indian Institute of Technology (IIT), Kanpur (India)* during Oct 4-7, 2015.
  - visited *National Brain Research Centre (NBRC), Manesar (India)* during Mar 13-16, 2016.
- **A. K. Bachhawat** visited *Cystinosis Research Foundation, Irvine, USA* during March 3-4, 2016.
- **Rachna Chaba** visited *University of California San Francisco, San Francisco, CA, USA* during July 31-August 3, 2015.
- **K. Chattopadhyay** visited *Department of Chemical Sciences, Tata Institute of Fundamental Research, Mumbai (India)* during August 17, 2015.
- **Sudip Mandal**
  - visited visited *Agharkar Research Institute, Pune (India)* on December 14, 2015.
  - visited *Indian Institute of Science Education and Research Pune, Pune (India)* during December 15-18, 2015.
- **Samrat Mukhopadhyay**
  - visited *Indian Institute of Science, Bangalore (India)* during December 2015.
  - visited *Indian Institute of Technology, Bombay (India)* during January 2016.
  - visited *Tata Institute of Fundamental Research (India)* during March 2016.
  - visited *University of Manchester (U.K)* during June 2015.
- **Mahak Sharma** visited *University of Nebraska Medical Center, Omaha, Nebraska (United States)* during May 05, 2015.-June 02, 2015.
- **Somdatta Sinha**
  - visited France under the *INSA-French Academy of Sciences Bilateral Exchange Programme* during May 17 - June 1, 2015.
  - visited *Santa Fe Institute (USA)* during June 15-30, 2015.
  - visited *The Abdus Salam International Centre for Theoretical Physics (ICTP) and International Centre for Genetic Engineering & Biotechnology (ICGEB) (Italy)* during July 27-31, 2015.
- **Ram Yadav**
  - visited *Indian Institute of Science, Bangalore (India)* during March 13 - 14, 2016.
  - visited *National Centre for Biological Sciences (India)* on March 15, 2016.
  - visited *Punjab Agricultural University, Ludhiana (India)* on September 5, 2015.

8.1.3 Talks delivered

- **Kavita Babu**
  - Model Organisms in Neuroscience : Banaras Hindu University, Varanasi : September 5 and 6, 2015.
  - The Cell Adhesion Molecule, RIG-3, is required for normal nervous system function : IIT Kanpur : October 6, 2015.
  - The Cell Adhesion Molecule, RIG-3, is required for normal nervous system function : XXXIII Indian Academy of Neuroscience Meeting : Punjab University : November 2, 2015.
  - Understanding the molecular mechanism of RIG-3 functioning at the synapse : First Indian C. elegans Meeting : Lonavala : January 31, 2016.
  - Model Organisms in Neuroscience : NBRC : March 15, 2016.
- **Yogesh Dahiya**
  - The Role of the CREB-1 homolog, CRH-1, in associative learning in Caenorhabditis elegans : First Indian C. elegans Workshop : TIFR : January 29, 2016.
- **Anand K. Bachhawat**
  - A carotenoid-based screen for identifying novel genes and mutants that increase metabolic flux in the isoprenoid pathway of S. cerevisiae : IIT Mumbai (Indo-US workshop) : March 18-20, 2016.
  - Development of a robust yeast assay for cystinosin function in Saccharomyces cerevisiae : Cystinosis Research Foundation, USA : March 3-4, 2016.
- **Samarjit Bhattacharyya**
  - Inside story of metabotropic glutamate receptors (mGluRs) : Annual meeting of Indian Academy of Neurosciences, Panjab University, Chandigarh (India) : October 31 - November 2, 2015.
  - Metabotropic Glutamate Receptor (mGluR) Trafficking : Ins and Outs. Exploring Biological systems : Cell to organisms (EBS) 2016, University of Calcutta, Kolkata (India) : March 1 - 2, 2016.
- **Kausik Chattopadhyay**
  - Invited lecture at the Department of Chemical Sciences, TIFR Mumbai : August 17, 2015.
- **Rachna Chaba**
  - Ubiquinone combats oxidative stress generated by Long chain fatty acid utilization in Escherichia coli : Molecular Genetics of Bacteria and Phages Meeting, University of Wisconsin-Madison, WI (USA) : August 4-8, 2015.
  - How does E. coli combat oxidative stress generated by Long Chain Fatty Acid (LCFA) metabolism? : Bacterial Expressions II Conference, NCBS Bangalore (India) : December 1-5, 2015.
- **P. Guptasarma**
  - Extreme Protein Engineering : Department of Biotechnology, Indian Institute of Technology Madras, Chennai : May 10, 2015.
  - Engineering and aggregation studies involving nuclear crystallins : 4th meeting of the Indian Eye Research Group Association for Research in Vision and Ophthalmology India Chapter, LV Prasad Eye Institute and Centre for Cellular and Molecular Biology, Hyderabad : July 25, 2016.
  - Thermodynamics versus kinetics : The protein folding enigma : Keynote Address at the 10th national Conference on Thermodynamics of Pharmaceutical, Chemical and Biological Systems, Panjab University : November 20, 2015.

- Calcium, beta-2-microglobulin and the disease known as dialysis-related amyloidosis (associated with treatment for kidney disease) : Unexpected connections : 42nd National Conference of the Association of Clinical Biochemists of India (ACBICON 2015), Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh : November 25, 2015.
- The E. coli protein HU and its role in biofilms : National Conference on Frontiers in Applied Biotechnology, Chandigarh University, Chandigarh : December 16, 2016.
- The ancillary molecular and cellular consequences of DNA-binding by the histone-like protein, HU : Annual Symposium of the Indian Biophysical Society, Indian Institute of Science, Bangalore : February 8, 2016.
- Are globular and fibrillar proteins photo-tunable nanomolecular devices designed by nature? : NanoSciTech 2016, Panjab University, Chandigarh : February 20, 2016.
- Arsenic-estrogen interactions : Simple molecular explanation for pathologic reproductive consequences of chronic arsenic ingestion? : 5th Annual Conference of Molecular Pathology Association of India, Postgraduate Institute of Medical Education and Research, Chandigarh : March 12, 2016.

- **Lolitika Mandal**
  - Invited Speaker, Platinum Jubilee Celebration : MCB, IISc Bangalore : November 10-14, 2015.

- **Shravan Kumar Mishra**
  - Department of Molecular Cell Biology, Max Planck Institute of Biochemistry Martinsried (Germany) : February 2016.
  - Zentrum für Molekulare Biologie der Universität Heidelberg (Germany) : February 2016.
  - Department of Biochemistry, Goethe University of Frankfurt (Germany) : February 2016.
  - Department of Microbiology and Cell Biology, Indian Institute of Science Bangalore (India) : February 2016.
  - National Agri-Food Biotechnology Insitute Mohali (India) : April 2015.

- **Arunika Mukhopadhaya**
  - Two lectures in GIAN course "Emerging and prevalent infections : our preparation to tackle" : IISER Mohali : January 26 - February 4, 2016.

- **Samrat Mukhopadhyay**
  - Talk at the International conference on Optics within Life Science (OWLS), TIFR Mumbai : March 2016.
  - Talk at the CRSI-RSC joint meeting Panjab University : February 2016.
  - Talk at the Indian Institute of Technology Bombay : January 2016.
  - Talk at the Discussion Meeting on Biological Membranes, Indian Institute of Science Bangalore : December 2015.
  - Talk at the IISc-RSC joint meeting : Challenges in Organic Materials and Supramolecular Chemistry (ISACS18), Indian Institute of Science Bangalore : November 2015.

- **Shashi Bhushan Pandit**
  - Development of Meta-approached to predict catalytic residue : Bimolecular Interactions at NCBS, Bangalore : December 26, 2015.
  - Protein Function Annotation, From sequence to structure based approaches : Department of Bioinformatics, DAV College, Sector 10, Chandigarh : January 30, 2016.

- Protein tertiary structure prediction : CPSDE Workshop in IISER Mohali : March 16, 2016.

- **Rhitoban Ray Choudhury**
  - Using Wolbachia bacterium to cure vector-borne diseases : PGIMER, Chandigarh : March 2015.
  - Wolbachia and Symbiosis in Insects : PG Department of Zoology. DAV College, Chandigarh : February 2016.

- **Mahak Sharma**
  - Arl8b interacts with PLEKHM1 to mediate endo-lysosomal fusion : All India Cell Biology Conference : December 7, 2015.
  - Emerging role of mammalian HOPS complex in regulating cargo traffic to lysosomes : implications in microbial clearance : University of Nebraska Medical Center (USA) : May 13, 2015.

- **Somdatta Sinha**
  - Modelling Malaria : EPSRC-DST conference on "Mathematics for health and disease" at ICMS, Edinburgh (UK) : April 13, 2015.
  - Compositional Complexity and Classification of Genomes : Symbiose, Rennes, (France) : May 27, 2015.
  - Designs of Regulation and Dynamics in Simple Biochemical Pathways : University of Montpellier (France) : May 26, 2015.
  - Analysis of biochemical circuits : UMR de Genetique Vegetale of Gif-sur-Yvette (France) : May 21, 2015.
  - Computational Biology - I and II : Complex Systems Summer School 2015, Santa Fe, NM (USA) : June 24 and 25, 2015.
  - Malaria Prevalence Pattern : Modeling and Data Analysis : Annual Meeting of the Society for Mathematical Biology at Atlanta, GA (USA) : June 30, 2015.
  - Modelling infectious disease from genomes to populations : International Centre for Genetic Engineering & Biotechnology (ICGEB), Trieste (Italy) : July 29, 2015.
  - Modelling Biological Systems : from genomes to populations : International Centre for Theoretical Sciences, Bangalore (India) : October 5, 2015.
  - Modelling infectious disease : Conference on "Infection and Molecular Epidemiology", Udaipur (India) : October 31, 2015.
  - Systems Biology I to IV : 4th SERC School on Non Linear Dynamics, Manipur University, Imphal (India) : November 25 and 26, 2015.
  - Systems and Biology : Complex Systems Winter School, IISER Mohali (India) : December 8, 2015.
  - Metapopulation dynamics in ecology : "Complex System Approach to Self-organization", IIT Madras (India) : February 4, 2016.
  - Modelling Periodic Processes in Biology : MKC Symposium, JNCASR, Bangalore (India) : February 5, 2016.
  - Talk at Bioinformatics Centre, Bose Institute, Kolkata, March 21-23, 2016.
  - Networks - a recurrent theme in biological systems : National Symposium on Computational Systems Biology JUIT, Waknaghat (India) : March 19, 2016.
  - Compositional Complexity in Genomic Patterns and Classification : Bioinformatics Centre, Bose Institute, Kolkata (India) : March 21, 2016.

- **Ram Yadav**
  - How do stem cells differentiate in the shoot apex? : MCB, IISc Bangalore : March 14, 2016.
  - Application of flow cytometry in studying cell type specification in plants : 17th Indo-US cytometry conference organized by IISc and NCBS Bangalore : March 14-15, 2016.
  - Understanding the inner functioning of shoot apex : Biennial Meeting of Indian Society of Development Biologists : CCMB Hyderabad : July 15-18, 2015.
  - **Shivani Bhatia** : A gene centered protein-DNA network for Arabidopsis thaliana shoot cell types : Arabidopsis2016, IISER Mohali : March 20, 2016.
  - **Prince Saini** : Developing a protein-protein interactome for cell type specific transcription factors involved in shoot apex development : Arabidopsis2016, IISER Mohali : March 21, 2016.
  - **Monika Mahajan** : Epigenomic profiling of shoot apical meristem (SAM) cell types in Arabidopsis : Arabidopsis2016, IISER Mohali : March 21, 2016.

8.1.4 Conferences attended by researchers

1. Pratima Pandey, Yogesh Dahiya, Shruti Thapliyal, Ashwani Bhardwaj, Pallavi Sharma, Nagesh Kadam, Vina Tikiyani and Kavita Babu : XXXIII Annual Conference of the Indian Academy of Neuroscience : Oct 31 - Nov 2, 2015 : Punjab University, Chandigarh.
2. Pratima Pandey, Yogesh Dahiya, Shruti Thapliyal, Ashwani Bhardwaj, Pallavi Sharma, Nagesh Kadam, Vina Tikiyani and Kavita Babu : First Indian C. elegans meeting (40th Mahabaleshwar seminar) : Jan 28 - Feb 2, 2016 : Lonavala, Maharashtra.
3. A. K. Bachhawat : INDO-US Workshop on Cell Factories, IIT Bombay, Mumbai, India : 18-20 March 2016
4. Samarjit Bhattacharyya : Annual meeting of Indian Academy of Neurosciences : October 31 – November 2, 2015 : Panjab University, Chandigarh, India.
5. Samarjit Bhattacharyya : Exploring Biological systems : Cell to organisms (EBS) 2016 : March 1 – 2, 2016 : University of Calcutta, Kolkata, West Bengal, India.
6. Saurabh Pandey : Society for Neuroscience meeting : October 17–21, 2015, : Chicago, USA.
7. Saurabh Pandey : The Long and Winding Road : Neuronal Trafficking in Physiology and Disease : May 31 - June 3, 2015 : Janelia campus, USA.
8. Prabhat Kumar Mahato : Society for Neuroscience meeting : October 17–21, 2015 : Chicago, USA .
9. Prabhat Kumar Mahato : Keystone symposium : Neurological Disorders and Intracellular Trafficking : Jan 31 - Feb 4, 2016 : Colorado, USA.
10. Ravinder Gulia : Annual meeting of Indian Academy of Neurosciences : October 31 - November 2, 2015 : Panjab University, Chandigarh, India.
11. Kausik Chattopadhyay : 6th EMBO : September 5-8, 2015 : EMBO : Birmingham, UK
12. Nidhi Kundu : Annual Meeting of the Indian Biophysical Society on Molecules in Living Cells : Mechanistic Basis of Function : February 8-10, 2016 : Indian Biophysical Society : Indian Institute of Science
13. Rachna Chaba : Molecular Genetics of Bacteria and Phages Meeting : August 4-8, 2015 : University of Wisconsin-Madison, WI, USA
14. Rachna Chaba : Sixth Indo-American Frontiers of Science Symposium (IAFOS 2015) : August 9-12, 2015 : Irvine, CA, USA

15. Rachna Chaba : Bacterial Expressions II Conference : December 1-5, 2015 : NCBS, Bangalore, India
16. Shashank Agrawal : Bacterial Expressions II Conference : December 1-5, 2015 : NCBS, Bangalore, India
17. Manjari Jain : Conference on Insect Biodiversity Studies : Where does India stand in the Global Map : March 29-31, 2016 : Entomological society of India : Central University of Kerala
18. Lolitika Mandal : MCB75 - Molecules to organism : November 11-14, 2015 : MCB, IISc, Bangalore
19. Saikat Ghosh : All India Developmental Biology Conference : July 2015 : Hyderabad
20. Saikat Ghosh : Europoean Fly Meet : Heidelberg, Germany
21. Shiv Kumar Sharma : All India Cell Biology Conference : Tiruanandapuram
22. Sudip Mandal : 8th National Teachers' Science Congress : December 15-17, 2015 : IISER Pune
23. Shravan Kumar Mishra : Ubiquitin and Ubiquitin like Modifications, NCB Bangalore, India, January 27-28, 2016
24. Shravan Kumar Mishra : Fission Yeast Meeting, Kobe, Japan, June 21-26, 2015
25. Arunika Mukhopadhaya : September 5-8, 2015 : 6th EMBO Meeting : Birmingham, UK
26. G.V.R. Krishna Prasad : Participated in GIAN course "Emerging and prevalent infections : our preparation to tackle : IISER Mohali, (Jan 26th –Feb 4th, 2016)
27. G.V.R. Krishna Prasad : Participated in FIMSA Advanced immunology course; PGI Chandigarh (March 17th –19th, 2016)
28. Aakanksha Gulati : Presented poster in the 84th Annual meeting of SBCI; Hyderabad, (Nov 24th –30th, 2015)
29. Aakanksha Gulati : Participated in GIAN course "Emerging and prevalent infections : our preparation to tackle"; IISER Mohali, (Jan 26th –Feb 4th, 2016)
30. Deepinder Kaur : Participated in GIAN course "Emerging and prevalent infections : our preparation to tackle"; IISER Mohali, (Jan 26th –Feb 4th, 2016)
31. Deepinder Kaur : Participated in FIMSA Advanced immunology course; PGI Chandigarh (March 17th –19th, 2016)
32. Vinica Dhar : Participated in GIAN course "Emerging and prevalent infections : our preparation to tackle"; IISER Mohali, (Jan 26th –Feb 4th, 2016)
33. Vinica Dhar : Participated in FIMSA Advanced immunology course; PGI Chandigarh (March 17th –19th, 2016)
34. Samrat Mukhopadhyay : Optics Within Life Sciences (OWLS) : March 2016 : TIFR Mumbai
35. Shruti Arya : Biophysical Society meeting : February-March 2016 : Los Angeles, USA
36. Samrat Mukhopadhyay : CRSI-RSC joint meeting : February 2016 : Panjab University, Chandigarh
37. Samrat Mukhopadhyay : Discussion Meeting on Biological Membranes : December 2015 : Indian Institute of Science, Bangalore
38. Samrat Mukhopadhyay : Challenges in Organic Materials and Supramolecular Chemistry (ISACS18) : November 2015 : IISc-RSC, Indian Institute of Science, Bangalore

39. Rajesh Ramachandran : Wellcome Trust DBT India Alliance meeting : November 3-6, 2015 : Hyderabad

40. Mahak Sharma : All India Cell Biology Conference : December 6-8, 2015 : Indian Society of Cell Biology : Kerala

41. Divya Khattar : All India Cell Biology Conference : December 6-8, 2015 : Indian Society of Cell Biology : Kerala

42. Rituraj Marwaha : All India Cell Biology Conference : December 6-8, 2015 : Indian Society of Cell Biology : Kerala

43. Aastha Sindhwani : All India Cell Biology Conference : December 6-8, 2015 : Indian Society of Cell Biology : Kerala

44. Devashish Dwivedi : All India Cell Biology Conference : December 6-8, 2015 : Indian Society of Cell Biology : Kerala

45. Aastha Sindhwani : Research Scholars Convention 2K15 : March 25, 2015 : Panjab University : Chandigarh

46. Somdatta Sinha : Annual Meeting of the Society for Mathematical Biology (SMB) : June 31-July 2, 2015 : Atlanta (USA)

47. Somdatta Sinha : Infection and Molecular Epidemiology : October 29-31, 2015 : Udaipur, Rajasthan

48. Somdatta Sinha : National Conference on Mathematical & Computational Biology : December 26-31, 2015 : Pune (IISER & NCL)

49. Somdatta Sinha : EPSRC-DST conference on Mathematics for health and disease : April 13-17, 2015 : International Centre for Mathematical Sciences, Edinburgh, (UK)

50. Somdatta Sinha : 3rd World Congress on Targeting Infectious Diseases on Targeting Ebola 2015 May 28-29, 2015 : Institut Pasteur, Paris (France)

51. Somdatta Sinha : Complex Systems Winter School 2015 (IISER Mohali and Santa Fe Institute) : December 7-21, 2015 : IISER Mohali

52. Ram Yadav : Biennial Meeting of Indian Society of Development Biologists : July 15-18, 2015 : CCMB Hyderabad

53. Ram Yadav : 17th Indo-US cytometry conference : March 14 - 15, 2016 : IISc and NCBS Bangalore.

54. Ram Yadav : Arabidopsis 2016 : March 20 – 22, 2016 : IISER Mohali

8.1.5 Publications : Biological Sciences

[1] **P. Mahato**, **S. Pandey** , and **S. Bhattacharyya**, "Differential effects of protein phosphatases in the recycling of metabotropic glutamate receptor 5," *Neuroscience*, vol. 306, pp. 138–150, 2015.

[2] **S. Bhattacharyya**, "Inside story of group I metabotropic glutamate receptors (mGluRs)," *The International Journal of Biochemistry & Cell Biology*, 2016.

[3] **A. K. Rai** and **K. Chattopadhyay**, "Revisiting the membrane interaction mechanism of a membrane-damaging β-barrel pore-forming toxin *Vibrio cholerae* cytolysin," *Molecular Microbiology*, vol. 97, no. 6, pp. 1051–1062, 2015.

[4] **B. Khilwani** and **K. Chattopadhyay**, "Signaling beyond punching holes: Modulation of cellular responses by *Vibrio cholerae* cytolysin," *Toxins*, vol. 7, no. 8, pp. 3344–3358, 2015.

[5] **A. K. Rai**, **N. Kundu**, and **K. Chattopadhyay**, "Physicochemical constraints of elevated pH affect efficient membrane interaction and arrest an abortive membrane-bound oligomeric intermediate of the beta-barrel pore-forming toxin *Vibrio cholerae* cytolysin," *Archives of Biochemistry and Biophysics*, vol. 583, pp. 9–17, 2015.

[6] **K. Lata** and **K. Chattopadhyay**, "*Helicobacter pylori* TlyA forms amyloid-like aggregates with potent cytotoxic activity," *Biochemistry*, vol. 54, no. 23, pp. 3649–3659, 2015.

[7] S. J. Sebastian, D. Kumar, C. S. Babu, J. N. Agrewala, B. Singh, **P. Guptasarma**, and D. Sarkar, "Probing protease sensitivity of recombinant human erythropoietin reveals $\alpha_3 - \alpha_4$ inter-helical loop as a stability determinant," *Proteins*, vol. 83, pp. 1813–1822, 2015.

[8] **N. Kishor** and **P. Guptasarma**, "Direct n-terminal sequencing of polypeptides using a thermostable bacterial aminopeptidase and MALDI-TOF mass spectrometry.," *Analytical Biochemistry*, vol. 488, pp. 6–8, 2015.

[9] **K. Arora**, S. S. Mangale, and **P. Guptasarma**, "Single cell-level detection and quantitation of leaky protein expression from any strongly regulated bacterial system," *Analytical Biochemistry*, vol. 484, pp. 180–182, 2015.

[10] **P. Sharma** and **P. Guptasarma**, "Super-perfect' enzymes: Structural stabilities and activities of recombinant triose phosphate isomerases from pyrococcus furiosus and thermococcus onnurineus produced in escherichia coli.," *Biochemical and Biophysical Research Communications*, vol. 460, pp. 753–758, 2015.

[11] **S. Ghosh**, **A. Singh**, **S. Mandal**, and **L. Mandal**, "Active hematopoietic hubs in drosophila adults generate hemocytes and contribute to immune response," *Developmental Cell*, vol. 33, pp. 478–488, 2015.

[12] S. Fragkostefanakis, A. Mesihovic, S. Simm, M. J. Paupière, Y. Hu, P. Paul, **S. K. Mishra**, B. Tschiersch, K. Theres, A. Bovy, E. Schleiff, and K.-D. Scharf, "HsfA2 controls the activity of developmentally and stress-regulated heat stress protection mechanisms in tomato male reproductive tissues," *Plant Physiology*, vol. 170, no. 4, pp. 2461–2477, 2016.

[13] **J. Khan**, **P. K. Sharma**, and **A. Mukhopadhaya**, "*Vibrio cholerae* porin OmpU mediates M1-polarization of macrophages/monocytes via TLR1/TLR2 activation," *Immunobiology*, vol. 220, no. 11, pp. 1199–1209, 2015.

[14] **S. C. Sakharwade** and **A. Mukhopadhaya**, "*Vibrio cholerae* porin OmpU induces lps tolerance by attenuating TLR-mediated signaling," *Molecular Immunology*, vol. 68, no. 2, pp. 312–324, 2015.

[15] **S. Gupta**, **G. K. Prasad**, and **A. Mukhopadhaya**, "*Vibrio cholerae* porin OmpU induces caspase-independent programmed cell death upon translocation to the host cell mitochondria," *Journal of Biological Chemistry*, vol. 290, no. 52, pp. 31051–31068, 2015.

[16] **V. Dalal**, **S. Arya**, **M. Bhattacharya**, and **S. Mukhopadhyay**, "Conformational switching and nanoscale assembly of human prion protein into polymorphic amyloids via structurally-labile oligomers," *Biochemistry*, 2015.

[17] **S. Arya**, **A. Kumari**, **V. Dalal**, **M. Bhattacharya**, and **S. Mukhopadhyay**, "Appearance of annular ring-like intermediates during amyloid fibril formation from human serum albumin," *Physical Chemistry Chemical Physics*, vol. 17, no. 35, pp. 22862–22871, 2015.

[18] **M. Bhattacharya** and **S. Mukhopadhyay**, "Studying protein misfolding and aggregation by fluorescence spectroscopy," in *Reviews in Fluorescence 2015*, pp. 1–27, Springer, 2016.

[19] **N. G. Prasad**, S. Dey, A. Joshi, and T. N. C. Vidya, "Rethinking inheritance, yet again: inheritomes, contextomes and dynamic phenotypes," *bioRxiv*, p. 013367, 2015.

[20] **K. Singh**, **E. Kochar**, and **N. G. Prasad**, "Egg viability, mating frequency and male mating ability evolve in populations of *Drosophila melanogaster* selected for resistance to cold shock," *PLoS One*, vol. 10, no. 6, p. e0129992, 2015.

[21] **V. Shenoi**, **S. Z. Ali**, and **N. G. Prasad**, "Evolution of increased adult longevity in *Drosophila melanogaster* populations selected for adaptation to larval crowding," *Journal of Evolutionary Biology*, vol. 29, no. 2, pp. 407–417, 2016.

[22] **S. Z. Ali**, **N. G. Prasad**, *et al.*, "Virility does not imply immensity: Testis size, accessory gland size and ejaculate depletion pattern do not evolve in response to experimental manipulation of sex ratio in *Drosophila melanogaster*," *bioRxiv*, p. 032649, 2015.

[23] **V. Gupta**, **S. Venkatesan**, **M. Chatterjee**, **S. Z. Ali**, **V. Nivsarkar**, and **N. G. Prasad**, "No apparent cost of evolved immune response in *Drosophila melanogaster*," *Evolution*, vol. 70, no. 4, pp. 934–943, 2016.

[24] **K. Singh**, **M. A. Samant**, **M. T. Tom**, and **N. G. Prasad**, "Evolution of pre-and post-copulatory traits in male *Drosophila melanogaster* as a correlated response to selection for resistance to cold stress," *PLoS One*, vol. 11, no. 4, p. e0153629, 2016.

[25] **K. Singh** and **N. G. Prasad**, "Evolution of pre-and post-copulatory traits in female *Drosophila melanogaster* as a correlated response to selection for resistance to cold stress," *Journal of Insect Physiology*, vol. 91, pp. 26–33, 2016.

[26] **V. N. Shenoi** and **N. G. Prasad**, "Local adaptation to developmental density does not lead to higher mating success in *Drosophila melanogaster*," *Journal of Evolutionary Biology*, 2016.

[27] **K. Singh**, **M. Zulkifli**, and **N. G. Prasad**, "Identification and characterization of novel natural pathogen of *Drosophila melanogaster* isolated from wild captured *Drosophila* spp.," *Microbes and Infection*, 2016.

[28] **R. Raychoudhury**, "Genetics of behavioural isolation," *Current Science*, vol. 108, no. 10, p. 1842, 2015.

[29] R. Sen, **R. Raychoudhury**, Y. Cai, Y. Sun, V.-U. Lietze, B. F. Peterson, M. E. Scharf, and D. G. Boucias, "Molecular signatures of nicotinoid-pathogen synergy in the termite gut," *PLoS One*, vol. 10, no. 4, p. e0123391, 2015.

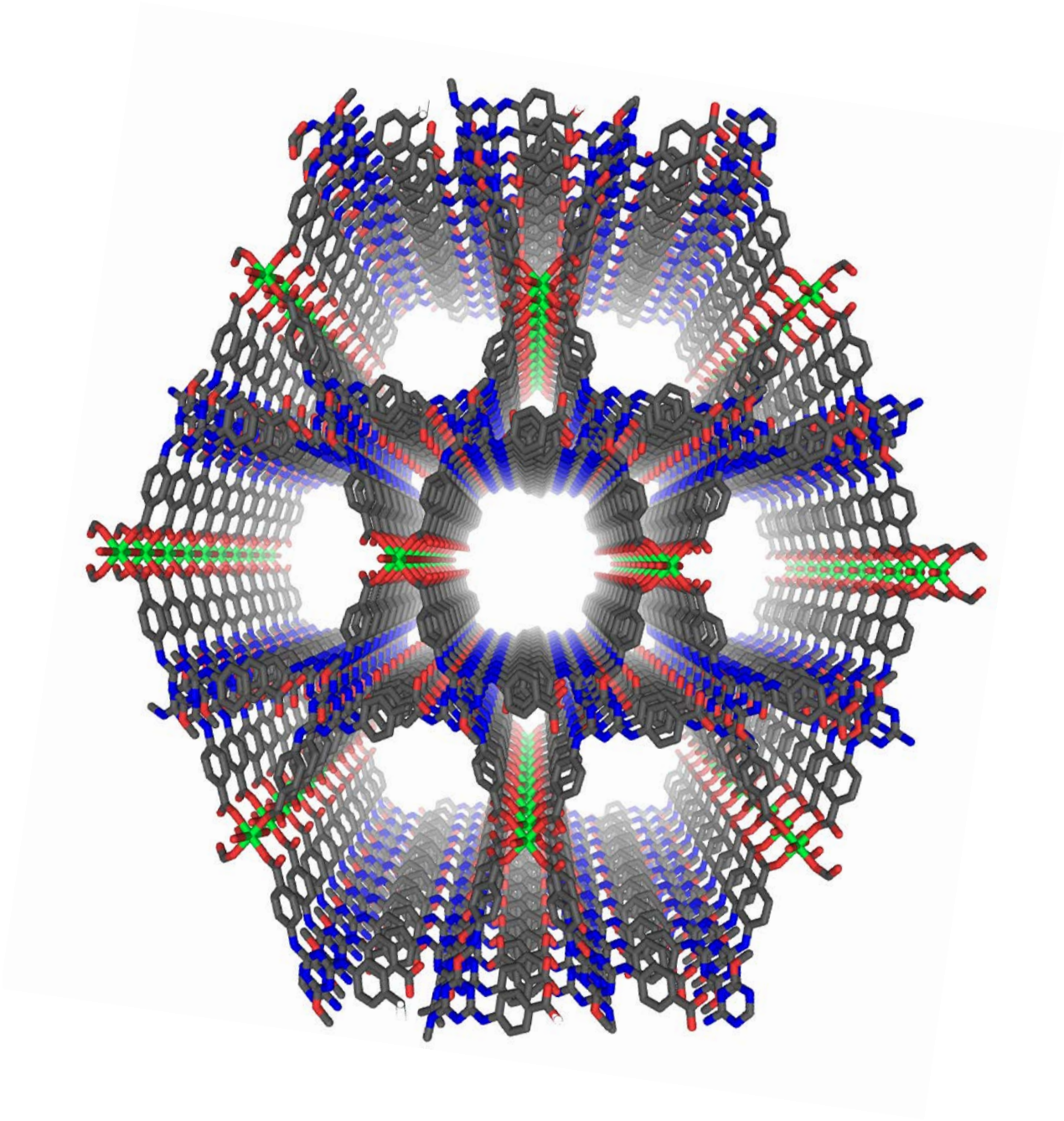
[30] **M. Bagadia**, **A. Singh**, and **K. S. Sandhu**, "Three dimensional organization of genome might have guided the dynamics of gene order evolution in eukaryotes," *Genome Biology and Evolution*, vol. 8, no. 3, pp. 946–954, 2016.

[31] **A. Singh**, **M. Bagadia**, and **K. S. Sandhu**, "Spatially coordinated replication and minimization of expression noise constrain three-dimensional organization of yeast genome," *DNA Research*, vol. 23, no. 2, pp. 155–169, 2016.

[32] **K. S. Sandhu**, "Do chromatin interaction networks radiate pathogenic contagion in the genome?," *Epigenetic Diagnosis & Therapy*, vol. 1, pp. 128–131, 2016.

[33] **D. Khatter**, **V. B. Raina**, **D. Dwivedi**, **A. Sindhwani**, **S. Bahl**, and **M. Sharma**, "The small GTPase Arl8b regulates assembly of the mammalian HOPS complex on lysosomes," *Journal of Cell Science*, vol. 128, no. 9, pp. 1746–1761, 2015.

[34] **D. Khatter**, **A. Sindhwani**, and **M. Sharma**, "Arf-like GTPase Arl8: Moving from the periphery to the center of lysosomal biology," *Cellular Logistics*, vol. 5, no. 3, p. e1086501, 2015.



8.2 Department of Chemical Sciences

8.2.1 Summary of the research work

R. Vijaya Anand : Our research is focussed primarily on the development of novel organic transformations using N-heterocyclic carbene (NHC) or bis(dialkylamino)cyclopropenylidene (BAC) as an organocatalyst. Recently, we have developed an efficient method for the synthesis of diarylated arylketones through BAC catalyzed 1,6-conjugate addition of aromatic aldehydes to p-quinone methides (p-QMs) [Org. Lett. 2015, 17, 3952]. We have also reported the utilization of NHC as a Bronsted base for the 1,6-hydrophosphonylation of p-quinone methides and fuchsones [Org. Biomol. Chem. 2016, DOI: 10.1039/C6OB00289G]. Through this protocol a wide range of diaryl- and triarylmethyl phosphonates in a very high chemical yields. Apart from NHC catalyzed reactions, we have also developed a few metal catalyzed electrophilic cyclization reactions leading to important heterocyclic cores. For example, we have developed an one-pot method for the synthesis of diarylindoylmethanes through Pd-catalyzed electrophilic cyclization of 2-alkynylanilines followed by electrophilic trapping with p-quinone methides [Org. Lett. 2015, 17, 3390]. Another interesting methodology that we developed involves silver catalyzed aminative electrophilic cyclization of 2-alkynyl benzaldehydes leading to substituted isoquinoline derivatives [Org. Biomol. Chem. 2015, 13, 3732]. This protocol was elaborated for the synthesis of medicinally important isoquinoline alkaloids such as Berberine and Palmatine. Recently, we have developed an alternative and atom-economical method for the synthesis of amino isoquinoline derivatives through Lewis acid catalyzed aminative cyclization of 2-alkynyl benzonitriles [Eur. J. Org. Chem. 2016, 453]. This method was elaborated for the synthesis of an important anti-cancer reagent.

S. Arulananda Babu : Our main interests and research programme are focused on the stereoselective transition metal-catalyzed C−H activation and metal-mediated C−−C bond construction strategies and developing new synthetic methods. Our lab is working on synthesis of new synthetic building blocks, unnatural amino acids and molecules with potential biological activities, such as anticancer, antimalarial agents by using the above mentioned strategies. Further, our lab is also working on developing catalytic methods which are greener by using magnetically recoverable metal catalysts and organocatalysts. Our lab has also interests in design and synthesis of novel crown-ether type molecules for industrial applications.

P. Balanarayan : The work in our group focuses on electronic structure of atomic and molecular systems in high intensity and high frequency laser fields. The interaction of light and matter is analysed in a regime where the light (in the form of a laser), is not merely a "spectator" but an active "player" that changes the results of the game. Contrary to usual expectations, in a high frequency regime, and at laser electric field strengths of 1×10^{14}W/cm^2, (which are comparable to the internal electric field of field free atom), there is an interesting suppression of ionization that occurs. The non-ionizing atom now behaves like a diatomic molecule in terms of its electronic structure. This changes the electronic structure of the atomic/molecular system and results in unusual and interesting chemistry.

One particular aspect that the group is looking at with a PhD scholar, Naveen, is how chemical reaction pathways are modified in a high frequency laser. It is seen that when the continuous wave (CW) laser is applied along the dipole direction of ammonia molecule, a planar geometry is favoured in the high frequency regime. This points towards the possibility of barriers chemical reactions in the presence of a high frequency-high intensity laser.

With the PhD scholar Deep Raj Meena, the group has been trying to seek an answer to the question of how to prepare an atom in minimum uncertainty state using a CW laser. This work examines the information entropies of the electronic densities of an atom in a CW laser in position and momentum spaces. For particular laser parameters, because of the "diatomic molecule-like" behaviour the information entropy sum in terms of experimentally measurable position and momentum densities, goes through a minimum.

With Prashant, the group implements codes to calculate lifetimes of metastable electronic states. One problem that this has been applied to are the lifetimes of dihydrogen anion as a function of internuclear distance. The work is still in progress.

Angshuman Roy Choudhury : Our research group works on various aspects of structural chemistry of small organic compounds using both single crystal and powder X-ray diffraction methods in association with other common characterization techniques such as NMR, FTIR, TGA, DSC and UV-VIS spectroscopy. We are interested in the study of weak interactions involving weak donors (C−H groups) and weak acceptors (C−X, organic halogen groups) in both model molecules and real molecules of potential futuristic drugs. We utilize all common methods of crystallization including solvent evaporation, vapour diffusion, co-precipitation, solvent-antisolvent evaporation etc. In situ crystallization technique is an unique feature of this group for crystallization of materials having low ($< 20^{\circ}$C), very low ($< -20^{\circ}$C) and ultra-low ($< -40^{\circ}$C) melting points. Our other interest is to carry out experimental charge density analyses to understand the nature and role of weak and very weak intermolecular interactions that may be responsible for holding the molecules together in a crystal lattice thereby altering its melting point compared to that of the similar molecules.

We are also interested to study cocrystallization and salt formation of pharmaceutically active compounds in order to improve their solubility and bioavailability. A number of different classes of drugs and pharmaceuticals are being screened in search of their polymorphs and salts/cocrystals for improved biological properties.

We are currently involved in developing a new series of Metal-Organic Framework materials for various applications.

Arijit Kumar De : We are interested in : (i) Probing the effect of charged interface on core water molecules by picosecond solvation dynamics of fluorescein dianion in AOT reverse micelle using time-correlated single photon counting (TCSPC) technique; (ii) Theoretical investigation on instantaneous momentum transfer and on nonlinear effects (Kerr effect) in optical trapping of dielectric nanoparticles with ultrafast pulsed excitation.

Ujjal K. Gautam : We have been working on renewable energy harvesting by using nanomaterials as heterogeneous catalysts. Our approach include solar water splitting, oxygen reduction reaction, hydrogen and oxygen evolution reaction and CO_2 reduction reaction. Usually the catalyst nanocrystals have to be mounted on a catalyst support in order to spread them out and disperse in reaction medium. In one of our recent work last year, we developed catalyst nanocrystals that resemble shape of wires. Therefore when they assemble, they form a mesh which is robust and through which reactants easily passes through enabling the reaction to occur efficiently without catalyst support. As using catalyst support causes loss of surface area of the precious metals, our approach have considerably increased the available surface area available for the reaction. We believe that this new approach will inspire development of such membrane-catalysts with widespread utilization.

Samrat Ghosh : My research efforts are focused on recycling spent chemicals for Alkaline drycell batteries and safe disposal of waste chemicals generated in the teaching lab. There is presently no agency in India which recycles chemicals generated from disposed batteries. We are developing facile chemical processes which will regenerate electrochemical grade manganese dioxide used as cathode material for alkaline batteries and other manganese based chemicals which may find application in other industries. We have been successful to certain extent in synthesizing manganese carbonate which is a versatile manganese precursor.

Sanjay Mandal : My group is engaged in developing diversified chemistry of elements across the periodic table through a variety of interdisciplinary projects that involve multi-step organic synthesis, coordination chemistry, catalysis and materials chemistry. Various spectroscopic techniques (UV-vis, FTIR, NMR, Raman, CD and Fluorescence), thermal analysis (TGA and DSC), electrochemistry, surface analysis (SEM/EDX and TEM), and X-ray crystallography (PXRD and SCXRD) are routinely used for establishing physicochemical properties of the new organic, inorganic and organometallic compounds. This has resulted in the strategic design of diverse coordination architectures with a special emphasis on Metal Organic Frameworks (MOFs) for their diverse structural aesthetics and for their possible roles in various applications, such as catalysis, luminescence, molecular separation, gas and liquid adsorption, magnetism, drug delivery, etc. Our research efforts target alternate solutions to some current issues in the fields of (i) mesh-adjustable molecular sieves and adsorbent coolant (green air-conditioning), (ii) selective gas adsorption studies - storage of hydrogen and methane (next generation fuels), (iii) sequestering of

carbon dioxide (lowering greenhouse effect), (iv) chormogenic and/or fluorogenic sensing of the cations, anions and neutral small molecules at the ppm or ppb level, (v) chiral catalysis, (vi) nanoscale drug delivery at physiological conditions, and (vii) generation and applications of metal oxides, sulfides and selenides in luminescence, photocatalysis and quantum dots.

Santanu K. Pal : Our major research focuses on the functionalized of soft nanomaterials for optoelectronic applications, efficient proton conduction and LC based chemical and bio-sensing applications. A summary of some highlights of our research held in 2015-2016 in this direction follows: Prepared Discotic systems based on alkoxy (tri- & di-) substituted highly conducting hexa-peri-hexabenzocoronene and blue light-emitting materials based on Multialkynylbenzene-bridged triphenylene dyads for optoelectronic applications and in addition, we able to prepare some room temperature bent-core LCs for ferroelectric and other practical applications. Designed LC based systems for studying endotoxin interactions with bacterial cell wall components for clinical understanding associated with Gram negative bacterial infections and for real-time monitoring of creatinine by changing pH in presence of creatinine deiminase enzyme which is of great importance in the detection of risk for renal failure.

Sabyasachi Rakshit : A multidisciplinary approach combining molecular biology and physical sciences, we aim to understand the hearing mechanism. Hearing is one of the most well-developed sensory organ in our body and yet very robust. It would be really interesting to learn how nature control such a sensor and also what triggers deafness related diseases.

We are also interested in (a) tag-free and single-step protein-purification with higher efficiency, (b) surface modification for immobilizing proteins directly from cell-lysate avoiding the hassle of protein purification. Outcome of these research is expected to have strong impact on industrial use as well.

Ramesh Ramachandran : Our research work focuses on developing analytic methods for understanding the spin physics in magnetic resonance experiments involving quadrupolar nuclei. Integrating the concepts of contact transformation and reduced density matrix theory, effective Hamiltonians based on Floquet theory have recently been proposed to quantify multiple-quantum magic angle spinning (MQMAS) experiments in solid state. Currently, the focus of our group is to extend this approach to the design of experiments in solid-state MAS experiments.

Sripada S. V. Rama Sastry : Major objective of our research is the development of new C-C, C-O, C-N bond forming reactions with relevance to both medicinal and natural products chemistry with a particular emphasis on catalysis and application of these strategies to the total synthesis of architecturally complex heterocycles of biological significance. Research also includes the development of atom economic, green and sustainable synthetic processes. The philosophy of my research is that the methods we develop should be user-friendly, experimentally trivial, and environmentally friendly and economically sound, while providing access to otherwise difficult targets. We have developed new modes of Lewis/Bronsted acid activation of a variety of functional groups, typically alcohols, carbonyls, olefins, alkynes etc., and their transformation to privileged structures and novel scaffolds. These methods find significant applications in both academia as well as industry.

N. Sathyamurthy : The research work of the group is centered about electronic properties of atoms, molecules and clusters, potential energy surfaces and molecular reaction dynamics. During the year 2015-16, our group reported on the relative stabilities different conformers of serotonin and the role of hydrogen bonding and $\pi - \pi$ stacking interaction between bases in the double helical structure of DNA. We also examined the role of confinement of a carbon nanotube on the noncovalent interaction in rare gas dimers. We used geometric phase as a diagnostic tool in locating conical interactions in NHH and CO_2^+.

K. R. Shamasundar : Proper treatment of electron-correlation effects is very often necessary for quantitative (sometimes also for qualitative) description of electronic structure of atoms and molecules. Molecules with closed-shell electronic structure can be well-described by quantum chemical methods available in many program packages. Description of open-shell electronic structures commonly occurring in many chemical phenomena involving bond-dissociation, excited states and transition metal complexes generally requires more sophisticated methods known

as multi-reference (MR) methods. My research focuses on development and applications of quantum chemical methods applicable for such situations.

My current interest is on MR methods making use of the concept of internally contracted (IC) excitations. The IC excitations are known to be compact form of excitation manifold required to correlate a zeroth-order approximation to the full wave-function. Recently, I have been involved in the development of a multi-reference configuration interaction (MRCI) method based on IC excitations. We have demonstrated the efficiency and applicability of the new method to medium size molecules such as metallocenes and dioxygen bound mono and di-copper complexes with moderately large ligands. Currently, I am working to extend this method for the treatment of excited state potential energy surfaces and molecular properties. In near future, I plan to explore some of the possibilities for IC multi-reference coupled-cluster methods which have the potential to be more accurate.

I am also interested in applying the standard as well as the newly developed methods to some interesting chemical problems involving reaction pathways and dynamics on excited potential surfaces.

Monika Sharma : I am primarily working in application of computational methods to understand the interactions of m-RNA with RNA-binding STAR family of transcriptional regulators. These interactions have direct implications in various developmental and physiological processes such as mammalian spermatogenesis, metazoan central nervous system development, sperm-to-oogenesis in hermaphrodites, or Drosophila wing development. In addition to this, they have also been reported to be associated with numerous human pathologies like cancers and neurological disorders such as human inherited ataxia, multiple sclerosis, or schizophrenia. Also, I am working with the structural modeling of yeast glutathione and cystine- transporters whose structures are not known. Experimental mutagenesis and kinetics data is mapped with the modeled structures to gain more insights into substrate affinity and binding of these transporters.

Sanjay Singh : Our research contributions address a few fundamental questions in the broad area of inorganic & organometallic chemistry. Our work has direct consequences on aspects of organometallic chemistry of group 13 and 14 elements from main group and late transition elements (Co, Ni, Cu, Pd, Hg, Au and Zn) in the form of their N-heterocyclic carbene (NHC) adducts, their reaction chemistry and applications in molecular transformations. In addition to this, we are also actively involved in exploring synthesis and properties of inorganic macrocycles and cryptands. These systems are based on phosp(III)azane units and boron-nitrogen based pyridinophanes.

Chemistry of group 13 elements : Synthesis of hydroborenium and cationic organoaluminum complexes: A series of highly reactive cationic species of boron as hydroborenium ions (three coordinated boron cations) and aluminum congeners with weakly coordinating anions have been isolated. These borenium and cationic aluminum complexes, due to the positive charge and coordination number of three at the B or Al centre, exhibit very strong Lewis acid character and have been useful in promoting/catalyzing organic reactions mediated by Lewis acids (Figure). A facile access to stable thioxo- and selenoxo-boranes via oxidative insertion of S/Se into the B-H bonds of the dihydroboron species has also been demonstrated that resulted in the formation of dithiol/diselenol derivatives that are kinetically labile to release H2S/H2Se in an intramolecular manner to afford thioxo- and selenoxo-boranes with terminal B=S and B=Se bonds.

Chemistry of low valent group 14 elements : Facile synthesis of germylenes and stannylenes and their reaction chemistry: Synthesis of novel germylene, stannylene chelate compounds stabilized by iminophosphonamide and bis(phosphinimino)amide ligands have been performed in this project. The successful synthesis of Ge(II) and Sn(II) compounds has opened up a new opportunity to explore Lewis acid-base chemistry, substitution reactions, reduction of these divalent species (to prepare zero valent species) and oxidation reactions (to new interesting derivatives of the unknown tetravalent metal centers) (Figure). Inorganic macrocycles and cryptands: Synthesis of phosph(III)azane based macrocycles and cryptands are major theme of this research area. Study of host-guest complexation and use of cations, anions or neutral molecules as templates in assembling macrocycles and cryptands are important aspect of our work. The phosphazene templated macrocyclic arrangement of NaCl and

the sulfur based hexameric macrocycle [(S=)P(μ-NtBu)2P(μ-Se)]6 are landmark in this area.

Sugumar Venkataramani :
Photoswitchable Molecular Transporter : Azobenzenes are robust switchable molecules with varying switching kinetics depending on the substitutions. Manipulation in the switching rate and functions can be made by changing the substitution. Our research interest in this regard is to connect multiple azobenzene moieties to a linker molecule in creating a light controlled void or confined space that can be useful for a small molecule transporter. Current research includes systematic design, synthesis, photoswitching and spectroscopic studies with respect to switching and transporting behaviour.

Matrix isolation and Computational studies of reactive intermediates :
One of our major areas of interest is to understand the structure, stability and reactivity of radicals and highly reactive species. In this regard, we utilize an experimental technique called matrix isolation infrared/UV spectroscopy. At very low temperatures (4 K), gases like argon, neon and nitrogen form transparent matrices in the UV and IR regions. By controlling the dilution in such gases, molecules can indeed be isolated and trapped. If the molecules of interest are prepared with photo-labile groups, transient and unstable species can be generated in matrix isolation conditions through photolysis. Alternatively, a precursor molecule with thermo-labile group can be sublimed through a hot quartz tube at very high temperature and high vacuum so as to generate transient species. The kinetically stable products can be trapped in argon or nitrogen matrices at low temperature. Further photochemistry of such transient products can also be followed to get information about their reactivity. A detailed infrared/UV spectroscopic investigation will be performed along with computational studies in order to understand the structural information and mechanistic pathways. Studies on heterocyclic transient species, photosensitized transients and developing model systems for radical damage are part of this investigation.

K. S. Viswanathan : The group is interested in studying weak non-covalent interactions using matrix isolation infrared spectroscopy. This technique uses cryogenic inert gas matrices together with infrared spectroscopy for the above studies. In particular, we have studied hydrogen bonded systems, which manifest multiple minima on the potential surface and have succeeded in trapping local minima, not observed in other experimental techniques such as molecular beam methods. These studies throw light on the nature of weak interactions and their importance in understanding chemical phenomena. Some typical systems we have studied are the phenylacetylene-water, phenylacetylene-acetylene, propargyl alcohol-water, and borazine-water hydrogen bonded complexes. We have also studied conformations of amino acids using matrix isolation infrared spectroscopy.

8.2.2 Visits of faculty members

- **Santanu Kumar Pal**
  - visited *Military University of Technology, Warsaw (Poland)* during September 13-18, 2015.
  - visited *Dehradun Institute of Technology University, Dehradun (India)* during December 21-23, 2015.
- **Sripada S. V. Rama Sastry**
  - visited *JECRC University, Jaipur (India)* during December 28-30, 2015.
  - visited *Birla Institute of Technology, Pilani (India)* during October 16-18, 2015.
  - visited *Guru Nanak Dev University, Amritsar (India)* during March 3-5, 2016.
  - visited *IISER Thiruvananthapuram (India)* during December, 11-13, 2015.
  - visited *Indian Institute of Intigrative Medicine, Jammu (India)* on February 18, 2016.
  - visited *Indian Institute of Technology, Ropar (India)* on August 01, 2015.
  - visited *North Eastern Hill University, Shillong (India)* during March 3-5, 2015.
  - visited *Punjabi University, Patiala (India)* on February 01, 2016.

- visited *Vallabh Govt. College, Mandi (India)* during April 10-12, 2015.

- **N. Sathyamurthy**
  - visited *Anna University, Chennai (India)* on March 12, 2016.
  - visited *IISER Kolkata (India)* on January 28, 2016.
  - visited *IIT Kharagpur (India)* on February 09, 2016.
  - visited *Multani Mal Modi College, Patiala (India)* on February 19, 2016.
  - visited *SASTRA University, Thanjavur (India)* on February 28, 2016.
  - visited *Indian Academy of Sciences, Bangalore (India)* on July 04, 2015.
  - visited *Pandit Ravishankar Shukla University, Raipur (India)* on July 27, 2015.

- **Sugumar Venkataramani** visited *Punjabi University, Patiala (India)* on February 4, 2016.

8.2.3 Talks delivered

- **R. Vijaya Anand**
  - Inter IISER Chemistry Meet during December 11-14, 2015.
  - NOST Conference at Jaipur during October 27-30, 2015.

- **Arijit Kumar De**

  Watching the dance of molecules with ultrafast laser spectroscopy : Toward solving the global energy crisis : MCM-DAV College for Women, Chandigarh (India) : August 21, 2015.

- **Ujjal Gautam**
  - Strategies for Supportless Electrocatalysis of Fuel Cell Reactions : AISRF Meeting, November 27, 2015.
  - Rare Pt nanostructures for efficient energy harvesting : Chemistry of Materials-2015, October 03, 2015.

- **Sanjay Mandal**
  - X-ray Diffraction (XRD): Single Crystal and Powder : Workshop on Diffraction, Microscopic and Spectroscopic techniques for Material Studies, Department of Physics, University of Lucknow, Lucknow : November 8, 2015.
  - Self-Assembly of Coordination Architectures and Their Applications : 5th Inter IISER Meet, IISER Thiruvananthapuram : December 11, 2015.
  - Use of X-ray Diffraction Techniques for the Success of Pharmaceutical Industry : Training School on Research Techniques in Pharmaceutical Sciences, UIPS, Panjab University, Chandigarh : January 11, 2016.
  - Triple Mode of Action of L-tyrosine Derived Probes: Solvent Mediated Flip-Flop Halide (iodide/fluoride) Sensors and Reversible Chromogenic pH Indicators : PIITCON 2016, Atlanta, Georgia, USA : March 6, 2016.

- **Santanu K. Pal**
  - pH-driven Ordering Transitions in Liquid Crystal induced by Conformational Changes of Cardiolipin : 16th Topical Meeting on the Optics of Liquid Crystals : September 17, 2015.
  - Australia-India Strategic Research Fund (AISRF) Meeting : Biocompatible liquid crystals droplets for monitoring cellular events : November 27, 2015.

- Liquid Crystals in optoelectronic and biosensor application : 22nd National Conference on Liquid Crystals : December 21, 2015.
- **S. Setia** : Development of alkoxy substituted hexa-peri-hexabenzocoronene discotics with higher ordered columnar mesophases at room temperature : 22nd National Conference on Liquid Crystals : December 21, 2015.
- **S. Sidiq** : Biocompatible liquid crystals droplets for monitoring cellular events : 22nd National Conference on Liquid Crystals : December 21, 2015.

• **Sabyasachi Rakshit**

- Force spectroscopy : New tool to characterize biomolecules under tension : MCMDAV College Chandigarh : August 21, 2015.
- Tale of Two Mechanosensing Proteins : International Conference on Electron Microscopy and XXXVI Annual Meeting of the Electron Microscope Society of India : IIT Mumbai : July 9, 2015.
- Force spectroscopy : New tool to characterize biomolecules under tension : Punjab University : February 27, 2016.
- Deciphering the role of mechanical force in hearing : The International Conference on Optics Within Life Sciences, TIFR Mumbai : March 18, 2016.
- **Jagadish P. Hazra** : Force spectroscopy : New tool to characterize biomolecules under tension : Advanced Techniques in Protein Design and Engineering, IISER Mohali, March 15-19, 2016.

• **Sripada S. V. Rama Sastry**

- Delivered an invited talk on 11th Apr, 2015 during 'Science: Emerging Scenario and Future Challenges-III (SESFC-3) at Vallabh Govt. College, Mandi, Himachal Pradesh organized by the Him Science Congress Association (HSCA).
- Delivered an invited talk on 1st Aug, 2015 at IIT Ropar during Consonance Chemical Society workshop.
- Gave an invited talk on 17th Oct, 2015 at BITS Pilani, Rajasthan during the International Conference on Nascent Developments in Chemical Sciences (NDCS-2015).
- Gave an invited talk on 28th Oct, 2015 at the Hotel Le Meridien, Jaipur during the 17th Organic Chemistry Conference organized by the National Organic Symposium Trust (NOST).
- Gave an invited talk on 12th Dec, 2015 at IISER Trivandrum during the 5th inter-IISER chemistry meet conducted by IISER Thiruvananthapuram.
- Gave an invited talk on 29th Dec, 2015 at Jaipur during the 52nd Annual Convention of Chemists (ACC) 2015 held at the JECRC University, Rajasthan.
- Delivered an invited talk on 4th Feb, 2016 at the Punjabi University, Patiala during the national conference 'New Paradigm in Chemical Sciences: Synthetic and Analytical Perspectives' (NPICS:SAP-2016).
- Gave an invited lecture at the IIIM Jammu on 18th Feb, 2016.
- Delivered an invited lecture during the Academies' sponsored workshop on 'Modern Chemistry and its applications' held at the GNDU, Amritsar during March 3-5, 2016.

• **N. Sathyamurthy**

- Symmetry and Pattern Formation in Flowers : Indian Academy of Sciences, Bangalore : July 4, 2015.
- Symmetry and Pattern Formation in Flowers : INSPIRE meeting, Pandit Ravishankar Shukla University : Raipur July 27, 2015.
- Back to the basics : certain diatomics and triatomics : IISER Kolkata, January 28, 2016.

- Symmetry and Pattern Formation in Flowers : Sir J C Ghosh Memorial Lecture, Department of Chemistry, IIT Kharagpur : February 9, 2016.
- Symmetry and Pattern Formation in Flowers : Multani Mal Modi College, Patiala : February 19, 2016.
- Symmetry and Pattern Formation in Flowers : SASTRA University, Thanjavur : February 28, 2016.
- Structural motifs in chemistry and chemical biology : Anna University, Chennai : March 12, 2016.

- **Monika Sharma**
  - In silico design of conformational shift to control protein binding specificity : March 16, 2016.
- **S. Singh**
  - Complexes of group 13 elements supported by P/N ligand backbone : Expedient synthesis of hydroborenium ions, aluminum congeners thioxo- and selenoxo-boranes : School of Chemistry, University of Hyderabad : August 14, 2015.
  - **K. Jaiswal** : Bis(phosphinimino)amide stabilized dihydroboron species as a precursor to synthesize its chalcogen and cationic boron derivatives : Inter IISER Chemistry Meet : IISER Thiruvananthapuram : December 11-13, 2015.
- **Sugumar Venkataramani**
  - Function by Switching - Photomagnetic Switching & Exploring Models towards Reversible Molecular Transport : Punjabi University, Patiala : February 04, 2016.
- **K. S. Viswanathan**
  - Low temperature spectroscopy: A tool to study non-covalent interactions : Professor R. C. Paul National Symposium 2016, Department of Chemistry, Panjab University, Chandigarh : January 23, 2016.
  - Weak interactions in low temperature inert matrices: Does the matrix have a role to play : Discussion Meeting on Spectroscopy and Dynamics of Molecules and Clusters, Mahabaleshwar, Maharashtra : February 18-21, 2016.

8.2.4 Conferences attended by researchers

1. Mily Bhattacharya : Challenges in Organic Materials and Supramolecular Chemistry; International Symposia on Advancing the Chemical Sciences (ISACS18) : November 19-21, 2015 : Royal Society of Chemistry : IISc Bangalore
2. Mily Bhattacharya : Optics Within Life Sciences (OWLS 2016) : March 16-19, 2016 : TIFR Mumbai
3. Arijit Kumar De : 13th DAE-BRNS Biennial Trombay Symposium on Radiation & Photochemistry (including 6th Asia-Pacific Symposium on Radiation Chemistry) : January 4-9 : Bhabha Atomic Research Centre, Mumbai (India).
4. Arijit Kumar De : 18th CRSI National Symposium in Chemistry (including 10th CRSI-RSC Symposium) : February 4-7, 2016 : Panjab University, Chandigarh (India).
5. Ujjal Gautam : AISRF Meeting, 25-27 November 2015, IISER Mohali
6. Ujjal Gautam : Chemistry of Materials-2015, October 02-04, 2015
7. Moumita Rana (poster) : MRS Spring Meeting, 2016, Phoenix, USA
8. Santanu K. Pal :16th Topical Meeting on the Optics of Liquid Crystals : September 13-18, 2015 : Military University of Technology : Sopot, Poland

9. Santanu K. Pal : 22nd National Conference on Liquid Crystals : December 21-23, 2015 : Indian Liquid Crystal Society : DIT University

10. S. Sidiq : 22nd National Conference on Liquid Crystals : December 21-23, 2015 : Indian Liquid Crystal Society : DIT University

11. S. Setia : 22nd National Conference on Liquid Crystals : December 21-23, 2015 : Indian Liquid Crystal Society : DIT University

12. M. Gupta : 22nd National Conference on Liquid Crystals : December 21-23, 2015 : Indian Liquid Crystal Society : DIT University

13. D. Das : 22nd National Conference on Liquid Crystals : December 21-23, 2015 : Indian Liquid Crystal Society : DIT University

14. J. De : 22nd National Conference on Liquid Crystals : December 21-23, 2015 : Indian Liquid Crystal Society : DIT University

15. I. Bala : 22nd National Conference on Liquid Crystals : December 21-23, 2015 : Indian Liquid Crystal Society : DIT University

16. S. Kaur : 22nd National Conference on Liquid Crystals : December 21-23, 2015 : Indian Liquid Crystal Society : DIT University

17. V. Punjani : 22nd National Conference on Liquid Crystals : December 21-23, 2015 : Indian Liquid Crystal Society : DIT University

18. Sabyasachi Rakshit : The International Conference on Electron Microscopy : July 2015 : Electron Microscopy Society : IIT Mumbai, India

19. Sabyasachi Rakshit : The Wellcome Trust-DBT India Alliance Meeting : November 2015 : Hyderabad

20. Sabyasachi Rakshit : Optics Within Life Sciences (OWLS) : March 16-19, 2016 : TIFR Mumbai

21. R. Ramesh : National Magnetic Resonance Society (NMRS) symposium; Feb 14-18, 2016 : IIT kharagpur

22. Seema Dhiman and Siddheshwar Bankar : Nascent Developments in Chemical Sciences (NDCS-2015) : October 16-17, 2015 : BITS Pilani, Rajasthan

23. Seema Dhiman, Rajendra Shirke and Siddheshwar Bankar : RSC-CRSI symposium : February 5-7, 2016 : Punjab University, Chandigarh

24. Bishnupada Satpahti and Siddheshwar Bankar : J-NOST conference : December 14-17, 2015 : NISER Bhubaneshwar

25. Sripada S. V. Rama Sastry : 18th CRSI symposium : February 5-7, 2016 : Punjab University, Chandigarh

26. N. Sathyamurthy : Department Day 2016 Department of Chemistry : January 28, 2016, IISER Kolkata

27. N. Sathyamurthy : National Science Day Lecture Series, February 28, 2016, SASTRA University, Thanjavur

28. N. Sathyamurthy : Frontiers in Chemical Biology, March 12, 2016, Anna University, Chennai

29. Monika Sharma : Young Investigator Meeting : February 28 - March 2, 2016 : RCB and IndiaBioScience, NCBS : Manesar

30. Monika Sharma : Advanced Techniques in Protein Design and Engineering : March 15-19, 2016 : CPSDE : IISER Mohali

31. G. S. Kumar, Sabari V. R., B. Prashanth, S. Singh : Modern Trends in Inorganic Chemistry (MTIC)-XVI : December 03-05, 2015 : Department of Chemistry, Jadavpur University : Kolkata; Poster presentation : Chemical reactivity and structural investigations on chlorostannylene supported by bulky iminiphosphonamide ligand

32. K. Jaiswal, B. Prashanth, S. Singh : 18th CRSI National symposium in Chemistry : February 05-07, 2016, Punjab University : Chandigarh; Poster presentation : Generation of stable borenium species from dihydroboron complexes stabilized by bis(phosphinimino)amide ligand.

33. D. Bawari, B. Prashanth, S. Singh : 18th CRSI National symposium in Chemistry : February 05-07, 2016, Punjab University : Chandigarh; Poster presentation : A sulfur bridged $[(S=)P(\mu-NtBu)2P(\mu-S)]6$ hexameric macrocycle, the dianion $[(S)PCl(\mu-NtBu)]22$- templated self assembly and two dimensional polymer

34. Sugumar V. : 8th National Seminar NPICS : SAP-2016 : February 04-05, 2016 : Punjabi University, Patiala

35. Sugumar V. : 18th CRSI : National Symposium in Chemistry : February 05-06, 2016 : INST & Panjab University

36. Sudhadevi : XI - J-NOST : December 14-17, 2015 : NISER Bhubaneswar

37. Lilit Jacob : 18th CRSI : National Symposium in Chemistry : February 05-06, 2016 : INST & Panjab University

38. Sudhadevi : 18th CRSI : National Symposium in Chemistry : February 05-06, 2016 : INST & Panjab University

39. Mayank Saraswat : 18th CRSI : National Symposium in Chemistry : February 05-06, 2016 : INST & Panjab University

40. Chitranjan Sah : 18th CRSI : National Symposium in Chemistry : February 05-06, 2016 : INST & Panjab University

8.2.5 Publications : Chemical Sciences

[1] **V. Reddy**, **A. S. Jadhav**, and **R. V. Anand**, "A room-temperature protocol to access isoquinolines through Ag (I) catalysed annulation of o-(1-alkynyl) arylaldehydes and ketones with NH_4OAc: elaboration to berberine and palmatine," *Organic & Biomolecular Chemistry*, vol. 13, no. 12, pp. 3732–3741, 2015.

[2] **V. Reddy** and **R. V. Anand**, "Expedient access to unsymmetrical diarylindolylmethanes through palladium-catalyzed domino electrophilic cyclization–extended conjugate addition approach," *Organic Letters*, vol. 17, no. 14, pp. 3390–3393, 2015.

[3] **B. T. Ramanjaneyulu**, **S. Mahesh**, and **R. V. Anand**, "Bis (amino) cyclopropenylidene-catalyzed 1, 6-conjugate addition of aromatic aldehydes to para-quinone methides: Expedient access to α, α'-diarylated ketones," *Organic Letters*, vol. 17, no. 16, pp. 3952–3955, 2015.

[4] **V. Reddy**, **A. S. Jadhav**, and **R. V. Anand**, "Catalyst-controlled regioselective approach to 1-aminoisoquinolines and/or 1-aminoisoindolines through aminative domino cyclization of 2-alkynylbenzonitriles," *European Journal of Organic Chemistry*, pp. 453, 2016.

[5] **P. Arde** and **R. V. Anand**, "N-heterocyclic carbene catalysed 1, 6-hydrophosphonylation of p-quinone methides and fuchsones: an atom economical route to unsymmetrical diaryl-and triarylmethyl phosphonates," *Organic & Biomolecular Chemistry*, vol. 14, pp. 5550, 2016.

[6] **C. Reddy** and **S. A. Babu**, "Zinc-Mediated Allylation Followed by Lactonization of Dialkyl 2-(3-Oxo-1, 3-diarylpropyl) malonates: Construction of δ-Lactones with Multiple Stereocenters," *Synlett*, vol. 26, no. 15, pp. 2121–2126, 2015.

[7] **R. Parella** and **S. A. Babu**, "Pd $(OAc)_2$-Catalyzed, AgOAc-Promoted Z Selective Directed β-Arylation of Acrylamide Systems and Stereoselective Construction of Z-Cinnamamide Scaffolds," *The Journal of Organic Chemistry*, vol. 80, no. 24, pp. 12379–12396, 2015.

[8] **B. Gopalakrishnan**, **S. A. Babu**, and **R. Padmavathi**, "Bidentate ligand 8-aminoquinoline-aided Pd-catalyzed diastereoselective β-arylation of the prochiral secondary sp^3 C$-$H bonds of 2-phenylbutanamides and related aliphatic carboxamides," *Tetrahedron*, vol. 71, no. 43, pp. 8333–8349, 2015.

[9] **Naveen** and **S. A. Babu**, "Ring-closing metathesis reaction-based synthesis of new classes of polyether macrocyclic systems," *Tetrahedron*, vol. 71, no. 40, pp. 7758–7781, 2015.

[10] **S. A. Babu**, **N. A. Aslam**, **A. Sandhu**, D. K. Singh, A. Rana, *et al.*, "Direct azidation of allylic/benzylic alcohols and ethers followed by the click reaction: one-pot synthesis of 1, 2, 3-triazoles and 1, 2, 3-triazole moiety embedded macrocycles," *Tetrahedron*, vol. 71, no. 38, pp. 7026–7045, 2015.

[11] **N. A. Aslam**, **S. A. Babu**, S. Rani, S. Mahajan, **J. Solanki**, M. Yasuda, and A. Baba, "Diastereoselective construction of 3-aminooxindoles with adjacent stereocenters: Stereocontrolled addition of γ-substituted allylindiums to isatin ketimines," *European Journal of Organic Chemistry*, vol. 2015, no. 19, pp. 4168–4189, 2015.

[12] **R. Padmavathi**, **R. Sankar**, **B. Gopalakrishnan**, **R. Parella**, and **S. A. Babu**, "Pd $(OAc)_2$/AgOAc catalytic system based bidentate ligand directed regiocontrolled C$-$H arylation and alkylation of the C$-$3 position of thiophene-and furan-2-carboxamides," *European Journal of Organic Chemistry*, vol. 2015, no. 17, pp. 3727–3742, 2015.

[13] **S. A. Babu**, **R. Padmavathi**, and **N. A. Aslam**, "Recent developments on the synthesis and applications of natural products-inspired spirooxindole frameworks," *Studies in Natural Products Chemistry*, vol. 46, p. 227, 2015.

[14] **M. Bhattacharya** and **P. Dogra**, "Self-assembly of ovalbumin amyloid pores: Effects on membrane permeabilization, dipole potential, and bilayer fluidity," *Langmuir*, vol. 31, no. 32, pp. 8911–8922, 2015.

[15] **S. Arya**, **A. Kumari**, **V. Dalal**, **M. Bhattacharya**, and **S. Mukhopadhyay**, "Appearance of annular ring-like intermediates during amyloid fibril formation from human serum albumin," *Physical Chemistry Chemical Physics*, vol. 17, no. 35, pp. 22862–22871, 2015.

[16] D. Dey, S. Das, **H. R. Yadav** , A. Ranjani, L. Gyathri, S. Roy, P. S. Guin, D. Dhanasekaran, **A. R. Choudhury**, M. A. Akbarsha, and B. Biswas, "Design of a mononuclear copper(II)-phenanthroline complex: Catechol oxidation, DNA cleavage and antitumor properties," *Polyhedron*, no. 106, pp. 106–114, 2016.

[17] S. K. Mal, M. Mitra, **H. R. Yadav** , C. S. Purohit, **A. R. Choudhury**, and R. Ghosh, "Synthesis, crystal structure and catecholase activity of a vanadium(V) schiff base complex," *Polyhedron*, vol. 111, pp. 118–122, 2016.

[18] **G. Kaur**, **S. Singh**, **A. Sreekumar**, and **A. R. Choudhury**, "The evaluation of the role of C$-$H$\cdots$F hydrogen bonds in crystal altering the packing modes in the presence of strong hydrogen bond," *J. Mol. Struct.*, vol. 1106, pp. 154–169, 2016.

[19] P. Alam, **G. Kaur**, A. Sarmah, R. K. Roy, **A. R. Choudhury**, and I. R. Laskar, "Highly selective detection of H^+ and OH^- with a single-emissive Iridium(III) complex: A mild approach to conversion of non-AIEE to AIEE complex," *Organometallics*, vol. 34, pp. 4480–4490, 2015.

[20] D. Dey, **H. R. Yadav** , A. De, S. Chatterjee, M. Maji, **A. R. Choudhury**, N. Kole, and B. Biswas, "Synthesis, structural characterization, and solution properties of a 1-D Pb (II)-bipyridine coordination polymer," *J. Coord. Chem.*, vol. 68, p. 169, 2015.

[21] D. Dey, S. Pal, **H. R. Yadav** , P. S. Sengupta, **A. R. Choudhury**, N. Kole, and B. Biswas, "Unusual crystallographic existence of a hydrated zinc (II) bisulphate complex: experimental and theoretical observations," *RSC Adv.*, vol. 5, p. 42681, 2015.

[22] P. Alam, **G. Kaur**, V. Kachwal, A. Gupta, **A. R. Choudhury**, and I. R. Laskar, "Highly sensitive explosive sensing by "aggregation induced phosphorescence" active cyclometalated Iridium (III) complexes," *J. Met. Chem. C.*, vol. 3, p. 5450, 2015.

[23] P. Alam, **G. Kaur**, S. Chakraborty, **A. R. Choudhury**, and I. R. Laskar, "'Aggregation induced phosphorescence' active 'rollover' Iridium (III) complex as a multi-stimuli-responsive luminescence material," *Dalton Trans.*, vol. 44, p. 6581, 2015.

[24] **A. K. De**, D. Roy, V. Bansal, A. Gupta, and D. Goswami, "Enhanced detection of tissue auto-fluorescence by one-photon ultrafast pulsed illumination," *Current Science*, vol. 109, no. 1, pp. 21–22, 2015.

[25] D. Roy, D. Goswami, and **A. K. De**, "Exploring the physics of efficient optical trapping of dielectric nanoparticles with ultrafast pulsed excitation," *Applied Optics*, vol. 54, no. 23, pp. 7002–7006, 2015.

[26] **A. K. De** and D. Goswami, "Signal enhancement in fluorescence microscopy by micro-second pulsed excitation," *Current Science*, vol. 110, no. 5, pp. 768–769, 2016.

[27] **M. Rana**, P. K. Patil, M. Chhetri, K. Dileep, R. Datta, and **U. K. Gautam**, "Pd–Pt alloys nanowires as support-less electrocatalyst with high synergistic enhancement in efficiency for methanol oxidation in acidic medium," *Journal of Colloid and Interface Science*, vol. 463, pp. 99–106, 2016.

[28] G. Singh, S. Girdhar, **S. Khullar**, and **S. K. Mandal**, "Imidazolyl-substituted silatranes derived from triethanolamine and tris(isopropanol)amine: syntheses and structural characterization," *Journal of Coordination Chemistry*, vol. 68, no. 5, pp. 875–894, 2015.

[29] G. Singh, A. Saroa, **S. Khullar**, and **S. K. Mandal**, "Schiff bases of N-(2-aminoethyl)-3-aminopropyltrimethoxysilane and its silatranes: Synthesis and characterization," *Journal of Chemical Sciences*, vol. 127, no. 4, pp. 679–685, 2015.

[30] **S. Kumar** and **S. K. Mandal**, "Capturing the structural diversification upon thermal desolvation of a robust metal organic framework via a single-crystal-to-single-crystal transformation," *CrystEngComm*, vol. 17, no. 46, pp. 8801–8806, 2015.

[31] **S. Khullar** and **S. K. Mandal**, "Ancillary ligand assisted self-assembly of coordination architectures of Mn(II): the effect of the N-alkyl group on a tridentate ligand," *Dalton Transactions*, vol. 44, no. 3, pp. 1203–1210, 2015.

[32] A. Bhalla, S. S. Bari, S. Berry, J. Bhalla, S. Vats, **S. K. Mandal**, and **S. Khullar**, "Facile synthesis of novel monocyclic trans-and cis-3-oxy/thio/seleno-4-pyrazolyl-β-lactams," *ARKIVOC*, vol. 7, pp. 10–27, 2015.

[33] K. Vasisht, M. Dhobi, **S. Khullar**, **S. K. Mandal**, and M. Karan, "Norneolignans from the roots of *Clitoria ternatea* L.," *Tetrahedron Letters*, vol. 57, no. 16, pp. 1758–1762, 2016.

[34] **V. Gupta**, **S. Khullar**, **S. Kumar**, and **S. K. Mandal**, "Construction of a robust pillared-layer framework based on the rare paddlewheel subunit $[Mn^{II}_2(\mu{-}O_2CR)_4L_2]$: synthesis, crystal structure and magnetic properties," *Dalton Transactions*, vol. 44, no. 38, pp. 16778–16784, 2015.

[35] A. Saini, R. Chadha, A. Gupta, P. Singh, S. Bhandari, **S. Khullar**, **S. K. Mandal**, and D. S. Jain, "New conformational polymorph of hydrochlorothiazide with improved solubility," *Pharmaceutical Development and Technology*, vol. 21, no. 5, pp. 611–618, 2015.

[36] **N. Kumar**, **S. Khullar**, and **S. K. Mandal**, "Controlling the self-assembly of homochiral coordination architectures of Cu(II) by substitution in amino acid based ligands: synthesis, crystal structures and physicochemical properties," *Dalton Transactions*, vol. 44, no. 12, pp. 5672–5687, 2015.

[37] P. V. Bharatam, M. Arfeen, N. Patel, P. Jain, S. Bhatia, A. K. Chakraborti, **S. Khullar**, **V. Gupta**, and **S. K. Mandal**, "Design, synthesis, and structural analysis of divalent N(I) compounds and identification of a new electron-donating ligand," *Chemistry–A European Journal*, vol. 22, pp. 1088–1096, 2016.

[38] **D. Das**, **S. Sidiq**, and **S. K. Pal**, "Design of bio-molecular interfaces using liquid crystals demonstrating endotoxin interactions with bacterial cell wall components," *RSC Advances*, vol. 5, no. 81, pp. 66476–66486, 2015.

[39] R. K. Gupta, B. Pradhan, S. K. Pathak, **M. Gupta**, **S. K. Pal**, and A. Ammathnadu Sudhakar, "Perylo [1, 12-b,c,d] thiophene tetraesters: A new class of luminescent columnar liquid crystals," *Langmuir*, vol. 31, no. 29, pp. 8092–8100, 2015.

[40] **M. Gupta** and **S. K. Pal**, "Triphenylene-based room temperature discotic liquid crystals: A new class of blue light-emitting materials with long range columnar self-assembly," *Langmuir*, 2016.

[41] A. Ammathnadu Sudhakar, R. K. Gupta, S. K. Pathak, B. Pradhan, **M. Gupta**, and **S. K. Pal**, "Bay-annulated perylene tetraesters: A new class of discotic liquid crystals," *ChemPhysChem*, 2016.

[42] **I. Verma**, **S. Sidiq**, and **S. K. Pal**, "Detection of creatinine using surface-driven ordering transitions of liquid crystals," *Liquid Crystals*, pp. 1–9, 2016.

[43] **I. Bala** and **S. K. Pal**, "Rod–disc oligomeric liquid crystal based on 4-cyanobiphenyl and truxene core," *Liquid Crystals*, pp. 1–9, 2016.

[44] **G. Mohiuddin**, **V. Punjani**, and **S. K. Pal**, "Three-ring-based room-temperature bent-core nematic compounds: Synthesis and characterization," *ChemPhysChem*, vol. 16, no. 13, pp. 2739–2744, 2015.

[45] **S. Setia** and **S. K. Pal**, "Unsymmetrically substituted room temperature discotic liquid crystals based on hexa–peri–hexabenzocoronene core," *ChemistrySelect*, vol. 1, no. 5, pp. 880–885, 2016.

[46] **H. Singh**, S. Kumar, and **S. K. Pal**, "Discotic liquid crystalline polymers: Structure and chemistry," in *Liquid Crystalline Polymers*, pp. 583–615, Springer, 2016.

[47] P. Kumar, C. Ramachandran, B. K. Mishra, and **N. Sathyamurthy**, "Interaction of rare gas dimers in the confines of a carbon nanotube," *Chemical Physics Letters*, vol. 618, pp. 42–45, 2015.

[48] **V. Dhindhwal**, M. Baer, and **N. Sathyamurthy**, "Study of topological effects concerning the lowest A" and the three A' states for the CO_2^+ ion," *The Journal of Physical Chemistry A*, 2015.

[49] S. Srivastava, M. Baer, and **N. Sathyamurthy**, "Jahn–Teller and coupled Jahn–Teller/Renner–Teller effects in the calculation of adiabatic-to-diabatic transformation angle for the lowest three ^{2}A' states of NH_2 (NHH)," *Molecular Physics*, vol. 113, no. 5, pp. 436–446, 2015.

[50] **S. Mittal**, B. K. Mishra, and **N. Sathyamurthy**, "The influence of sugar-phosphate backbone on the stacking interaction in B-DNA helix formation.," *Current Science*, vol. 108, no. 6, pp. 1126–1131, 2015.

[51] S. Dev, K. Giri, M. Majumder, and **N. Sathyamurthy**, "Relative stabilities and the spectral signatures of stacked and hydrogen-bonded dimers of serotonin," *Molecular Physics*, vol. 113, no. 19-20, pp. 2952–2959, 2015.

[52] **N. Sathyamurthy**, "IISERs : Emerging Science Universities of India,", vol. 110, no. 5, pp. 747–748, 2016.

[53] **B. Prashanth** and **S. Singh**, "Concise access to iminophosphonamide stabilized heteroleptic germylenes: chemical reactivity and structural investigation," *Dalton Transactions*, 2016.

[54] **K. Jaiswal**, **B. Prashanth**, **S. Ravi**, **K. Shamasundar**, and **S. Singh**, "Reactivity of a dihydroboron species: synthesis of a hydroborenium complex and an expedient entry into stable thioxo-and selenoxo-boranes," *Dalton Transactions*, vol. 44, no. 36, pp. 15779–15785, 2015.

[55] **K. Jaiswal**, **B. Prashanth**, **D. Bawari**, and **S. Singh**, "Bis (phosphinimino) amide supported borondihydride and heteroleptic dihalo compounds of group 13," *European Journal of Inorganic Chemistry*, vol. 2015, no. 15, pp. 2565–2573, 2015.

[56] **B. Prashanth**, **S. Singh**, and **A. Verma**, "Co(II), Ni(II) and Cu(II) complexes of sterically encumbered N-arylimidoylamidine based [N, N'] chelating ligands," *Polyhedron*, vol. 99, pp. 17–25, 2015.

[57] R. Dani, M. Bharty, O. Prakash, R. K. Singh, **B. Prashanth**, **S. Singh**, and N. Singh, "Ni(II) and Co(III) complexes of 5-methyl-1, 3, 4-thiadiazole-2-thiol: syntheses, spectral, structural, thermal analysis, and DFT calculation," *Journal of Coordination Chemistry*, vol. 68, no. 15, pp. 2666–2681, 2015.

[58] A. Singh, M. Bharty, P. Bharati, A. Bharti, **S. Singh**, and N. Singh, "Synthesis, spectral, thermal and structural characterization of a hexanuclear copper (I) cluster and a cobalt (III) complex of 1-ethyl-3-phenyl-thiourea," *Polyhedron*, vol. 85, pp. 918–925, 2015.

[59] **R. P. Shirke**, **V. Reddy**, **R. V. Anand**, and **S. S. V. Ramasastry**, "Furans to benzofurans: Intramolecular cross-benzoin reactions catalysed by N-heterocyclic carbenes," *Synthesis*, vol. 48, pp. 1865–1871, 2016. [Invited article towards the special issue 'Cyclization Tactics and Strategies'].

[60] **S. Dhiman** and **S. S. V. Ramasastry**, "Synthesis of polysubstituted cyclopenta[b]indoles via relay gold (I)/Brønsted acid catalysis," *Chemical Communications*, vol. 51, no. 3, pp. 557–560, 2015.

[61] **R. P. Shirke** and **S. S. V. Ramasastry**, "Modular assembly of furotropones and benzofurotropones, and study of their physicochemical properties," *The Journal of Organic Chemistry*, vol. 80, no. 10, pp. 4893–4903, 2015.

[62] **S. Dhiman** and **S. S. V. Ramasastry**, "One-pot relay gold (i) and brønsted acid catalysis: Cyclopenta[b]annulation of indoles via hydroamination/nazarov-type cyclization cascade of enynols," *Organic Letters*, vol. 17, no. 20, pp. 5116–5119, 2015.

[63] **S. K. Bankar**, **R. P. Shirke**, and **S. S. V. Ramasastry**, "Synthesis of O, S-containing polycycles via one-pot Michael addition–cycloacetalisation cascade," *Advanced Synthesis & Catalysis*, vol. 357, no. 14-15, pp. 3284–3296, 2015.

[64] **B. Satpathi** and **S. S. V. Ramasastry**, "Morita–baylis–hillman reaction of β, β-disubstituted enones: Enantioselective organocatalytic approach for the synthesis of Cyclopenta[b]annulated arenes and heteroarenes," *Angewandte Chemie International Edition*, vol. 55, no. 5, pp. 1777–1781, 2016.

[65] **Manisha**, **S. Dhiman**, **J. Mathew**, **S. S. V. Ramasastry**, *et al.*, "One-pot relay catalysis: divergent synthesis of furo [3, 4-b]indoles and cyclopenta[b]indoles from 3-(2-aminophenyl)-1, 4-enynols," *Organic & biomolecular chemistry*, vol. 14, pp. 5563–5568, 2016. [Invited article towards the thematic issue 'New Talent']. 2016.

[66] **S. Dhiman**, **U. K. Mishra**, and **S. S. V. Ramasastry**, "One-pot trimetallic relay catalysis: A unified approach for the synthesis of β-carbolines and other [c]-fused pyridines," *Angewandte Chemie International Edition*, vol. 55, no. 27, pp. 7737–7741, 2016.

[67] **S. K. Bankar**, **J. Mathew**, and **S. S. V. Ramasastry**, "Synthesis of benzofurans via an acid catalysed transacetalisation/fries-type $\mathrm{O} \rightarrow \mathrm{C}$ rearrangement/michael addition/ring-opening aromatisation cascade of β-pyrones," *Chemical Communications*, vol. 52, no. 32, pp. 5569–5572, 2016.

[68] **G. Karir** and **K. S. Viswanathan**, "Phenylacetylene–water complex: Is it n$\cdots\sigma$ or H$\cdots\pi$ in the matrix?," *Journal of Molecular Structure*, vol. 1107, pp. 145–156, 2016.

[69] **J. Saini** and **K. S. Viswanathan**, "Does a hydrogen bonded complex with dual contacts show synergism? a matrix isolation infrared and ab-initio study of propargyl alcohol–water complex," *Journal of Molecular Structure*, vol. 1118, pp. 147–156, 2016.

[70] **P. Mishra**, **K. Verma**, **D. Bawari**, and **K. S. Viswanathan**, "Does borazine–water behave like benzene-water? a matrix isolation infrared and ab initio study," *The Journal of Chemical Physics*, vol. 144, no. 23, p. 234307, 2016.

[71] **K. Verma**, **K. Dave**, and **K. S. Viswanathan**, "Hydrogen-bonded complexes of phenylacetylene-acetylene: Who is the proton donor?," *J. Phys. Chem. A*, vol. 119, p. 12656, 2015.

8.3 Department of Earth & Environmental Sciences

8.3.1 Summary of the research work

Anoop Ambili : I have undertaken a comprehensive study on sediments (catchment/core sediments) and modern vegetation samples in and around lake Ennamangalam, south India with focus on the reconstruction of past climate during mid to late Holocene epoch using lipid biomarkers (n-alkanes) distribution and carbon isotopic composition of organic matter. The retrieved ca. 1.65 m long well-dated sediment core sediments from lake Ennamangalam span the past ca. 4800 cal yr BP. The n-alkane index such as Paq, carbon preference index (CPI), terrestrial vs. aquatic ratio (TAR) have been developed to infer past organic matter source changes and to understand the climate-induced changes recorded in the lake sediment. Based on the terrestrial vs. aquatic ratio (TAR) values shows higher terrestrial influx observed after ca. 2500 cal yr BP indicates increase precipitation in the region. The results are currently under review in Quaternary International and Quaternary Science Reviews journals.

Lakshmi Narayanan : My work during the period of April 2015 - March 2016 focused on the ionospheric instabilities occurring in the low and middle latitudes. These instabilities are capable of affecting trans-ionospheric radio communications and navigational systems. In the low latitudes equatorial plasma bubbles (EPBs) are important instability phenomenon and in the middle latitudes electrified medium-scale traveling ionospheric disturbances (EMSTIDs) are important. I analyzed data from Indian region to study the EPBs and data from Japanese, Indian and Pacific regions to study the EMSTIDs. Some of the important results are summarized below.

Direct observational evidence is obtained for the process of merging of two individual EPBs. The process of decay of EPBs are not studied earlier. It was believed that once generated in the night, EPBs persist till sunrise hours. For the first time, the decay process of EPBs are studied in detail. It was found that they may decay even before sunrise. Earlier study by Narayanan et al. [JGR-Space Phys., 2014] revealed the cause of decay of EMSTIDs when they approach low latitudes based only on data from Japanese region. Recently, similar process is identified to be operational globally with the help of datasets from Indian, Japanese and Pacific sectors. The role of thermospheric winds in the formation and evolution of EMSTIDs are being studied at present.

In addition to the above mentioned works, I am involved in the study of gravity waves occurring in the equatorial thermosphere - ionosphere system.

Bärbel Sinha : Our group works on assessing the impact of short lived climate forces (SLCFs) and particulate matter on climate change and air quality. SLCFs are of great interest from a climate change mitigation perspective. Their forcing is large enough to offset carbon dioxide induced warming in the near and midterm future, but their lifetime is short (days to weeks) and their climate effects (cloud burning, changes in the atmospheric laps rate and the consequential changes in the hydrological cycle) are highly localised. Thus mitigation benefits those that enforce the emission cuts most by reducing atmospheric temperatures on the regional scale and improving human health, crop productivity and ecosystem health.

This year our group made a hallmark contribution, demonstrating that a popular source apportionment method which tries to source apportion the atmospheric black carbon burden to fossil fuel burning sources and biomass burning sources using the optical properties of the aerosol does not produce robust results in the Indian environment. Instead proven biomass burning events (crop residue burning, garbage burning and leaf litter burning) typically produce black carbon which, based on its optical properties, would be attributed to fossil fuel burning sources. On the other hand, traffic emissions can mistaken for biomass burning emissions when they originate from cars with poorly tuned engines. This finding has important real world implications. The scientific rational behind the recent odd-even experiments in New Delhi was a 2014 source apportionment study which used this questionable optical-property based approach and concluded, that 94% of the black carbon emission in New Delhi originate from fossil fuel burning and only 6% originate from biomass burning. If that finding had been true, then the odd-even rule would be expected to result in significant emission reductions. Our findings imply that it is highly unlikely all the black carbon blamed on fossil fuel sources actually originates from the same and hence the odd-even experiment is not likely to produce the expected emission cuts.

Vinayak Sinha : Our current research is focused on improving fundamental process-based understanding of emissions-atmospheric chemistry-air quality and climate and their bi-directional feedbacks over South Asia. Towards this end, we deploy sophisticated (and develop) mass spectrometric, spectroscopic and gas chromatographic techniques for identifying and quantifying gaseous emissions (e.g. volatile organic compounds and green house gases) and hydroxyl radical reactivity in field experiments, controlled laboratory experiments and from point sources. The experimental studies are combined with appropriate modeling tools (chemical box models, chemical transport models and positive matrix factorization models) to finally accurately assess air pollution and climate change effects on atmospheric chemistry for proposing mitigation strategies and policies.

8.3.2 Visits of faculty members

- **Lakshmi Narayanan**
  - visited *Aichi University, Toyohashi (Japan)* on March 16, 2016.
  - visited *Electronic Navigation Research Institute, Tokyo (Japan)* on March 15, 2016.
  - visited *Institute of Space-Earth Environmental Research, Nagoya University, Nagoya (Japan)* during January 09 - 30 March, 2016.
  - visited *National Institute of Information and Communications Technology, Tokyo (Japan)* on March 15, 2016.
- **Bärbel Sinha** visited *Max Planck Institute for Chemistry, Mainz, Germany* during October 12-14, 2015.
- **Vinayak Sinha**
  - visited *Korea University (South Korea)* during May 20-22, 2015.
  - visited *ARIES, Nainital (India)* during November 23-25, 2015.
  - visited *Indian Institute of Tropical Meteorology (India)* on March 2, 2016.

8.3.3 Talks delivered

- **V. L. Narayanan**
  - Merging of equatorial plasma bubbles - case studies based on OI 630.0 nm imaging observations : 26th IUGG General Assembly meeting : June 24, 2015.
  - Understanding the disappearance of nighttime electrified medium-scale travelling ionospheric disturbances reaching lower latitudes : Nagoya University, Japan : February 19, 2016.
- **Bärbel Sinha**
  - Limitation of using Angstrom exponent for source apportionment of black carbon in complex environments - A case study from the North West Indo Gangetic Plain : Max Planck Insitute for Chemistry, Mainz Germany : October 14, 2015.
  - **Harshita Pawar** : Quantifying the contribution of Long-Range Transport to Particulate Matter (PM) enhancement at a suburban site in the North-Western Indo Gangetic Basin : Second Workshop on Atmospheric Composition and the Asian Summer Monsoon (ACAM) : NCAR National Center for Atmospheric Research in Bangkok, Thailand : June 8, 2015.
- **V. Sinha**
  - Impact of biomass combustion on ambient chemical composition in the IGP : Results of PTR-MS, PTR-TOF-MS VOC and OH reactivity measurements in Mohali and Kathmandu : Forschungszentrum, Jülich, Germany : July 8, 2015.
  - Impacts of bi-directional exchange of volatile organic compounds and trace gases with fog water in the N.W. IGP : Institute of Tropical Meteorology, Pune : August 13, 2015.
  - Atmospheric cleansing capacity : Indian Institute of Technology, Kanpur : August 27, 2015.

8.3.4 Conferences attended by researchers

1. Saryu Garg : American Geophysical Union Fall Meeting : December 12-18 2015 : American Geophysical Union : San Fransisco, USA

2. Harshita Pawar : National Climate Science Conference : July 2-3 2015 : Divecha Center for Climate Change at the Indian Institute of Sciences : IISc Bangalore, India

3. Harshita Pawar : The Second Workshop on Atmospheric Composition and the Asian Summer Monsoon (ACAM) : June 8-10 2015 : NCAR National Center for Atmospheric Research : Bangkok, Thailand

4. V. L. Narayanan : 26th IUGG General Assembly : 22 June – 2 July 2015 : International Union of Geodesy and Geophysics : Prague (Czech Republic)

5. V. L. Narayanan : 12th Annual meeting of AOGS : 2 – 7 August 2015 : Asia Oceania Geosciences Society (Singapore)

6. Chandra, B., P. and Sinha V. : Atmospheric Composition And The Asian Monsoon : June 8-10, 2015 : International Global Atmospheric Chemistry Project : Bangkok

7. Hakkim, H., Sarkar, C., Chandra, B., P. and Sinha V. : National Climate Science Conference : July 2-3, 2015 : Indian Institute of Science : Bangalore

8. Sinha, V., Chandra, P., Kumar, V. and Sarkar, C. : American Geophysical Union Fall Meeting : December 13-18, 2015 : American Geophysical Union : San Francisco

9. Sarkar, C., Sinha, V., Kumar, V., Rupakheti, R., Panday, A., Mahata, K., Rupakheti, D., Kathayat, B. and Lawrence, M. : American Geophysical Union Fall Meeting : December 13-18, 2015 : American Geophysical Union : San Francisco

10. Sinha, V., Chandra, P., Kumar, V. and Sarkar, C.:Impact of post harvest agricultural biomass fires on atmospheric composition of reactive gases and ozone in the N.W. Indo-Gangetic Plain :International Conference on Atmospheric Chemistry and Agricultural Meteorology : November 2-4, 2015 : World Meteorological Organization and Indian Meteorological Department : Pune

11. Chandra, B., P. and Sinha V. : Contribution of post-harvest agricultural paddy residue fires in the N.W. Indo-Gangetic Plain to ambient carcinogenic benzenoids, toxic isocyanic acid and carbon monoxide : Integrated Chemie Conference on Frontiers in Applied Chemistry – From Molecules to Materials : February 12-13, 2016 : Sri Sathya Sai Institute of Higher Learning : Prashantinilayam

8.3.5 Publications : Earth and Environmental Sciences

[1] **B. Nandy**, **G. Sharma**, **S. Garg**, **S. Kumari**, **T. George**, **Y. Sunanda**, and **B. Sinha**, "Recovery of consumer waste in india–a mass flow analysis for paper, plastic and glass and the contribution of households and the informal sector," *Resources, Conservation and Recycling*, vol. 101, pp. 167–181, 2015.

[2] K. Li, **B. Sinha**, and P. Hoppe, "Speciation of nitrogen-bearing species using negative and positive secondary ion spectra with nano secondary ion mass spectrometry," *Analytical chemistry*, vol. 88, no. 6, pp. 3281–3288, 2016.

[3] K. Li, **B. Sinha**, and P. Hoppe, "Nitrogen isotope analysis of $NaNo_3$ and KNO_3 by nano secondary ion mass spectrometry using the $15N16O_2$-/$14N16O_2$- ratio," *Journal of Vacuum Science & Technology B*, vol. 34, no. 3, p. 030601, 2016.

[4] **S. Garg**, **B. P. Chandra**, **V. Sinha**, R. Sarda-Esteve, V. Gros, and **B. Sinha**, "Limitation of the use of the absorption angstrom exponent for source apportionment of equivalent black carbon-a case study from the North West Indo-Gangetic plain," *Environmental Science & Technology*, vol. 50, pp. 814–824, 2016.

[5] **V. Kumar**, **C. Sarkar**, and **V. Sinha**, "Influence of post-harvest crop residue fires on surface ozone mixing ratios in the NW IGP analyzed using 2 years of continuous in situ trace gas measurements," *Journal of Geophysical Research: Atmospheres*, vol. 121, no. 7, pp. 3619–3633, 2016.

[6] **B. P. Chandra** and **V. Sinha**, "Contribution of post-harvest agricultural paddy residue fires in the NW Indo-Gangetic plain to ambient carcinogenic benzenoids, toxic isocyanic acid and carbon monoxide," *Environment International*, vol. 88, pp. 187–197, 2016.

[7] **C. Sarkar**, **V. Sinha**, **V. Kumar**, M. Rupakheti, A. Panday, K. S. Mahata, D. Rupakheti, B. Kathayat, and M. G. Lawrence, "Overview of VOC emissions and chemistry from PTR-TOF-MS measurements during the SUSKAT-ABC campaign: high acetaldehyde, isoprene and isocyanic acid in wintertime air of the Kathmandu valley," *Atmos Chem Phys*, vol. 16, pp. 3979–4003, 2016.

[8] R. Hansen, M. Blocquet, C. Schoemaecker, T. Léonardis, N. Locoge, C. Fittschen, B. Hanoune, P. Stevens, **V. Sinha**, and S. Dusanter, "Intercomparison of the comparative reactivity method (CRM) and pump–probe technique for measuring total OH reactivity in an urban environment," *Atmospheric Measurement Techniques*, vol. 8, no. 10, pp. 4243–4264, 2015.

[9] P. Misztal, C. Hewitt, J. Wildt, J. Blande, A. Eller, S. Fares, D. Gentner, J. Gilman, M. Graus, J. Greenberg, A. B. Guenther, A. Hansel, P. Harley, M. Huang, K. Jardine, T. Karl, L. Kaser, F. N. Keutsch, A. Kiendler-Scharr, E. Kleist, B. M. Lerner, T. Li, J. Mak, A. C. Nölscher, R. Schnitzhofer, **V. Sinha**, B. Thornton, C. Warneke, F. Wegener, C. Werner, J. Williams, D. R. Worton, N. Yassaa, and A. H. Goldstein, "Atmospheric benzenoid emissions from plants rival those from fossil fuels," *Scientific Reports*, vol. 5, 2015.

[10] N. Zannoni, S. Dusanter, V. Gros, R. Sarda Esteve, V. Michoud, **V. Sinha**, N. Locoge, and B. Bonsang, "Intercomparison of two comparative reactivity method instruments inf the mediterranean basin during summer 2013," *Atmospheric Measurement Techniques*, vol. 8, pp. 3851–3865, 2015.

8.4 Department of Humanities & Social Sciences

8.4.1 Summary of the research work

Ritajyoti Bandyopadhyay : I am a historical anthropologist at present. My earlier and ongoing research projects explore themes in informality, infrastructure technologies and governmentality studies in late-colonial and post-colonial India. I am particularly invested in studying the materiality of mass politics as India transitioned from imperial sovereignty to popular sovereignty. I am also interested in the genealogies of Marxism and Fascism infested in popular consciousness in South Asia. My current projects are as follows: 1. The Rule of the Street: Institutions and Informalities in Calcutta 1911–2011 (book manuscript under preparation, commissioned by the Cambridge University Press) 2. Governing Calcutta in the Twentieth Century: A Legal- Institutional History 3. Technopolitics of Identification: Aadhaar and the Regimes of Risk under Neolibaralism 4. Urban Food Provisioning in Contemporary West Bengal: The Emerging Frontiers of Retail 5. War and Urbanity in South Asia in the Long-Twentieth Century I have taught courses on urban history, property, infrastructure studies, and social policy during my prior academic assignments. I am looking forward to develop courses on the understandings of capitalism, crisis, science and technology in the contemporary world. I wish to work and supervise projects on the trajectories of capitalist accumulation, social policy, rent and tenancy relations in South Asian cities and mass political formation under neoliberalism.

Parth R. Chauhan : In the summer of 2015, I continued my archaeological and paleontological surveys in the central Narmada Basin in Madhya Pradesh and in January 2016, I initiated a similar project in the Siwalik Hills and the Himalayan zone in Himachal Pradesh. In Madhya Pradesh, we discovered new Paleolithic and Mesolithic stone tool sites, rock art sites of various periods and several new vertebrate fossil occurrences. These occurrences include both surface occurrences as well as buried primary context ones, some of in which we placed small trenches to obtain spatial and geological information as well as for the collection of sediments for different types of analyses. This work is generally carried out during the summers and includes student interns from IISER Mohali and other institutions. In Himachal Pradesh, we discovered and collected vertebrate fossil remains up to 3 million years old and younger Paleolithic evidence belonging to the Soanian industry/tradition. This work is being done in the nearby Siwalik Hills on weekends and in interior Himalayan ranges during longer semester breaks. In Siwalik Hills, we are looking for evidence of human occupation in Early Pleistocene contexts and in the interior mountain zones, we are looking for Middle/Late Pleistocene sites representing high altitude prehistoric adaptations. Future work will involve a strong experimental archaeology component which will entail the replication of various 'primitive' or ancient technologies to test their efficiency on a variety of materials including meat, bone, wood and so forth.

Adrene Freeda D'cruz : My primary area of research is postwar American fiction, in particular the works of the contemporary American novelist, Don DeLillo. In addition, I work on science-in-theater, an upcoming genre that deals with the interface between science and literature.

S. K. Arun Murthi : In the area of philosophy of science I am interested in the philosophical accounts of scientific theories. The issues that I am specifically concerned are whether in the context of science the philosophical positions like realism and empiricism need reorientation, the philosophical importance of scientific concepts as part of theory building in science. Here my interests are more towards the foundational concepts in the special sciences and towards the emerging area of philosophy of chemistry. The philosophical understanding of scientific concepts is closely tied to the idea of explanations and theories and I attempt to synthesize these notions. In Indian Philosophy I am interested in the metaphysical and epistemological issues with regard to Avidya in the different systems. Here I draw upon my background in analytic philosophy. Apart from this I am also interested in the comparative study of a) essentialism in the western tradition in different forms (Aristotelian, Lockean and modern) and Sankhya and b) the nature of laws and Vyapti as explicated in different systems in general and Nyaya in particular.

Meera Nanda : I work in the general space where history and philosophy of modern science meet, and often conflict with history and philosophy of Indian sciences and religions. My doctoral dissertation in Science and Technology Studies was a defense of objectivity and universality of modern scientific knowledge against postmodernist

critics who view all knowledge as a social construct of power and ideology. I have published original historical research on the reception and reinterpretation of Darwinism by modern Hindu reformers in the 19th century India. In addition, I have examined the influence of Theosophy on modern Hindu interpretation of the Vedic worldview as scientific. I am currently at work on a social and intellectual history of the idea of scientific tempera as it is understood in the Indian context.

V. Rajesh : I have been working on the history of progressive literary movement and the intellectual history of early communist movement in Tamil Nadu. The investigation has resulted in the writing of a research paper presented at the Chicago Tamil Forum workshop at the University of Chicago and subsequent publication in South Asia journal. I am currently drafting a book proposal on this topic and aim towards producing the first draft of the book manuscript by next year.

Anu Sabhlok : My research lies broadly in the domain of critical and feminist geography. I look at how social and spatial relationships are mutually constituted. The methodological tools that I use are from ethnography and my theoretical engagements have been with political economy, feminist theory, critical social theory and urban studies. Currently, I am leading two research projects:

- *Constructing the Nation*: An Ethnographic Account of Migrant Road Construction Labour in the Upper Himalayas I have been conducting ethnographic research in Lahaul-Spiti, Ladakh and Jharkhand since 2010 to understand the dynamics of seasonal labour migration and its relationship to national development. This project uses social theory to engage with themes of national borders, infrastructure development and defense as they intersect with the lives of the migrant labour. Migration studies within population geography and studies of nationalism in several disciplines (including geography, sociology and anthropology) have produced a plethora of literature over the past few decades. However, both migration studies and studies on nationalism have moved parallel to each other with little or no overlaps for the most part, especially on internal migration. In fact, until recently most studies on migration looked at either economic factors or mobility behavior but did not address issues of identity. On the other hand, most studies on nationalism have tended to focus on the scale of the nation-state. My work moves beyond a nested understanding of scale and shows how migrant bodies are constructed by (and in turn construct) the nation-state (materially and discursively).
- *Chandigarh: Shifting Paradigms* : "Let this be a new town, unfettered by the traditions of the past." Nehru proclaimed for the new city of Chandigarh in the early years of Independence. Chandigarh was planned and designed by Le Corbusier in the modernist idiom complete with wide roads, concrete structures and large plazas. My project explores the mutual construction of identity and place in Chandigarh with particular emphasis on gender and class. I investigate both the public and private spaces of Chandigarh as well as the in-between spaces such as sector parks, apartment terraces and service lanes. Each of these spaces has stories to tell - stories that inform us about the production, reproduction and negotiation of gendered national identities in modern urban space. Does the 'modern' city of Chandigarh, create a new kind of citizen for India? Does the modernity apparent in the planning translate into a more democratic and inclusive space or does it recreate similar gender dynamics to those that exist in other parts of urban India and elsewhere? I have been conducting ethnographic work in the city now for over 5 years and also integrate this research with my course on 'Urban theory and Laboratory.' The narrative that emerges weaves in themes of nationalism, 'respectability' and economic liberalization to discuss the mutual construction of gender and place in the context of Chandigarh.

8.4.2 Visits of faculty members

- **Parth R. Chauhan** visited *M. S. University of Baroda, Vadodara (India)* during July 1-15, 2015.
- **V. Rajesh**
  - visited *The University of West Indies, Trinidad (Trinidad and Tobago)* during June 1-4, 2015.

- visited *University of Chicago, Illinois (United States)* during May 21-23, 2015.
- visited *University of Miami, Florida (United States)* during May 26-28, 2015.

- **Anu Sabhlok**
  - visited *Department of Geography, Delhi School of Economics, Delhi (India)* on October 13, 2015.
  - visited *Institute of Advanced Study, Shimla (India)* during June 4-10, 2015.
  - visited *Indian Institute of Science Education and Research, Mohali (India)* during January 20 - 22, 2016.
  - visited *Banaras Hindu University, Varanasi (India)* during February 24 - 26, 2016.

8.4.3 Talks delivered

- **Parth R. Chauhan**
  - The Easternmost Acheulean record in the Old World. XIX INQUA Congress (Nagoya, Japan) : July 28, 2015.
  - *Poster* : A decade of South Asian prehistory (2005-2015) : Seminar in honor of Prof. V.N. Misra (Pre & Proto-history of India) : Deccan College (Pune) : August 18, 2015.
  - Preserving prehistory : Unique challenges and ideas to include all heritage. Workshop on Commodity, resource or heirloom? Investigating the social, economic and ethical values of cultural heritage : M.S. University of Baroda (Vadodara) : September 30, 2015.
  - Recent prehistoric surveys in the Sehore and Hoshangabad Districts of Madhya Pradesh (2014-15) : Annual IAS-ISPQS-IHCS Conference : University of Hyderabad : December 17-20, 2015.
  - Archaeological perspectives on human evolution and dispersals in India : Biology Discussion Forum, IISER Mohali : February 13, 2016.
  - Cuts not up to the mark : Critical comments on recent claims of Late Pliocene paleoanthropological evidence in the Shiwalik Hills near Chandigarh, northern India : National Seminar on Anthropology and Human Welfare : Bio-Culture Perspective : Panjab University (Chandigarh) : March 11, 2016.
  - Origins, Intellect, Innovation & Identity : Issues in Indian and Asian prehistoric archaeology : Harvard-Yenching Annual Forum : Asian Archaeology : Recent Discoveries and controversies : Harvard University (Boston, USA) : March 28, 2016.
  - **Nupur Tiwari** : Open-air site museums : Recreating / reconstructing the prehistoric abode : Annual Conference of Museums Association of India : January 31 - February 2, 2016.

- **Anu Sabhlok**
  - The new public sector labour geographies presented at the 12th annual conference of the journal Historical Materialism. School of Oriental and African Studies. London November 5-8, 2015.
  - Walking with the Subalterns' : imagining ways of dialogic engagements and representations presented at the Comparative Subalternity workshop. Indiana University Bloomington Gurgaon center.December 11-14, 2015.
  - Feminist Geographies in South Asia presented at workshop on Radical Convergence : Exploring Critical Geographies in South Asia. Sambhaavna Institute. Palampur. June 26-30, 2015.
  - (With K. Sarma and J. Malik) : Road Chronicles : an ode to the labourer. A photo installation at Alliance Française de Delhi from October 10-15, 2015.

- **Navprit Kaur**
  - Understanding Women as Differentiated Category: National Seminar on Gender Relations in North-Western India : November 23, 2015
  - The City and Its Invisible : International workshop on the theme Learning from the Utopian City-Chandigarh : February 28-29, 2016.
  - Reconstruction of Caste and Gender during Anti-Mandal Protests : UGC Special Assistance Programme Seminar on Gender Caste and Religion in Indian Literature : March 3-4, 2016.

8.4.4 Conferences attended by researchers

1. P. R. Chauhan : XIX INQUA Congress : July 26-August 2, 2015 : Nagoya, Japan.
2. P. R. Chauhan : Seminar in honor of Prof. V.N. Misra : August 18, 2015 : Deccan College, Pune.
3. P. R. Chauhan : Workshop on Commodity, resource or heirloom? Investigating the social, economic and ethical values of cultural heritage : September 30, 2015 : M.S. University of Baroda, Vadodara.
4. P. R. Chauhan : Annual IAS-ISPQS-IHCS conference : December 17-20, 2015 : University of Hyderabad, Hyderabad.
5. P. R. Chauhan : National Seminar on Anthropology and Human Welfare : Bio-Culture Perspective : March 10-11, 2016 : Panjab University, Chandigarh.
6. P. R. Chauhan : Harvard-Yenching Annual Forum : Asian Archaeology : Recent Discoveries and controversies : March 28, 2016 : Harvard University, USA.
7. Nupur Tiwari : Annual IAS-ISPQS-IHCS conference : December 17-20, 2015 : University of Hyderabad, Hyderabad.
8. Nupur Tiwari : Annual Conference of Museums Association of India : January 31- February 2, 2016. Chennai.
9. Vivek Singh : Archaeology workshop on pottery analysis : April 1, 2016 : University of Delhi.
10. Ravindra Deora : Training Workshop on modern river management and historic reconstruction with advanced fluvial remote sensing : April 9-10, 2016 : IIT Kanpur.
11. Rajesh Venkatasubramanian : Chicago Tamil Forum Workshop : 21-23 May, 2015 : Department of Anthropology, University of Chicago, Illinois, United States.
12. Shipa Dahake, Yogesh Mishra, Dalia Bhattacharjee, Preetika Sharma : Radical Convergence : exploring critical geographies in South Asia : June 26-30, 2015 : Sambhaavna Institute, Palampur
13. Shilpa Dahake : Winter Fog Meeting : December 1-3, 2015 : International Centre for Integrated Mountain Development, Kathmandu (Nepal)

8.4.5 Publications : Humanities & Social Sciences

[1] **P. R. Chauhan**, "A decade of paleoanthropology in the indian subcontinent (2005–2015)," *A Companion to South Asia in the Past*, pp. 32–50.

[2] **P. R. Chauhan** and P. Sukumaran, "Paleoanthropology," *Current Science*, vol. 110, no. 5, pp. 759–760, 2016.

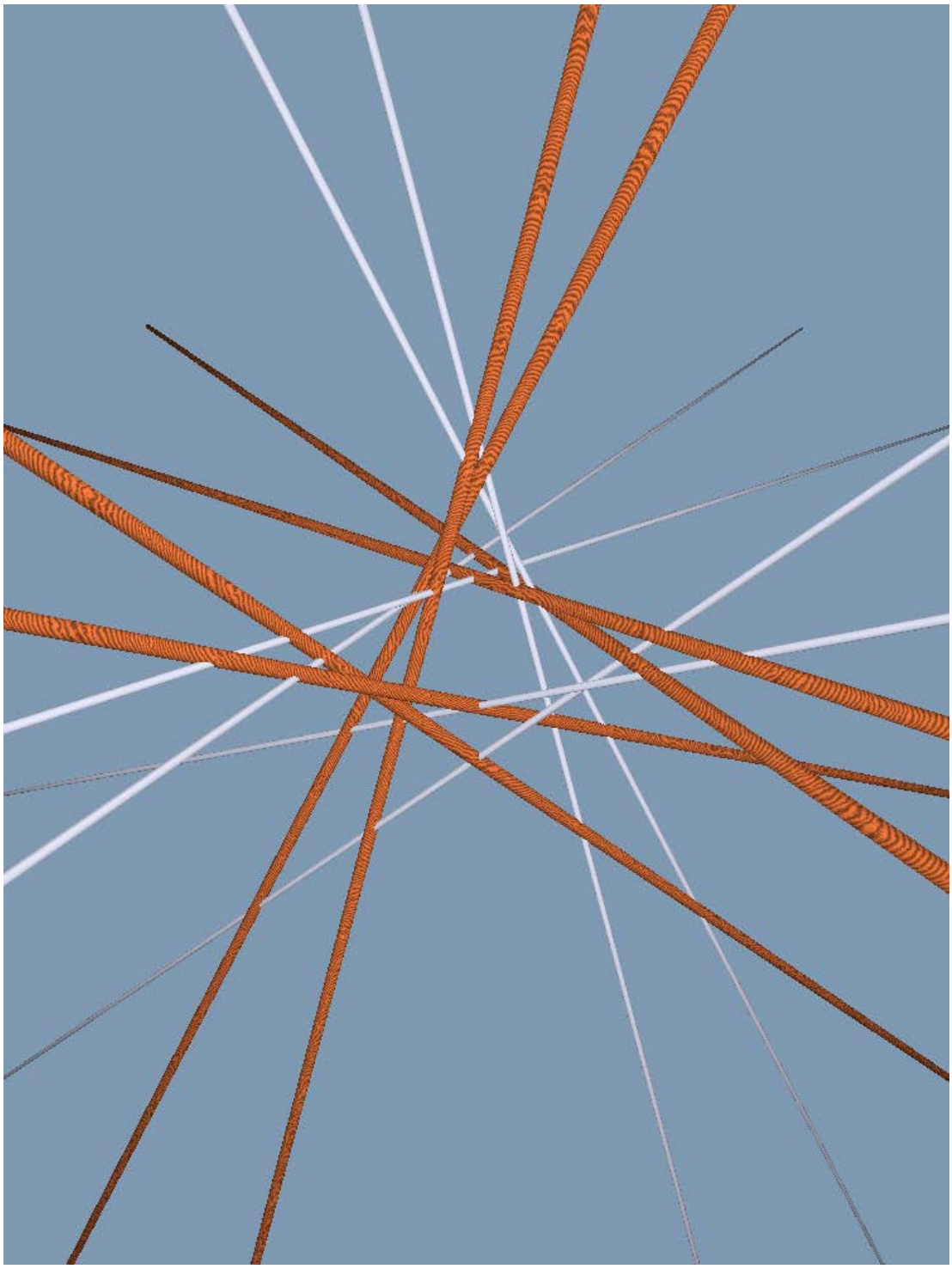
[3] **P. R. Chauhan**, K. Krishnan, K. Garg, S. Pal, B. Singh, and A. Mukherjee, "Revisiting the Joshipur rockshelter complex (sehore dt., madhya pradesh)," *Heritage: Journal of Multidisciplinary Studies in Archaeology*, vol. 3, pp. 105–127, 2015.

[4] **A. F. D'cruz**, "Violence and Scapegoating in Don Delillo's Libra," *The Explicator*, vol. 73, no. 4, pp. 325–330, 2015.

[5] **M. Nanda**, *Science in Saffron: Skeptical essays on the Hindutva History of Science*, Three Essays Press, New Delhi, January 2016.

[6] **A. Sabhlok**, C. Hoiwan, and **Y. Mishra**, "Narratives of health and well-being in the lives of migrant labour working in the upper himalayas," *Economic and Political Weekly*, vol. 50, pp. 71–78, Dec. 2015.

[7] **Y. Mishra**, "Documenting multiple narratives," *Greater Kashmir*, Oct. 2015.



8.5 Department of Mathematical Sciences

8.5.1 Summary of the research work

Chandrakant S. Aribam : A central area in number theory is the study of special values of L-functions of automorphic forms, which are analytic objects. Many of the problems in number theory can be studied in terms of the L-function of certain automorphic forms. One fruitful way of studying the special values of these L-functions is through the p-adic interpolation of these values, for a prime p. This is carried out through the Bloch-Kato Tamagawa Number Conjecture and the Main Conjecture of Iwasawa theory. These conjectures relate the p-adic interpolation of special values of L-function which are analytic objects with arithmetic objects known as Selmer groups. In a vast generalization, by considering an infinite extension of a number field whose Galois group is a p-adic Lie group, many deep and beautiful conjectures were formulated relating objects of arithmetic nature, again typified by a Selmer group of Galois representations and p-adic nature of their corresponding L-functions. We have carried out a study of an important invariant that tells us about the structure of these Selmer groups. We are also interested in studying the p-adic nature of representations of Galois groups which are fundamental in understanding the Selmer groups.

Anandam Banerjee : My interests are in the fields of Algebraic Geometry and Algebraic K-Theory. I focus on the study of the triangulated categories of motives, algebraic cobordism and motivic homotopy theory. Higher Chow groups were defined by Bloch in the 80's as an integral cohomology theory that rationally recovers the weight-graded pieces of algebraic K-theory, extending the Chern character isomorphism on rational Chow groups. For a smooth variety over complex numbers C, Bloch also constructed a higher cycle-class map from higher Chow groups to Deligne cohomology extending the usual cycle class map from Chow groups to singular cohomology. In a well-known work, Totaro showed that the usual cycle class map factors through complex cobordism quotiented by the coefficients of the Lazard ring. Jointly with Amit Hogadi, I am working on the problem of generalizing Totaro's construction to Bloch's higher cycle class map to Deligne cohomology. The right context to state this problem is at the level of motivic stable homotopy theory, where instead of bigraded cohomology theories, we consider the P1-spectrum of motivic spaces over C. Using the Morel-Hopkins isomorphism, we show that the higher cycle class map is in fact induced by a map of ring spectra between the P1-spectra representing the respective cohomology theories. Also, the map factors through a quotient of the Hodge-filtered cobordism spectrum defined by Hopkins and Quick as a cobordism analogue of Deligne cohomology. In another project, I am studying the nature of the functor from modules over algebraic cobordism to Voevodsky's triangulated category of motives over a perfect field.

Krishnendu Gongopadhyay : We have studied palindromic widths in solvable groups. We have obtained new results about palindromic automorphisms of free groups. We have obtained algebraic classification of complex hyperbolic isometries, and more generally unitary groups of signature (p, q).

Sudesh Kaur Khanduja : Let R be a Prüfer domain with quotient field K and θ be an element of an integral domain containing R with θ integral over R and $F(x)$ be the minimal polynomial of θ over K. We have given some necessary and sufficient conditions to be satisfied by $F(x)$ so that $R[\theta]$ is integrally closed. We have applied this criterion to rings of algebraic integers of algebraic number fields which are generated by a root of an irreducible trinomial over the ring R of integers.

Amit Kulshrestha : My research interests lie in the theory of Central Simple Algebras and related structures such as Quadratic Forms and Algebraic Groups. Currently I am engaged in exploring special 2-groups using quadratic forms over fields of characteristic 2. Along with Dilpreet Kaur, I recently obtained rational Wedderburn decomposition for these groups in terms of quadratic maps and showed that two non-isomorphic real special 2-groups may have isomorphic rational group algebra. In a collaboration with Varadharaj Srinivasan I have started working on Differential Central Simple Algebras with an intention to explore the field extensions which split Differential Crossed Product Algebras.

Chanchal Kumar : My research interest in algebraic geometry includes study of moduli space of vector bundles, Geometric Invariant Theory and Classical Algebraic Geometry. For the last five years, I have been interested in some aspects of Combinatorial Commutative Algebra; namely, the study of free resolutions of monomial ideals, computation of their Betti numbers and relationship between their combinatorial and algebraic properties.

Alok Maharana : My research interests include the study of compact and non-compact algebraic surfaces and their singularities. I have investigated cyclic covers of the affine plane without any topological condition like acyclicity, and completely classified those which are not of logarithmic general type. I am interested in the existence of C^*-fibrations on affine surfaces of logarithmic non-general type, especially those with logarithmic Kodaira dimension zero. In a joint work with R. V. Gurjar we have shown that affine surfaces with logarithmic Kodaira dimension zero and zero canonical divisor, do admit a C^*-fibration, except in the case of complements of smooth cubic curves in the projective plane.

Yashonidhi Pandey : My broad area of research is the subject of bundles on curves. During my doctorate, I calculated polarizations on Prym-Tyurin-Donagi varieties in view of the Abelianization programme initiated by Nigel Hitchin. Later I worked on the torsors under Bruhat-Tits group schemes and gave a criteria for the existence of stable torsors on the projective line. Recently, I have been working to compactify the moduli of quadratic bundles on curves fixing the loci of degeneracy and the orders. I have also computed the Brauer group of the moduli space and stack of torsors under Bruhat-Tits group schemes. In future, I wish to work in the emerging area of essential dimension in the context of moduli theory.

Kapil H. Paranjape : Some canonical complexes to compute the cohomology of the general linear group (in collaboration with M V Nori and R de Jeu) Complex multiplication K3 surfaces (in collaboration with M V Nori and V Srinivas) Modular forms and Calabi-Yau varieties (in collaboration with D Ramakrishnan) Finitistic characterisation of the category of finite-type schemes. Some questions arising out of computations in mathematics.

I. B. S. Passi : Work was carried out on generalized dimension subgroups and derived functors in collaboration with Roman Mikhailov (St. Petersburg, Russia). Thomas Sicking, a research student at Mathematisches Institut Georg-August Universitt, Göttingen (Germany), visited IISER Mohali during September 2015 - March 2016 and worked with me on Lie dimension subrings. Work with Mahender Singh (IISER Mohali) and Manoj Kumar Yadav (HRI, Allahabad) on a monograph on automorphisms of finite groups was continued. An advanced course on Geometric Group Theory was designed and given; in addition to some of the regular BS-MS students, this course was audited by a few MS-PhD students as well. Supervised MS Thesis of Bhaskar Vashishth on The Normalizer Problem in Integral Group Rings.

Lingaraj Sahu : My research interest include analysis of Completely Positive (CP) maps and semi-groups of such maps on C^* or von Neumann algebras. Recently, we (jointly with Preetinder Singh) have constructed a class of semi-group of completely positive maps on type II_1- factor from formal generators. Here the generator is only given in term of unbounded form. We are also investigating Dirichlet form on C^* or von Neumann algebras and exploring possible construction of CP semi-group of CP.

Sudhanshu Shekhar : My Area of research is Arithmetic Geometry. Currently I am interested in Iwasawa Theory of p-adic Lie extensions, Congruence between special values of L-functions and Hida Theory. Iwasawa theory is the study of objects of arithmetic interest over infinite towers of number fields. It is an active area of research in number theory that plays an important role in attacking problems like the celebrated Birch and Swinnerton Dyer conjecture. In the study of Iwasawa theory of elliptic curves and modular forms various algebraic and analytic invariants appear (eg. the μ and λ invariant of the Selmer groups and the p-adic L-functions). Much of my current research is focused on studying the variation of these arithmetic, algebraic and analytic invariants associated to elliptic curves and modular forms under the congruences of associated Galois representations.

Mahender Singh : We investigated free actions of finite groups on products of spheres and Stiefel manifolds. We also obtained some results on automorphisms of braid groups and palindromic automorphisms of free groups.

Varadharaj R. Srinivasan : My present research work revolves around the algebraic theory of non linear differential equations. In particular, I am interested in the following problem: Give a procedure to determine whether a non linear differential equation $f(x, y, y') = 0$ admits a non zero closed form solution and to find one when it does.

8.5.2 Visits of faculty members

- **Anandam Banerjee** visited *Universität Duisburg-Essen, Essen (Germany)* during June 14 - July 16, 2015.
- **Krishnendu Gongopadhyay**
  - visited *Max Plank Institute for Mathematics, Bonn (Germany)* during June 22-26, 2015.
  - visited *Osaka University (Japan)* during December 10-13, 2015.
  - visited *Goa University (India)* during October 17-20, 2015.
  - visited *IISER Bhopal (India)* during December 2-4, 2015.
  - visited *International Center for Theoretical Physics, Trieste (Italy)* during May 21–July 9, 2015. and August 30–September 5, 2015.
  - visited *National University of Singapore (Singapore)* during March 16-23, 2016.
  - visited *RIMS Kyoto (Japan)* during December 14-17, 2015.
  - visited *Sobolev Institute of Mathematics, Novosibirsk (Russia)* during July 19-29, 2015.
  - visited *Tata Institute of Fundamental Research Mumbai (India)* during October 22-25, 2015.
  - visited *University of Burdwan (India)* during January 12-16, 2016.
- **Sudesh K. Khanduja**
  - visited *HP University, Shimla (India)* during October 20-21, 2015.
  - visited *IISER Pune (India)* during November 6-8, 2015.
  - visited *IIT Bombay* during March 28-30, 2016.
  - visited *South Asian University, New Delhi (India)* during April 23-24, 2015.
  - visited *University of Pune (India)* during November 7, 2015.
- **Amit Kulshrestha**
  - visited *Chennai Mathematical Institute, Chennai (India)* during July 27 - 29, 2015.
  - visited *Tata Institute of Fundamental Research, Mumbai (India)* during December 21 - 26, 2015.
- **Alok Maharana**
  - visited *Manipal Center for Natural Sciences, Manipal (India)* during July 22-29, 2015.
  - visited *Tata Institute of Fundamental Research, Mumbai (India)* during October 17-26, 2015.
  - visited *University of Hyderabad, Hyderabad (India)* during December 5-21, 2015.
- **Kapil H. Paranjape**
  - visited *School of Mathematics, TIFR, Mumbai (India)* during September 3-6, 2015.
  - visited *Department of Mathematics & Statistics, IIT Kanpur, Kanpur (India)* during October 1-2, 2015.
- **I. B. S. Passi**
  - visited *Chandigarh University, Gharuan, Mohali, Punjab (India)* during October 29, 2015.

- visited *Harish-Chandra Research Institute, Allahabad (India)* during May 3 - 10, 2015.
- visited *Himachal Pradesh University, Shimla (India)* on November 28, 2015. and March 26, 2016.
- visited *National University of Singapore, (Singapore)* during August 24-28, 2015.
- visited *Central University of Punjab, Bathinda (India)* during December 11, 2015. and March 5-6, 2016.
- visited *Manipal Institute of Technology, Manipal University, Manipal (India)* during July 5 - 9, 2015.
- visited *Shivalik Public School, Chandigarh (India)* on November 28, 2016.

- **Sudhanshu Shekhar**
  - visited *IIT Kanpur* during December 30, 2015. - January 5, 2016.
  - visited *Mathematics Center Heidelberg (Germany)* during December 2014 - July 2015.

- **Mahender Singh**
  - visited *Harish-Chandra Research Institute, Allahabad (India)* during December 13 - 24, 2015.
  - visited *Harish-Chandra Research Institute, Allahabad (India)* during October 06-14, 2015.
  - visited *National Institute for Mathematical Sciences, Daejeon (South Korea)* during November 28-December 06, 2015.
  - visited *Sobolev Institute of Mathematics, Novosibirsk (Russia)* during July 18 -31, 2015.

8.5.3 Talks delivered

- **Anandam Banerjee**
  - The Standard Conjecture (D) for algebraic cobordism : Mathematics Seminar, IISER Mohali : September 4, 2016.

- **Krishnendu Gongopadhyay**
  - Decomposition of Complex Hyperbolic Isometries by Involutions, Geometry and Dynamics Conference, IISER Bhopal, December 2–4, 2015.
  - Conjugation classes of pairs in SL(4, C) and $\mathrm{SU}(3,1)$, Geometry of moduli space for low dimensional manifolds, RIMS Kyoto, December 14–18, 2015.
  - Conjugation classes of pairs in $\mathrm{SL}(4,\mathbb{C})$ and $\mathrm{SU}(3,1)$, Geometry of Discrete Actions, ICTP, August 31–September 4, 2015.

- **Sudesh K. Khanduja**
  - Irreducible polynomials : Indian women in Mathematics : Delhi University, South campus : April 2, 2015.
  - Fascination of Prime Numbers : South Asian University, New Delhi : April 23 2015.
  - Dedekind's Theorem on Splitting of Primes : 137 Years of Journey : 30th Annual conference of Ramanujan Mathematical Society : IISER Mohali : May 16, 2015.
  - Sudesh K. Khanduja : Dedekind's Theorem on splitting of primes and simple extensions of integrally closed domains : International Conference on Algebra, Geometry and History of Mathematics : Chennai Mathematical Institute : July 28, 2015.
  - Irreducible polynomials over valued fields : H. P. University Shimla : October 20, 2015.
  - Dedekind's Theorem on Splitting of Primes : 137 Years of Journey : IISER Pune : November 6, 2015.

- On some generalizations and applications of Eisenstein-Dumas and Schonemann Irreducibility Criteria : University of Pune : November 7, 2015.
- : Fascination of primes : Mathematics workshop for school teachers sponsored by Chandigarh chapter of NASI : November 28, 2015.
- Sudesh K. Khanduja : Irreducible polynomials : IIT Bombay : March 28, 2016.

- **Amit Kulshrestha**
  - A rational Wedderburn decomposition using quadratic maps : Chennai Mathematical Institute : July 28, 2015.
  - Why obstruct the abstract? : Some High Points in Undergraduate Teaching, 30th Annual Meeting of Ramanujan Mathematical Society : May 14, 2015.
  - Minus One : Child Scientists Camp by Department of Science and Technology at IISER Mohali : June 29, 2015.
  - Why Mathematics? And, where? : Shivalik Public School, Chandigarh : September 03, 2015.
  - Career Options for Mathematics Students : MCM-DAV College for Women, Chandigarh : September 15, 2015.
  - Primes, Pi, Pineapple and A Missing Square : DST-INSPIRE Science Camp at Asian Educational Institute, Patiala, September 28, 2015.
  - Joining the dots : Ishan Vikas Program, IISER Mohali : July 08, 2015.
  - Role of Curiosity in Creating Mathematics : SCERT Workshop for Secondary School Teachers, Regional Institute of Cooperative Management, Chandigarh : February 09, 2016.

- **Kapil H. Paranjape**
  - Various topics on Algebraic Surfaces : AIS Algebraic Surfaces : July 20-1 August, 2015.
  - Higher Dimensional Geometry : Math-Stat Colloquium, IIT Kanpur : October 1, 2015.
  - Modular Forms and Calabi-Yau Varieties : International Colloquium on K-Theory, TIFR Mumbai : January 9, 2016.
  - Mathematics and Computation : Workshop on Mathematics and Computation, CUJ, Jammu : March 25, 2016.

- **Sonica**
  - On a Conjecture on Linear Systems : Young Women in Algebraic Geometry, Bonn : October 5, 2015.

- **I. B. S. Passi**
  - Generalized Dimension Subgroups and Derived Functors, International Conference on Nearrings, Nearfields and Related Topics, Manipal Institute of Technology, Manipal University, Manipal (Karnataka), July 6, 2015.
  - Generalized Dimension Subgroups and Derived Functors, International Conference on Combinatorial and Toric Homotopy, Institute for Mathematical Sciences, National University of Singapore, Singapore, August 27, 2015.
  - Equation Theory and Matrices, Shivalik Public School, Chandigarh, November 28, 2015.
  - Geometric Group Theory, Himachal Pradesh University, Shimla (Himachal Pradesh), March 26, 2016.
  - Galois Theory, Central University of Punjab, Bathinda (Punjab), March 5 - 6, 2016.

- **Sudhanshu Shekhar**
  - An Introductory talk on Vector bundle on the algebraic Fargues-Fontaine curve, workshop on The Galois group of $\mathbb{Q}_p$ as a geometric fundamental group, Schlosshotel Neckarbischofsheim, Germany, May 2015.
- **Mahender Singh**
  - Extensions and automorphisms of groups and Lie algebras : Sobolev Institute of Mathematics, Novosibirsk, Russia : July 19, 2015.
  - Generalised spherical space form problem : Harish-Chandra Research Institute, Allahabad : October 10, 2015.
  - Compact group actions on manifolds : 6th East Asian Conference on Algebraic Topology (EACAT), South Korea : December 02, 2015.
- **Varadharaj R. Srinivasan**
  - Life and Work of Srinivasa Ramanujan : February 06, 2016 : P. G. Arya College, Panipat.

8.5.4 Conferences attended by researchers

1. Anandam Banerjee : International Colloquium on K-theory : January 6-14, 2016 : Tata Institute of Fundamental Research, Mumbai : TIFR Mumbai
2. K. Gongopadhyay : Geometry of Discrete Actions, ICTP, August 30–eptember 4, 2015
3. K. Gongopadhyay : Growth, Symbolic Dynamics and Combinatorics of Words in Groups, ENS Paris, June 1–5, 2015
4. K. Gongopadhyay : Geometry of Moduli Space of Low Dimensional Manifolds, RIMS Kyoto, December 14–18.
5. K. Gongopadhyay : Topology and Groups, October 17–20, Goa University
6. K. Gongopadhyay : TIMC-BU Teacher's Enrichment Program, Burdwan University, January 13–17, 2016.
7. Sudesh Kaur Khanduja : Indian women in Mathematics : April 2-4, 2015 : Delhi University : South campus Delhi University
8. Sudesh Kaur Khanduja : 30th Annual conference of Ramanujan Mathematical Society :May 15 - 17, 2015 : Ramanujan Mathematical Society : IISER Mohali
9. Sudesh Kaur Khanduja : International Conference on Algebra, Geometry and History of Mathematics : July 27-29, 2015 : Chennai Mathematical Institute : Chennai Mathematical Institute.
10. Amit Kulshrestha : International Conference on Algebra, Geometry and History of Mathematics : July 27 - 29, 2015 : Chennai Mathematical Institute, Chennai
11. Alok Maharana : Algebraic Surfaces and Related Topics 2015 : November 21-30, 2015 : ICTS-TIFR, Bangalore
12. Sonica : Young Women in Algebraic Geometry:October 5-7, 2015:Hausdorff Centre for Mathematics:University of Bonn
13. Sonica : Students Tropical Algebraic Geometry Symposium : April 17-19, 2015 : STAGS : Brown University
14. Sonica : Students Workshop on Tropical and Non-Archimedean Geometry : August 2015 : STAGS : University of Regensburg

15. I.B.S. Passi : International Conference on Nearrings, Nearfields and Related Topics, July 5 - 12, 2015, Manipal Institute of Technology, Manipal University, Manipal.

16. I.B.S. Passi : International Conference on Combinatorial and Toric Homotopy, August 24 - 28, 2015, Institute for Mathematical Sciences, National University of Singapore, Singapore.

17. I.B.S. Passi : National Conference on Recent Developments in Mathematical Modelling and Fuzziology, October 29, 2015, Chandigarh University, Gharuan, Mohali (Punjab).

18. Sudhanshu Shekhar : Workshop on The Galois group of Q_p as a geometric fundamental group, Schlosshotel Neckarbischofsheim, Germany, May 2015

19. Mahender Singh : 30th Annual Conference of the Ramanujan Mathematical Society : May 15-17, 2015 : IISER Mohali.

20. Mahender Singh : Meeting on Knots Braids and Automorphism Groups : July 18-19, 2015 : Sobolev Institute of Mathematics, Novosibirsk, Russia.

21. Mahender Singh : International Conference on Topology and Groups : October 17-20, 2015 : Goa University.

22. Mahender Singh : 6th East Asian Conference on Algebraic Topology (EACAT) : December 1-4, 2015 : NIMS Daejeon, South Korea.

8.5.5 Publications : Mathematical Sciences

[1] **A. Banerjee** and J. Park, "On numerical equivalence for algebraic cobordism," *Journal of Pure and Applied Algebra*, vol. 220, no. 1, pp. 435–464, 2016.

[2] **K. Gongopadhyay**, J. R. Parker, and **S. Parsad**, "On the classifications of unitary matrices," *Osaka Journal of Mathematics*, vol. 52, no. 4, pp. 959–991, 2015.

[3] V. G. Bardakov and **K. Gongopadhyay**, "Palindromic width of finitely generated solvable groups," *Communications in Algebra*, vol. 43, no. 11, pp. 4809–4824, 2015.

[4] V. G. Bardakov, **K. Gongopadhyay**, and **M. Singh**, "Palindromic automorphisms of free groups," *Journal of Algebra*, vol. 438, pp. 260–282, 2015.

[5] **S. K. Khanduja** and B. Jhorar, "When is r [θ] integrally closed?," *Journal of Algebra and Its Applications*, p. 1650091, 2015.

[6] B. Jhorar and **S. K. Khanduja**, "Reformulation of hensel's lemma and extension of a theorem of ore," *Manuscripta Mathematica*, pp. 1–19, 2016.

[7] B. Jhorar and **S. K. Khanduja**, "On power basis of a class of algebraic number fields," *International Journal of Number Theory*, 2016.

[8] **D. Kaur** and **A. Kulshrestha**, "Characters of special 2-groups," *Journal of the Ramanujan Mathematical Society*, vol. 30, no. 4, pp. 375–396, 2015.

[9] **K. H. Paranjape**, "Grothendieck and the concept of space," *Resonance*, 2015.

[10] **K. H. Paranjape** and D. Ramakrishnan, "Modular forms and Calabi-Yau varieties," in *Arithmetic and geometry*, vol. 420 of *London Math. Soc. Lecture Note Ser.*, pp. 351–372, Cambridge Univ. Press, Cambridge, 2015.

[11] R. Mikhailov and **I. B. S. Passi**, "The subgroup determined by a certain ideal in a free group ring," *Journal of Algebra*, vol. 449, pp. 400 – 407, 2016.

[12] R. Mikhailov and **I. B. S. Passi**, "Generalized dimension subgroups and derived functors," *Journal of Pure and Applied Algebra*, vol. 220, no. 6, pp. 2143 – 2163, 2016.

[13] L. Bartholdi and **I. B. S. Passi**, "Lie dimension subrings," *Int. J. Algebra Comput.*, vol. 25, no. 8, pp. 1301 – 1325, 2015.

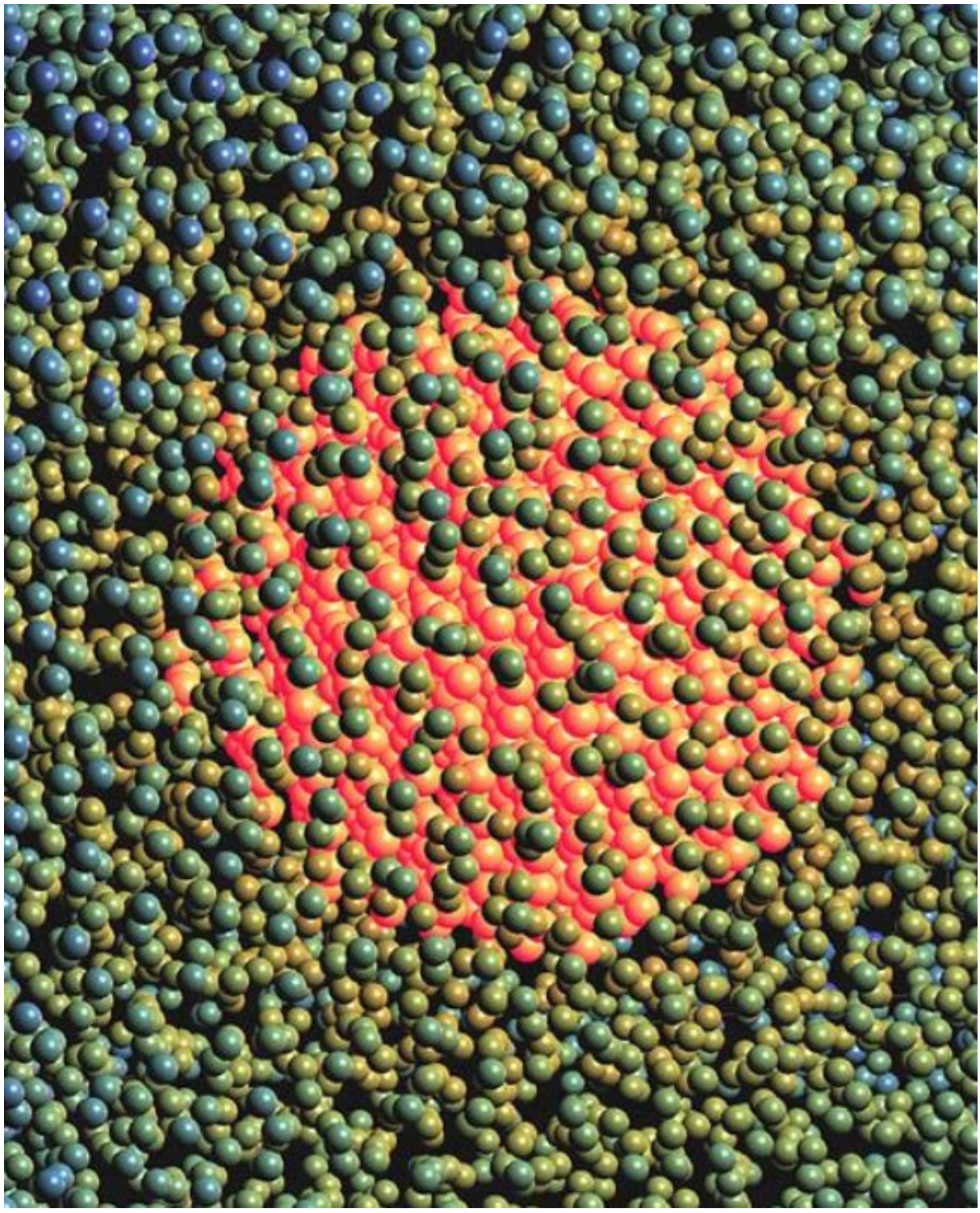
[14] G. K. Bakshi, S. Gupta, and **I. B. S. Passi**, "The algebraic structure of finite metabelian group algebras," *Communications in Algebra*, vol. 43, no. 6, pp. 2240 – 2257, 2015.

[15] **L. Sahu** and **P. Singh**, "Some quantum dynamical semi-groups with quantum stochastic dilation," *Communications on Stochastic Analysis*, vol. 9, no. 3, pp. 297–307, 2015.

[16] **S. Shekhar**, "Parity of ranks of elliptic curves with equivalent mod p-galois representations," *Proceedings of the American Mathematical Society*, 2016.

[17] V. G. Bardakov, **K. Gongopadhyay**, **M. Singh**, A. Vesnin, and J. Wu, "Some problems on knots, braids and automorphism groups," *Sib. Èlektron. Mat. Izv.*, vol. 12, pp. 394–405, 2015.

[18] D. de Mattos, P. L. Q. Pergher, E. L. dos Santos, and **M. Singh**, "Zero sets of equivariant maps from products of spheres to Euclidean spaces," *Topology Appl.*, vol. 202, pp. 7–20, 2016.



8.6 Department of Physical Sciences

8.6.1 Summary of the research work

Arvind : Recent work in my group has focused on weak measurements for quantum state tomography and on quantum cryptography protocols. Quantum ideas have led to surprising developments in the field of secure communication. The most startling example is that of cryptography, where quantum ideas have revolutionized the field. Quantum Private Comparison (QPC) allows us to protect private information during its comparison. In the past various three-party quantum protocols have been proposed that claim to work well under noisy conditions. We have in a recent paper tackled the problem of QPC under noise. We analyzed the EPR-based protocol under depolarizing noise, bit flip and phase flip noise. We showed how noise affects the robustness of the EPR-based protocol. We also designed a straightforward protocol based on CSS codes to perform QPC which is robust against noise and secure under general attacks. Other recent work explored the possibility of using "weak measurements" without "weak value" for quantum state estimation. Since for weak measurements the disturbance caused during each measurement is small, we can rescue and recycle the state, unlike for the case of projective measurements. We used this property of weak measurements and designed schemes for quantum state estimation for qubits and for Gaussian states. We showed, via numerical simulations, that under certain circumstances, our method can outperform the estimation by projective measurements. It turns out that ensemble size plays an important role and the scheme based on recycling works better for small ensembles.

Charanjit Singh Aulakh : My work focuses on a specific class of Supersymmetric SO(10) Grand Unified theories called Minimal Supersymmetric GUTs which were proposed by us in 1983 and after extensive study have proved capable of successful gauge and Yukawa unification and of fitting the available(18 parameter) fermion mass hierarchy data. It also yields acceptable rates of exotic processes such as B and L violation due to the operation novel and generic mechanisms demonstrated by us. It predicted characteristic superparticle spectra of the mini-split susy type with normal s-hierarchy and large A parameter in 2008 : anticipating the shift caused by Higgs discovery in 2012. We also study Inflationary models based on Type I seesaw and the MSGUTs. Finally we have recently implemented dynamical generation of flavour structure by extending the NMSGUT with a O(3) flavour symmetry. This initiates a program of Dynamical flavour and Grand Unification.

Jasjeet Singh Bagla : Focus of my research work in this year has been on aspects of galaxy formation. One key problem that we are studying is the interplay of outflows from galaxies that are expected to enrich the inter-galactic medium by depositing elements synthesized in stars, and infall of matter due to gravitational clustering. We find that the infall dominates in more massive galaxies whereas in low mass galaxies the outflow manages to break through the infalling matter as in low mass galaxies the infall is slower. We also study the the impact of the circumgalactic material and find that this too dominates in more massive galaxies. We conclude that outflows from low mass galaxies must dominate in terms of enriching the inter-galactic medium. This work has been done in collaboration with Priyanka Singh and Biman Nath from the Raman Research Institute, and Sandeep Rana at IISER Mohali. I am also studying the impact of dynamical dark energy on non-linear collapse of dark matter, and the effect of non-linear clustering on dark energy. In order to work with self consistent models, we are working with spherical collapse. The system is being modeled with the Lemaitre-Tolman-Bondi metric with non-relativistic matter and a scalar field to provide dark energy. We find that the effect of dynamical dark energy on collapse of dark matter is of a limited nature, whereas collapsing matter influences dark energy in a significant manner. This study is being done with Manvendra Pratap Rajvanshi.

Vishal Bhardwaj : Vishal Bhardwaj is an experimental high energy physicist, working in Belle I/II collaboration. Belle I is name of detector situated at the KEKB asymmetric-energy e^+e^- collider (Tsukuba, Japan), which has collected the world's largest and cleanest $\Upsilon(4S)$ data. Success of Belle I can be seen from the fact that its results (along with rival BaBar collaboration's result) resulted in Nobel prize to M. Kobayashi and T. Maskawa in 2008. Belle II is a next-generation high precision B factory which will search for New Physics (NP) beyond the Standard Model (SM). After his joining as INSPIRE faculty, IISER Mohali is now an official member of the international Belle I/II collaboration. Currently, he is working on the following topics : (a) Search for CP violation in the D decays - Precise measurement and validating the predictions of Standard Model is a way to search for the

New Physics. (b) Find the unfound states - These are higher states consist of $c\bar{c}/b\bar{b}$ pairs. Till know only few states have been found. Finding new states will improve our understanding and our knowledge of how matter is made. (c) Searching/Understanding the Exotic states - Finding a tetra-quark or a molecular state will complete our knowledge of how quarks come together to build the universe.

Dipanjan Chakraborty : My broad research interest lies in the physics of soft matter systems. The realm of soft matter comprises of a multitude of systems with important technological applications, with model examples ranging from colloidal suspensions, polymer gels and solutions, granular media to more complex systems of biological matter. Soft matter systems are characterized by the large length and time scales (compared to microscopic lengths) and the thermal fluctuations governing the dynamics of the constituent macromolecules. A wide range of collective phenomena resulting in complex structure and dynamics emerge at such mesoscopic length scales. The recent advancement in experimental techniques have allowed for characterization of such collective behaviors and also provide us with remarkable control down to single particle level. Particle chemistry has succeeded in producing colloidal particle with a definite control over its shape, size and interactions, such as patchy colloids of different shapes. While theoretical formulations of such emergent phenomena rely on the formulations of statistical mechanics out of equilibrium, a more microscopic insight can be gained using computer simulations, bridging the gap between theory and experiments. They serve as an indispensable tool to validate theoretical predictions and gain access to phenomena which are otherwise difficult to observe or measure in experiments. My own research activities strongly build on large-scale coarse-grained simulations of soft matter systems, with a goal to understand the rich physics at such mesoscopic length scales.

Abhishek Chaudhuri : The aim of our group is to understand the physical properties of biological and soft condensed matter systems that are driven out of equilibrium. Recently, we have developed a mesoscopic molecular dynamics scheme to study emergent dynamics and structure formation in a collection of cytoskeletal filaments and motor proteins. In this context we have formulated and characterized a model to describe the dynamics of a semiflexible polymer in the presence of activity due to motor proteins attached irreversibly to a substrate and a transverse pulling force acting on one end of the filament. We have obtained phase diagrams characterizing the adsorption-desorption transition and a mean field theory which captures the main features of the simulation results. We have also looked at the transport of cargo by molecular motors with a binding-unbinding characterized by a catch-bond like mechanism distinct from the usual slip bond. This unusual behavior, observed experimentally in a certain class of molecular motors, have a profound effect on the transport properties of cargo carried by several such molecular motors.

Kavita Dorai : Recent research in NMR quantum information and quantum computing from our group focused on characterization of entanglement and on computing using systems of hybrid qudits. We experimentally constructed a three-qubit entangled W-superposition state on an NMR quantum information processor and designed a measurement-based filtration protocol for the invertible local operation that converts this superposition state to the Greenberger-Horne-Zeilinger (GHZ) state, using a register of three ancilla qubits. Further we implemented an experimental protocol to reconstruct full information about the three-party W-superposition state using only two-party reduced density matrices. The quantum Fourier transform (QFT) is a key ingredient of several quantum algorithms and a qudit-specific implementation of the QFT is hence an important step toward the realization of qudit-based quantum computers. Our recent work showed a novel circuit decomposition of the QFT for hybrid qudits based on generalized Hadamard and generalized controlled-phase gates, which can be implemented using selective rotations in NMR. We experimentally implemented the hybrid qudit QFT on an NMR quantum emulator, using four NMR qubits to emulate a hybrid qudit system comprising a single qutrit coupled to two qubits. Recent research in NMR metabolomics from our group focused on identifying key metabolites of medicinal value in the papaya plant and on identifying key metabolites involved in the underlying diurnal clock of Drosophila melanogaster. Extracts from the Carica papaya L. plant are widely reported to contain metabolites with antibacterial, antioxidant and anticancer activity. We analyzed the metabolic profiles of papaya leaves and seeds in order to gain insights into their phytomedicinal constituents. We performed metabolite fingerprinting using 1D and 2D proton NMR experiments and used multivariate statistical analysis to identify those plant parts that contain the most concentrations of metabolites of phytomedicinal value. Secondary metabolites such as phenyl

propanoids, including flavonoids, were found in greater concentrations in the leaves as compared to the seeds. Interestingly, the concentration of eleven secondary metabolites namely caffeic, cinnamic, chlorogenic, quinic, coumaric, vanillic, and protocatechuic acids, naringenin, hesperidin, rutin, and kaempferol, were higher in young as compared to old papaya leaves. The results of the NMR analysis were corroborated by estimating the total phenolic and flavonoid content of the extracts. We utilized an NMR-based metabolomic approach to profile the metabolites in Drosophila melanogaster that cycle with a daily rhythm. 1H 1D and 2D NMR experiments were performed on whole-body extracts sampled from flies that experienced strong time cues in the form of both light and temperature cycles. Multivariate and univariate statistical analysis was used to identify those metabolites whose concentrations oscillate diurnally. We compared metabolite levels at two time points twelve hours apart, one close to the end of the day and the other close to the end of the night, and identified metabolites that differed significantly in their relative concentrations. We were able to identify fourteen such metabolites whose concentrations differed significantly between the two time points. The concentrations of metabolites such as sterols, fatty acids, amino acids such as leucine, valine, isoleucine, alanine and lysine as well as other metabolites such as creatine, glucose, AMP and NAD were higher close to the end of the night, whereas the levels of lactic acid, and a few amino acids such as histidine and tryptophan were higher close to the end of the day. We compared signal intensities across 12 equally spaced time points for these 14 metabolites, in order to profile the changes in their levels across the day, since the NMR metabolite peak intensity is directly proportional to its molar concentration. We were able to establish NMR-based metabolomics combined with multivariate statistical analysis as a useful method for studying the interactions between circadian clocks and metabolic processes.

Harvinder Kaur Jassal : Recent work has shown that Supernovae of type Ic which are associated with Gamma Ray Bursts (GRBs) are candidates for standard candles. We constrain cosmological parameters using this data and combine it with the cosmology independent calibrated distance moduli of GRBs at high redshifts. We show that the constraints, while not as strong as those given by Supernova type 1a observations and Baryon Acoustic Oscillation data, are significantly better than those obtained earlier using GRB data. While cosmological constant is consistent with these observations, we find that for models with constant and varying equation of state, the constraints are consistent with constraints from type Ia Supernovae data. The constraints are stronger then those previously obtained, in particular, the high redshift data constrains varying equation of state effectively

Ramandeep Singh Johal : We have studied efficiency of heat engines between finite source and sink, using quasi-static processes. The upper and lower bounds for efficiency have been derived. These expressions are remarkably similar to those obtained with certain finite time models of heat engines. (with R. Rai, Europhys. Lett. vol 113, 10006 (2016)).

We have analysed models of mesoscopic heat engines, in particular Feynman's ratchet and pawl model, for its performance using limited information on the internal microscopic energy scales. Using inference analysis and deriving the form of appropriate prior under given conditions, we have shown the similarity between optimal behaviour of the model under complete information and the estimates based on inference analysis. (with G. Thomas, J. Phys. A: Math. Theor. vol 48, 335002 (2015)).

Rajeev Kapri : We study the characterization of order in a passive scalar system, in which a passive species is driven by an autonomously evolving field, e.g., particles driven by a fluctuating surface. In this system fluctuations are anomalously strong, but it has a propensity to order, leading to fluctuation-dominated phase ordering. The system consists of hard-core particles sliding under gravity on a stochastically evolving one-dimensional surface through either Edwards-Wilkinson or Kardar-Parisi-Zhang dynamics. The evolution of the local density is monitored by using Monte Carlo simulations. We found that a single scalar order parameter does not suffice to properly characterize the order and we need to monitor a larger set. This set is built from the long-wavelength Fourier components of the density profile, which are able to capture an essential aspect of the state, namely the continuous break-up and re-merging of macroscopic particle-rich regions.

We study the translocation of semiflexible polymer through narrow pores with patterned stickiness. We obtain the translocation time statistics as a function of bending rigidity for different type of pores. We also consider the

role of hydrodynamics in the translocation process.

Sanjeev Kumar : My recent research focus has been on the following topics: (i) Understanding the mechanisms for simultaneous presence of long-range magnetic order and ferroelectric order in materials. Such materials are famous as multiferroics and hold promise for applications in data storage and processing devices. (ii) Understanding the influence of disorder on superconductivity. Here we are exploring the competition between different kind of superconducting orders, for example, s-wave, p-wave and d-wave, and the manner in which impurities effect these orderings. (iii) The problem on which we have got some interesting results during the last few years is the study of coupled spin-charge systems on geometrically frustrated lattices. These problems have provided some nice illustrations of the 'emergent' phenomena in many-body physics, where unusual ordering emerges from simple pairwise interactions.

Smriti Mahajan : I study the properties of external galaxies such as the rate at which they form stars, and how these properties are influenced by the density of the space and the large-scale structure the galaxies reside in. In particular I am interested in studying the influence of the large-scale cosmic filaments on the properties of galaxies.

My recent research interest has been studying peculiar looking galaxies in clusters using ultraviolet and optical data. I have also been analysing radio continuum and optical spectroscopic data for active galaxies in group environments to confirm if their are any environmental or host property dependencies among radio and optically active galaxies.

Manimala Mitra : Here are the few specific areas in which I work, a)Beyond Standard Model physics b) Neutrino physics c) Collider physics and d) Astroparticle physics. A series of outstanding experiments over the past few decades have established the fact that Standard Model (SM) neutrinos have eV masses. Few of the specific questions that still remain unanswered are whether SM neutrinos are Dirac or Majorana, the mass hierarchy of SM neutrinos, CP violating phases and most importantly what is the theory behind neutrino mass generation. One of the most attractive mass generation mechanism is Seesaw, where the light neutrino mass is generated from a higher dimensional (d=5) operator. I am exploring how to unveil the underlying theory of neutrino mass generation through experimental searches, such as, neutrinoless double beta decay and collider searches.

The other areas of interests are Higgs physics and astroparticle physics. The Large Hadron Collider (LHC), in CERN, Geneva has discovered the Higgs. However, its couplings to all the SM fermions are yet not been measured. One of the major theoretical question is the radiative stability of Higgs mass, for which beyond standard model (BSM) description is required. The BSM description has new degrees of freedom. I am exploring the prospect of observing BSM Higgs boson at collider. In addition, I am also interested in astroparticle physics, in particular, dark matter and leptogenesis.

Ketan Patel : The Large Hadron Collider at CERN, Geneva has recently indicated an existence of a resonance with mass near to 750 GeV. We have recently shown that such a signal can be accommodated in a well motivated class of grand unified theories based on SU(5) gauge symmetry.

Goutam Sheet : The research work at Dr. Goutam Sheet's lab involves investigation of physics of topological materials like topological insulators, topological superconductors, Weyl semimetal, Dirac semimetal etc. using scanning probe microscopy and transport spectroscopy at ultra-low temperatures and high magnetic fields. In addition, physics of unconventional superconductivity and the interaction between superconducting and magnetic order parameters are also investigated. He also studies the long range interaction in artificially designed lattices to realize tunable topological and magnetic properties. Such works are interesting for device application in the areas of data storage and information processing through spintronics and magnonics.

Kamal P. Singh : We have shown that the momentum of photons is increased in water when compared to the vacuum. A simple yet sensitive experiment on measuring nanometric deformation of water drop create and probed by a laser beam was setup. This discovery was highlighted in media and the paper is published in Physical Review

Letters.

Mandip Singh : Laser cooling of rubidium atoms has been experimentally realised. Atom chip for the Bose-Einstein condensation experiment has been designed and constructed. In addition, momentum entangled photons have been produced.

Yogesh Singh : Our group specialises in the synthesis and discovery of new or improved materials which have the potential to show novel physical behaviours. Below I briefly describe the progress made on different research topics during the last year. *Pressure and Field dependence of superconductivity in the Pd intercalated topological insulator Bi_2Te_3* : Pd intercalated Bi_2Te_3 single crystals were grown. This material has a superconducting critical temperature $T_c = 5.4$K. We studied the magnetic field and externally applied pressure dependence of T_c. The H-T phase diagram shows an unusual upward curvature which has previously been observed for unconventional (non-BCS, multi-gap) superconductors. This suggests that the superconductivity in Pd:Bi2Te3 could have an unconventional pairing mechanism or it could be a multi-gap superconductor. *Superconductivity in small k material OsB2 and RuB2* OsB_2 and RuB_2 were synthesised by arc-melting and their normal state and superconducting properties were studied down to 0.3 K. We find superconductivity at $T_c = 2.1$ K and 1.5 K, for OsB_2 and RuB_2, respectively. The magnitude of the heat capacity anomaly at T_c is smaller than expected from conventional BCS theory suggesting that OsB2 and RuB2 could be an unconventional (multi-gap) superconductor. *Robust Spin Liquid State in $Na_{4-x}Ir_3O_8$* : The hyper-kagome material $Na_{4-x}Ir_3O_8$ is a three-dimensional spin-liquid candidate proximate to a quantum critical point (QCP). We performed a comprehensive study of the structure, magnetic susceptibility χ, heat capacity C, and electrical transport on polycrystalline samples of the doped hyper-kagome material $Na_{4-x}Ir_3O_8$ ($x \approx 0, 0.1, 0.3, 0.7$). Materials with $x \leq 0.3$ are found to be Mott (local-moment) insulators with strong antiferromagnetic interactions. No magnetic ordering down to $T = 2$K demonstrates that the Mott insulating spin-liquid state seen in the $x = 0$ material is robust against large hole doping. The $x = 0.7$ sample shows $\rho(T)$ which weakly increases with decreasing temperature T, nearly T independent χ, a linear in T contribution to the low temperature C, and a Wilson ratio $RW \approx 7$ suggesting anomalous semi-metallic behavior. *Signatures of Strong Kitaev Exchange Correlations in Raman scattering on $(Na_{1-x}Li_x)_2IrO_3$* : Na_2IrO_3 is a candidate material to show Kitaev spin-liquid behavior. Inelastic light scattering studies on single crystals of $(Na_{1-x}Li_x)_2IrO_3$ ($x = 0, 0.05$ and 0.15) show a polarization independent broad band at $\approx 2750cm^{-1}$ with a large band-width $\approx 1800cm^{-1}$. For Na_2IrO_3 the broad band is seen for temperatures $\leq$ 200 K and persists inside the magnetically ordered state. For Li samples, the intensity of this mode increases, shifts to lower wave-numbers, and persists to higher temperatures. Such a mode has recently been predicted (Knolle et.al.) as a signature of the Kitaev spin liquid. We assign the observation of the broad band to be a signature of strong Kitaev-exchange correlations. The fact that the broad band persists even inside the magnetically ordered state suggests that dynamically fluctuating moments survive even below TN. This is further supported by our mean field calculations. The Raman response calculated in mean field theory shows that the broad band predicted for the SL state survives in the magnetically ordered state near the zigzag-spin liquid phase boundary. A comparison with the theoretical model gives an estimate of the Kitaev exchange interaction parameter to be JK $\approx$ 57 meV. *Direct Evidence for Dominant Bond-directional Interactions in a Honeycomb Lattice Iridate Na_2IrO_3* : Heisenberg interactions are ubiquitous in magnetic materials and have been prevailing in modeling and designing quantum magnets. Bond-directional interactions offer a novel alternative to Heisenberg exchange and provide the building blocks of the Kitaev model, which has a quantum spin liquid (QSL) as its exact ground state. Using diffuse magnetic scattering measurements done in collaboration with groups at MPI Stuttgart and Argonne National Lab, we have obtained direct evidence for dominant bond directional interactions in antiferromagnetic Na_2IrO_3 and show that they lead to strong magnetic frustration.

Sudeshna Sinha : We investigated the dynamics of networks of bistable elements with varying degrees of randomness in connections, considering both static random connections and time-varying random links. We probed how the presence of a few dissimilar elements affects the collective features of this system, and found that a network with random links is hyper-sensitive to heterogeneity. Namely, even a small number of distinct elements manages to drastically influences the collective dynamics of the network, with the mean-field swinging to the stable value of the minority elements. We found that the transition in the collective field gets sharper as the fraction of random

links increases, for both static and time-varying links. We also demonstrated that networks where the links are switched more frequently, synchronize faster. Lastly, we showed that as global bias tends to a critical value, even a single different element manages to drag the entire system to the natural stable state of the minority element. So it is evident that when coupling connections are random, a network with even a very small number of links per node has the ability to become ultra-sensitive to heterogeneity. This phenomenon can potentially be observed in social and biological networks, and implemented in experiments such as coupled nano-mechanical resonators and coupled laser arrays.

We considered a multi-species community modelled as a complex network of populations, where the links are given by a random asymmetric connectivity matrix J, with fraction $1 - C$ of zero entries, where C reflects the over-all connectivity of the system. The non-zero elements of J are drawn from a Gaussian distribution with mean μ and standard deviation σ. The signs of the elements Jij reflect the nature of density-dependent interactions, such as predatory-prey, mutualism or competition, and their magnitudes reflect the strength of the interaction. We tried to uncover the broad features of the inter-species interactions that determine the global robustness of this network, as indicated by the average number of active nodes (i.e. non-extinct species) in the network, and the total population, reflecting the biomass yield. We found that the network transitions from a completely extinct system to one where all nodes are active, as the mean interaction strength goes from negative to positive, with the transition getting sharper for increasing C and decreasing σ. We also found that the total population, displays distinct non-monotonic scaling behaviour with respect to the product μC, implying that survival is dependent not merely on the number of links, but rather on the combination of the sparseness of the connectivity matrix and the net interaction strength. Interestingly, in an intermediate window of positive μC, the total population is maximal, indicating that too little or too much positive interactions is detrimental to survival. Rather, the total population levels are optimal when the network has intermediate net positive connection strengths. At the local level we observed marked qualitative changes in dynamical patterns, ranging from anti-phase clusters of period 2 cycles and chaotic bands, to fixed points, under the variation of mean μ of the interaction strengths. We also studied the correlation between synchronization and survival, and find that synchronization does not necessarily lead to extinction. Lastly, we proposed an effective low dimensional map to capture the behavior of the entire network, and this provides a broad understanding of the interplay of the local dynamical patterns and the global robustness trends in the network.

Ananth Venkatesan : We studied Nano-scale Palladium beams and tuned the low temperature dissipation scenario by adding hydrogen gas to these systems. Damping in mechanical resonators are usually linear i.e proportional to the velocity. While non-linear phenomena where the restoring force depends on the amplitude of vibration have been discovered. Most damping phenomena have been linear. We discovered some interesting non-linear damping phenomena in these systems. In a collaborative project with INST we measured magneto-transport of quasi 2-D electron gases on the surface of KTaO3 and modeled its behaviour based on ab-intio calculations. We are making nano-scale versions of these devices. We repaired our dilution fridge system and are starting some new experiments on the system.

8.6.2 Visits of faculty members

- **Arvind**
  - visited *Department of Physics, NIT Patna (India)* during November 30-December 4, 2015.
  - visited *University of South Korea (South Korea)* during February 15-19, 2016.
  - visited *IISER Pune (India)* during March 10-15, 2016.
- **Charanjit Singh Aulakh** visited *ICTP, Trieste (Italy)* during June 1-August 1, 2015 as Visiting Senior Associate.
- **Jasjeet Singh Bagla**
  - visited *Radio Astronomy Centre, Ooty (India)* during June 14-21, 2015.

- visited *Homi Bhabha Centre for Science Education, Mumbai (India)* during November 7-8, 2015.
- visited *National Institute of Science Education and Research, Bhubaneswar (India)* during January 17-19, 2016.
- visited *Homi Bhabha Centre for Science Education, Mumbai (India)* during March 20-21, 2016.

- **Dipanjan Chakraborty** visited *Institute of Theoretical Physics, University of Leipzig (Germany)* during May 23 - June 23, 2015.

- **Abhishek Chaudhuri** visited *Simon Centre, NCBS Bangalore* during June 7 - July 8, 2016.

- **Kavita Dorai** visited *National Institute of Chemistry, Ljubljana (Slovenia)* during September 25-29, 2015.

- **Harvinder Kaur Jassal**
  - visited *Homi Bhabha Centre for Science Education, Mumbai (India)* during November 7-8, 2015.
  - visited *Homi Bhabha Centre for Science Education, Mumbai (India)* during March 20-21, 2016.

- **Ramandeep Singh Johal** visited *International Centre for Theoretical Sciences, Bangalore (India)* during February 12-14, 2016.

- **Rajeev Kapri** visited *Padua University (Italy)* during June 10 - July 12, 2015.

- **Sanjeev Kumar**
  - visited *Indian Institute of Technology Kharagpur, Kharagpur (India)* during December 14 - 17, 2015.
  - visited *Institute for Solid State and Materials Research (IFW) Dresden, Dresden (Germany)* during June 1 - July 29, 2015.

- **Smriti Mahajan**
  - visited *Indian Institute of Technology, Ropar (India)* during March 7, 2016.
  - visited *Panjab University, Chandigarh (India)* during March 30, 2016.

- **Ketan Patel** visited *Harish-Chandra Research Institute, Allahabad (India)* during March 17-19, 2016.

- **Kamal P. Singh** visited *Free Electron Laser in Hamburg, Hamburg (Germany)* during April 1-15, 2015.

- **Yogesh Singh** visited *Kavli Institute for Theoretical Physics, Santa Barbara, USA* during July 27-30, 2015.

- **Sudeshna Sinha**
  - visited *Jacobs University (Germany)* during July 19-22, 2015.
  - visited *Potsdam Institute for Climate Impact Research (Germany)* during July 9-14, 2015.
  - visited *University of Oldenburg (Germany)* during July 15-18, 2015.

- **Ananth Venkatesan**
  - visited *Panjab University, Chandigarh (India)* on March 17, 2016.
  - visited *Punjab Engineering College, Chandigarh (India)* on September 18, 2015.
  - visited *Institute of Nano-science & Technology, Mohali (India)* on January 6, 2016.

8.6.3 Talks delivered

- **Arvind**
  - What scientists expect from science education : February 19-21, 2016 : Delhi University : New Delhi.
  - Enhancing the entanglement detection capacity of positive maps : February 15-19, 2016 : Department of Mathematics, University of South Korea : Daejeon South Korea.
  - What is science and rationality : December 27 2015 : Children's Science Congress Chandigarh University Gharuan.
  - Weak quantum measurements : November 30-December 4, 2015 : Department of Physics, NIT Patna, Patna.
  - Delivered 10 invited talks on the theme of Science, Scientific Temper and Rationality in DST INSPIRE camps all over the country during 2015-2016.
- **Charanjit S. Aulakh**
  - MSSM Higgs : Window into Susy GUTs : May 25-29, 2015 : 18th International Conference From the Planck Scale to the Electroweak Scale (Planck 2015) : Ioannina, Greece.
  - Yukawa Structure in Susy SO(10) : October 28-31, 2015 : International Workshop for the Next Generation Nucleon Decay and Neutrino Detectors (NNN15) : State University of New York at Stony Brook, N.Y., USA.
  - From QED to SO(10) - two lectures at Short Term Course on "Advances in Nuclear and Particle Physics: Present and Future" : February 08-12, 2016 : Department of Physics, Dr. B. R. Ambedkar National Institute of Technology, Jalandhar.
  - Quest for Unification : January 2-6, 2016 : INSPIRE camp at IISER Mohali.
  - MSSM Higgs : Portal into UV structure : May 06-08, 2015 : Exploring Fundamental Physics using Atomic Systems (EFPAS 2015) conference : Physical Research Laboratory (PRL), Ahmedabad, India.
  - Neutrino masses and GUT Structure : March 17-19, 2016 : Nu Horizons 2016 at the Harish-Chandra Research Institute (HRI), Allahabad, India.
- **Jasjeet S. Bagla**
  - Statistical HI Signal : Cosmology with the HI 21cm line : June 24, 2015.
- **Kavita Dorai**
  - Recent results in NMR quantum computing : Symposium on Recent Advances in NMR Spectroscopy, Indian Institute of Science Bangalore : July 16-17, 2015.
  - NMR-based metabolomics : insights into diabetes, diurnal rhythms and bioprospecting : National Institute of Chemistry, Ljubljana Slovenia : September 28, 2015.
  - Exploring biomolecular dynamics using NMR cross-correlated spin relaxation : COE Workshop on Biomolecular Interactions, NCBS Bangalore : November 26, 2015.
  - NMR Metabolomics : A Honey Trap for Biologists : Department of Crop Physiology, University of Agriculture, GKVK Bangalore : November 27, 2015.
  - Nuclear Magnetic Resonance in Physics, Chemistry and Biology : DST-INSPIRE Science Camp IISER Mohali : January 6, 2016.
  - Characterizing multiqubit entanglement and detecting nonclassical correlations via a witness on an NMR ensemble quantum 22nd Conference of National Magnetic Resonance Society : IIT Kharagpur February 18-21, 2016.

- Novel insights into protein structure determination using NMR : Workshop on Advanced Techniques in Protein Design and Engineering, IISER Mohali : March 19, 2016.
- NMR at the interface of Physics, Chemistry and Biology : Ishan Vikas Camp, IISER Mohali : June 08 2016.

- **Ramandeep S. Johal**
  - Universality of efficiency at maximum work with finite reservoirs, ICTS Bangalore, February 12, 2016.

- **Rajeev Kapri**
  - Dynamic Transitions in DNA Unzipping : Padua University (Italy) : June 25, 2015.
  - Unzipping DNA by Force : HBN University Srinagar Garhwal : January 22, 2016.
  - Dynamic Transitions in DNA Unzipping : Institute of Physics Bhubaneswar : March 18, 2016.

- **Sanjeev Kumar**
  - Carrier induced antiferromagnetic coupling in LSMO-SRO interfaces : IFW Dresden (Germany) : June 13, 2015.
  - Frustrated itinerant magnets : IIT Kharagpur : December 14, 2015.
  - Sanjeev Kumar : Electronic route to stabilize nanoscale spin textures in itinerant frustrated magnets : APS March meeting, Baltimore : March 17, 2016.

- **Smriti Mahajan**
  - Star Formation and nuclear activity of galaxies in different environments : Panjab University, Chandigarh : March 30, 2016.
  - Star Formation and nuclear activity of galaxies in different environments : Indian Institute of Science Education and Research Mohali : March 8, 2016.
  - Star Formation and nuclear activity of galaxies in different environments : Indian Institute of Technology, Ropar : March 7, 2016.

- **Ketan M. Patel**
  - Decoding neutrino masses and mixing : from symmetry to anarchy : Harish-Chandra Research Institute : March 17, 2016.

- **Goutam Sheet**
  - Unconventional superconductivity at nano-scale junctions between a normal metal and a 3D Dirac semimetal : IISER Pune : February-March 2016.
  - Mesoscopic superconductivity and multiple Andreev reflection on the Dirac Semi-metal Cd_3As_2 : AESET, IIT Mandi : January 2016.
  - Unexpected Superconductivity at Mesoscopic Point-contacts on a Dirac Semi-metal : TIFR Mumbai : September 2015.
  - Unconventional superconductivity at Mesoscopic Point-contacts on a Dirac Semi-metal : Emerging Phenomena at Interfaces, IISc Bangalore : November 2015.
  - Unconventional Superconductivity at Mesoscopic Point-contacts on the 3-Dimensional Dirac Semimetal Cd_3As_2 : University of Wisconsin Milwaukee : April 2015.
  - Spectroscopy on Superconductors : INST Mohali : March 2015.

- **Kamal P. Singh**
  - Photons momentum on water drop, GNDU Amritsar, September 2015.
  - Behaviour of light, Ishan Vikas Program, IISER Mohali, July 2015.
  - Nanoprocessing silk and Photons momentum, IIT Guwahati, April 2015.
  - Unravelling novel torsional and mechanical properties of spider silk, Punjab University, Chandigarh, March 2015.
  - Long Range Nanometric bending of light, FILMI IIT Ropar, March 2016.
  - **Gopal Verma** : Vectorial detection of capillary curvature by beam profile deformation, FILMI IIT Ropar, March 2016.
- **Mandip Singh**
  - Schrödinger cat and hybrid quantum systems : IIT Ropar : Frontiers in light-matter interaction, March 4-5, 2016.
- **Yogesh Singh**
  - High Pressure Transport and Structural Study on the Honeycomb Lattice Iridates A_2IrO_3 (A= Na, Li) : March meeting, American Physical Society : March 16, 2016.
  - Quest for the realization of the Kitaev-Heisenberg model in Honeycomb Lattice Iridates A_2IrO_3 (A = Na, Li) : Institute for Mathematical Sciences, Chennai : March 3, 2016.
  - Spin Liquids in Geometrically Frustrated Magnets : Institute of Physics, Bhubaneswar : January 18, 2016.
- **Sudeshna Sinha**
  - Taming explosive growth in complex networks : Potsdam Institute for Climate Impact Research : July 13, 2015.
  - Noise Enhanced Activity in a Complex Network : University of Oldenburg : July 16, 2015.
  - Noisy Logic : Jacobs University : July 20, 2015.
  - Taming Complex Networks : PHYSCON, Istanbul : August 21, 2015.
  - Dynamics of Rewired Networks : CDSA, Durgapur : February 16, 2016.
  - Dynamics of Rewired Networks : CHASCON, Chandigarh : March 2, 2016.
  - Dynamics of Rewired Networks : Workshop on Complex networks and emerging applications, Edinburgh : March 28, 2016.
- **Ananth Venkatesan**

  Nano-mechanical systems and 2-D electron systems at low temperatures : March 2016.

8.6.4 Conferences attended by researchers

1. Arvind : Foundations of Biology Meeting : March 11-14, 2016 : Biology Department IISER Pune
2. Arvind : Trends in science and mathematics education : February 19-21, 2016 : Delhi University : New Delhi
3. Arvind : Mathematical aspects in current quantum information theory : February 15-19, 2016 : Department of Mathematics, University of South Korea : Daejeon (South Korea)
4. Arvind : International Conference on Quantum Foundations 2015 : November 30 - December 4, 2015 : Department of Physics, NIT Patna

5. Debmalya Das : International Workshop and Conference on Quantum Foundations 2015 : November 28 - December 04, 2015 : NIT Patna, India

6. Debmalya Das : Meeting on Quantum Information Processing and Applications 2015 : December 7-13, 2015 : Harish-Chandra Research Institute, Allahabad

7. Jaskaran Singh Nirankari : International school and conference on quantum information : February 9-18, 2016 : Institute of Physics, Bhubhaneswar

8. Mamta Gulati : 8th International Conference on Gravitation and Cosmology (ICGC): December 14-18, 2015 : IISER Mohali

9. Ram Lal Awasthi : WHEPP-XIV : December 4-13, 2015 : IIT Kanpur

10. Ram Lal Awasthi : NuHoRIzons-IV : March 17-19, 2016 : HRI Allahabad

11. Jasjeet S. Bagla : Cosmology with the HI 21cm line : June 23-26, 2015 : Raman Research Institute and National Centre for Radio Astrophysics : Raman Research Institute

12. Jasjeet S. Bagla : International Conference on Gravitation and Cosmology : December 14-18, 2015 : Indian Association for General Relativity and Gravitation : IISER Mohali

13. Abhishek Chaudhuri : Dynamics of Biopolymers : June 2016 : NCBS Bangalore

14. Sameep Chandel : Statistical Physics of Soft Matter : November 26 - 30, 2015 : Department of Physics, Banaras Hindu University

15. Nisha Gupta : Statistical Physics of Soft Matter : November 26 - 30, 2015 : Department of Physics, Banaras Hindu University

16. Rajneesh Kumar : Statistical Physics of Soft Matter : November 26 - 30, 2015 : Department of Physics, Banaras Hindu University

17. Kavita Dorai : Recent Advances in NMR Spectroscopy : July 16-17 2015 : NMR Research Centre IISc Bangalore : Bangalore (India)

18. Kavita Dorai : Application of NMR Spectroscopy in Pharmaceutical Industry : September 23-25 2015 : Pharma NMR Europe : Rovinj (Croatia)

19. Kavita Dorai : 22nd Conference of National Magnetic Resonance Society of India : February 18-21 2016 : NMRS Society, IIT Kharagpur (India)

20. Harpreet Singh :European Congress on Magnetic Resonance 2015 : July 5-9, 2015 : EUROMAR, Prague, (Czech Republic).

21. Shruti Dogra:Meeting on Quantum Information Processing and Applications (QIPA-2015) : December 7-13, 2015 : Harish-Chandra Research Institute, Allahabad (India)

22. Harpreet Singh : 22nd Conference of National Magnetic Resonance Society of India : February 18-21, 2016 : NMRS Society, IIT Kharagpur (India)

23. Amandeep Singh : 22nd Conference of National Magnetic Resonance Society of India : February 18-21, 2016 : NMRS Society, IIT Kharagpur (India)

24. Satnam Singh : 22nd Conference of National Magnetic Resonance Society of India : February 18-21, 2016 : NMRS Society, IIT Kharagpur (India)

25. Rakesh Sharma : 22nd Conference of National Magnetic Resonance Society of India : February 18-21, 2016 : NMRS Society, IIT Kharagpur (India)

26. Jyotsana Ojha : 22nd Conference of National Magnetic Resonance Society of India : February 18-21, 2016 : NMRS Society, IIT Kharagpur (India)

27. Harvinder K. Jassal : Cosmology with the HI 21-cm Line, Raman Research Institute : June 23-26, 2015 : Bangalore, India

28. Harvinder K. Jassal : The 8th International Conference on Gravitation and Cosmology (ICGC) : December 14-18, 2015 : IISER Mohali

29. Ramandeep S. Johal : Indian Statistical Physics Meeting : February 12-14, 2016 : ICTS, Bangalore

30. Rajeev Kapri : XX Conference on Statistical Physics and Complex Systems : June 29 - July 01, 2015 : University of Parma : Univ. Parma Italy. Poster Title : Dynamic Transitions in DNA Unzipping : Scaling of Hysteresis Loop Area.

31. Rajeev Kapri : Seminar Series in Complex Systems : March 14 - 24, 2016 : Institute of Physics : IOP Bhubaneswar.

32. Rajneesh Kumar : Statistical Physics of Soft Matter : November 26-30, 2015, Banaras Hindu University : BHU Varanasi. Poster Title : Polymer Translocation : Role of Semiflexibility and Hydrodynamics.

33. Sanjeev Kumar : Workshop on Topological Particles in Condensed Matter : August 6-11, 2015 : IISER Pune : IISER Pune (India)

34. Sanjeev Kumar : APS March Meeting : March 14-18, 2016 : American Physical Society : Baltimore (USA)

35. Deepak Singh Kathyat : Workshop on Topological Particles in Condensed Matter : August 6-11, 2015 : IISER Pune : IISER Pune

36. Deepak Singh Kathyat : International workshop on "Emergent Phenomena in Quantum Hall Systems - 6 (EPQHS6)" : January 7-9, 2016 : TIFR Mumbai : TIFR Mumbai

37. Deepak Singh Kathyat : Workshop on Frontiers of Condensed Matter Physics (CONDMAT 2016) : February 22-27, 2016 : IOP Bhubaneshwar : IOP Bhubaneshwar

38. Arnob Mukherjee : Workshop on Frontiers of Condensed Matter Physics (CONDMAT 2016) : February 22-27, 2016 : IOP Bhubaneshwar : IOP Bhubaneshwar

39. Ayushi Singhania : Winter School On Condensed Matter Physics - 2016 : January 11-22, 2016 : Physics and Applied Mathematics Unit : Indian Statistical Institute, Kolkata

40. Kanika Pasrija : International Conference on Condensed Matter and Applied Physics (ICC-2015) : October 30-31, 2015 : Govt. Engineering College Bikaner and Ceramic Electrical Research & Development Centre Rajasthan : Bikaner, Rajasthan

41. S. Mahajan : Indo-French Astronomy School on Optical Spectroscopy : November 23-28, 2015 : Inter-University Centre for Astronomy and Astrophysics, Pune

42. K. M. Patel : NuHoRIzon 2016 : Marh 17-19, 2016 : Harish-Chandra Research Institute : Allahabad

43. Kamal P. Singh : Photons momentum on water drop : GNDU Amritsar : Sept, 2015.

44. Kamal P. Singh : Long range nanometric bending of water by light, Frontier on Light Matter Interaction : March IIT Ropar.

45. Kamal P. Singh : Meeting of Ramanujan Fellow, IIT Guwahati, April 2015

46. Mandip Singh : Frontiers in light-matter interaction : March 4-5, 2016 : IIT Ropar, India.

47. Yogesh Singh : American Physical Society March meeting : March 14-18, 2016 : American Physical Society : Baltimore, MD, USA.

48. Yogesh Singh : Quantum Disordered Systems : March 1-3, 2016 : IMSC Chennai.

49. Yogesh Singh : Emerging Trends in Advanced Functional Materials : January 18-21, 2016 : Institute of Physics Bhubaneswar

50. Yogesh Singh : Advanced School and Workshop on Topological Particles in Condensed Matter : August 6-11, 2015 : IISER Pune

51. Yogesh Singh : Novel states in spin-orbit coupled quantum matter : from models to materials : July 27-30, 2015 : Kavli Institute for Theoretical Physics : Santa Barbara, USA

52. A. Balodhi : SERC school on Single Crystals of Functional materials and their applications : 2-22 September 2015 : SSN College of Engineering, Chennai.

53. A. Balodhi : Winter School on frontiers in materials science : December 7-11, 2015 : JNCASR Bangalore.

54. A. Balodhi : Workshop on Frontiers in Condensed matter Physics : February 22-27, 2016 : IOP Bhubaneswar.

55. Amit : An Advanced School & Topical Workshop on "Topological Particles in Condensed Matter Physics" : August 6-11, 2015 : IISER Pune.

56. Amit : Workshop on Frontiers in Condensed Matter Physics : February 22-27, 2016 : Institute of Physics, Bhubaneswar.

57. K. Mehlawat : Workshop on Current Treads in Frustrated Magnetism :February 9-13, 2015 : ICTP : JNU, New Delhi.

58. K. Mehlawat : DST-SERC SCHOOL on Single Crystal of Functional Materials and Their Application : Sept 2-22, 2015 : DST-SERC : SSN College of Engineering, Kalavakkam, Chennai.

59. K. Mehlawat : Winter School on Frontiers of Materials Science : Dec 7-11, 2015 : JNCASR-Cambridge University : JNCSAR, Bangalore.

60. K. Mehlawat : DAE-60th SSPS symposium : Dec 21-25,2015 : DAE-SSPS : Amity University, New Delhi.

61. K. Mehlawat : Frontiers in Condensed Matter Physics : Feb 22-27, 2016 : CONDMAT : IOP, Bhubaneswar.

62. Anzar Ali : Topological Particles in Condensed Matter Physics : August 6-11, 2015 : An Advanced school and Topical Workshop : IISER Pune.

63. Anzar Ali : Emerging Trend in Advanced Functional Materials 2016 : January 18-21, 2016 : Institute of Physics Bhubaneswar.

64. Jaskaran Singh : International Workshop on Emergent Phenomenon in Quantum Hall Systems (EPQHS 2016) : January 7-9, 2016 : TIFR Mumbai, India.

65. Jaskaran Singh : Emerging Trend in Advanced Functional Materials 2016 : January 18-21, 2016 : Institute of Physics, Bhubaneswar.

66. Sudeshna Sinha : PHYSCON : August 19-22, 2015 : IPACS : Istanbul

67. Sudeshna Sinha : CDSA : February 15-17, 2016 : NIT Durgapur : Durgapur

68. Ananth Venkatesan : Nano India 2015 : Sastra University Thanjavur (India)

8.6.5 Publications : Physical Sciences

[1] **S. Dogra**, **Arvind**, and **K. Dorai**, "Implementation of the quantum Fourier transform on a hybrid qubit-qutrit NMR quantum emulator," *Intl. J. Qtm. Infor.*, vol. 13, p. 1550059, 2015.

[2] **D. Das**, **S. Dogra**, **K. Dorai**, and **Arvind**, "Experimental construction of a W-superposition state and its equivalence to the Greenberger-Horne-Zeilinger state under local filtration," *Physical Review A*, vol. 92, p. 022307, 2015.

[3] **V. Siddhu** and **Arvind**, "Quantum private comparison over noisy channels," *Quantum Information Processing*, vol. 14, pp. 3005–3017, 2015.

[4] **D. Das** and **Arvind**, "Quantum state estimation using weak measurements," *Current Science*, vol. 109, pp. 1939–1945, 2015.

[5] **Charanjit S. Aulakh**, "MSSM Higgs : Window into Susy GUTs," *PoS PLANCK2015*, Proceedings, 18th International Conference From the Planck Scale to the Electroweak Scale (Planck 2015) : Ioannina, Greece, May 25-29, 2015, p. 010.

[6] **Charanjit S. Aulakh**, "New Minimal SO(10) GUT : A Theory for All Epochs," *Pramana*, vol. 86, no. 2, pp. 207–221, 2016.

[7] **Charanjit S. Aulakh**, "Bajc-Melfo vacua enable Yukawon ultraminimal grand unified theories," *Phys. Rev. D*, vol. 91, p. 055012, 2015.

[8] **Charanjit S. Aulakh**, K. Kumar and U. Yajnik (editors), *Proceedings of the International Workshop on Unification and Cosmology after Higgs Discovery and BICEP*, Indian Academy of Sciences, Bengaluru, 2016.

[9] **R. L. Awasthi**, P. S. B. Dev, and **M. Mitra**, "Implications of the diboson excess for neutrinoless double beta decay and lepton flavor violation in tev scale left right symmetric model," *Phys. Rev.*, vol. D93, no. 1, p. 011701, 2016.

[10] **J. S. Bagla** and P. K. Sandhu, "Gravitational collapse and structure formation in an expanding universe," *Resonance*, vol. 20, no. 9, pp. 803–815, 2015.

[11] **V. Bhardwaj**, et al. (Belle Collaboration), "Inclusive and exclusive measurements of B decays to χ_{c1} and χ_{c2} at belle," *Phys. Rev. D*, vol. 93, p. 052016, 2016.

[12] **D. Chakraborty** and D. Chaudhuri, "Stochastic ratcheting of two-dimensional colloids : Directed current and dynamical transitions," *Physical Review E*, vol. 91, no. 5, p. 050301, 2015.

[13] **A. Chaudhuri** and D. Chaudhuri, "Forced desorption of semiflexible polymers, adsorbed and driven by molecular motors," *Soft Matter*, vol. 12, p. 2157, 2016.

[14] **N. Gogna**, V. Singh, V. Sheeba, and **K. Dorai**, "NMR-based investigation of the *drosophila melanogaster* metabolome under the influence of daily cycles of light and temperature," *Molecular BioSystems*, vol. 11, pp. 3305–3315, 2015.

[15] **N. Gogna**, N. Hamid, and **K. Dorai**, "Metabolomic profiling of the phytomedicinal constituents of *Carica papaya L.* leaves and seeds by ^{1}H NMR spectroscopy and multivariate statistical analysis," *J. Pharm. Biomed. Anal.*, vol. 115, pp. 74–85, 2015.

[16] C. A. Brosey, S. E. Soss, S. Brooks, C. Yan, I. Ivanov, **K. Dorai**, and W. J. Chazin, "Functional dynamics in replication protein a dna binding and protein recruitment domains," *Structure*, vol. 23, pp. 1028–1038, 2015.

[17] **N. Gogna** and **K. Dorai**, "Hr-mas nmr-based metabolomic approach to study the effect of fungicidal stress on wheat seed germination," *Current Science*, vol. 108, pp. 1694–1701, 2015.

[18] **R. S. Johal** and R. Rai, "Near-equilibrium universality and bounds on efficiency in quasi-static regime with finite source and sink," *EPL (Europhys. Lett.)*, vol. 113, p. 10006, 2016.

[19] **G. Thomas** and **R. S. Johal**, "Estimating performance of feynman's ratchet with limited information," *Journal of Physics A: Mathematical and Theoretical*, vol. 48, no. 33, p. 335002, 2015.

[20] **P. Aneja**, **H. Katyayan**, and **R. S. Johal**, "Optimal engine performance using inference for non-identical finite source and sink," *Mod. Phys. Lett. B*, vol. 29, no. 33, p. 1550217, 2015.

[21] **P. Aneja** and **R. S. Johal**, "Form of prior for constrained thermodynamic processes with uncertainty," *Eur. Phys. J. B*, vol. 88, no. 5, p. 129, 2015.

[22] **R. Kapri**, M. Bandyopadhyay, and M. Barma, "Order-parameter scaling in fluctuation-dominated phase ordering," *Physical Review E*, vol. 93, no. 1, p. 012117, 2016.

[23] S. Reja, R. Ray, J. van den Brink, and **S. Kumar**, "Coupled spin-charge order in frustrated itinerant triangular magnets," *Phys. Rev. B*, vol. 91, no. 14, p. 140403, 2015.

[24] L. Davies, A. Robotham, S. Driver, M. Alpaslan, I. Baldry, J. Bland-Hawthorn, S. Brough, M. Brown, M. Cluver, B. Holwerda, ..., **S. Mahajan**, *et al.*, "Galaxy and mass assembly (GAMA): growing up in a bad neighbourhood–how do low-mass galaxies become passive?," *Monthly Notices of the Royal Astronomical Society*, vol. 455, no. 4, pp. 4013–4029, 2016.

[25] S. P. Driver, A. H. Wright, S. K. Andrews, L. J. Davies, P. R. Kafle, R. Lange, A. J. Moffett, E. Mannering, A. S. Robotham, K. Vinsen, ..., **S. Mahajan**, *et al.*, "Galaxy and mass assembly (GAMA): Panchromatic data release (far-UV–far-IR) and the low z energy budget," *Monthly Notices of the Royal Astronomical Society*, vol. 455, no. 4, pp. 3911–3942, 2016.

[26] N. Agius, S. di Serego Alighieri, S. Viaene, M. Baes, A. Sansom, N. Bourne, J. Bland-Hawthorn, S. Brough, T. Davis, I. De Looze, ..., **S. Mahajan**, *et al.*, "H-atlas/GAMA and hevics–dusty early-type galaxies in different environments," *Monthly Notices of the Royal Astronomical Society*, vol. 451, no. 4, pp. 3815–3835, 2015.

[27] M. Alpaslan, S. Driver, A. S. Robotham, D. Obreschkow, E. Andrae, M. Cluver, L. S. Kelvin, R. Lange, M. Owers, E. N. Taylor, ..., **S. Mahajan**, *et al.*, "Galaxy and mass assembly (GAMA): trends in galaxy colours, morphology, and stellar populations with large-scale structure, group, and pair environments," *Monthly Notices of the Royal Astronomical Society*, vol. 451, no. 3, pp. 3249–3268, 2015.

[28] **K. M. Patel** and P. Sharma, "Interpreting 750 GeV diphoton excess in SU(5) grand unified theory," *Phys. Lett.*, vol. B757, pp. 282–288, 2016.

[29] S. Banerjee, B. , **M. Mitra**, and M. Spannowky, "The Lepton Flavour Violating Higgs Decays at HL-LHC and the ILC," *Journal of High Energy Physics*, vol. 1607, p. 059, 2016.

[30] G. Bambhaniya, P. S. B. Dev, S. Goswami, and **M. Mitra**, "The Scalar Triplet Contribution to Lepton Flavour Violation and Neutrinoless Double Beta Decay in Left-Right Symmetric Model," *Journal of High Energy Physics*, vol. 1604, p. 046, 2016.

[31] S. Banerjee, **M. Mitra**, and M. Spannowsky, "Searching for a Heavy Higgs boson in a Higgs-portal B-L Model," *Phys. Rev.* vol. D92, p. 055013, 2015.

[32] **L. Aggarwal**, **A. Gaurav**, G. S. Thakur, Z. Haque, A. K. Ganguli, and **G. Sheet**, "Unconventional superconductivity at mesoscopic point-contacts on the 3-dimensional dirac semi-metal Cd_3As_2," *Nature Materials*, no. 15, pp. 32–37, 2016.

[33] **A. Sirohi**, C. K. Singh, G. S. Thakur, **P. Saha**, **S. Gayen**, **A. Gaurav**, **S. Jyotsna**, Z. Haque, L. C. Gupta, M. Kabir, A. K. Ganguli, and **G. Sheet**, "High spin polarization and the origin of unique ferromagnetic ground state in CuFeSb," *Applied Physics Letters*, no. 108, p. 242411, 2016.

[34] **A. Sirohi**, **P. Saha**, **S. Gayen**, A. Singh, and **G. Sheet**, "Transport spectroscopy on trapped superconducting nano-islands of Pb: Signature of unconventional pairing," *Nanotechnology*, no. 27, p. 285701, 2016.

[35] **L. Aggarwal**, A. Banik, S. Anand, U. V. Waghmare, K. Biswas, and **G. Sheet**, "Local ferroelectricity in SnTe above room temperature driven by competing phonon instabilities and soft resonant bonding," *Journal of Materiomics*, no. 2, p. 196, 2016.

[36] K. S. Asha, M. Makkitaya, **A. Sirohi**, L. Yadav, **G. Sheet**, and S. Mandal, "A series of s-block (Ca, Sr and Ba) metal-organic frameworks : synthesis and structure-property correlation," *CrystEngComm*, no. 18, p. 1046, 2016.

[37] **S. Sanwlani**, M. Balal, **S. Jyotsna**, and **G. Sheet**, "The role of substrates and environment in piezoresponse force microscopy: A case study with regular glass slides," *Solid State Communications*, no. 246, pp. 17–22, 2016.

[38] **M. Aslam**, A. Paul, G. S. Thakur, S. Das, **S. Gayen**, U. Waghmare, and **G. Sheet**, "Evidence of a pseudogap in the ferromagnetic superconductor $Sr_{0.5}Ce_{0.5}FBiS_2$ driven by competing orders of multi-band origin," *Journal of Physics - Condensed Matter*, no. 28, p. 195701, 2016.

[39] **G. Verma** and **K. P. Singh**, "Vectorial detection of sub-microscale capillary curvature by laser beam profile," *Applied Physics Letters*, vol. 107, no. 16, p. 164101, 2015.

[40] **G. Verma** and **K. P. Singh**, "Universal long-range nanometric bending of water by light," *Physical review letters*, vol. 115, no. 14, p. 143902, 2015.

[41] **K. P. Singh** and J. M. Rost, "Global control of attosecond photoionization of atoms through xuv dispersion," *Physical Review A*, vol. 91, no. 1, p. 013415, 2015.

[42] **G. Verma**, M. Pandey, and **K. P. Singh**, "Interferometric technique for nanoscale dynamics of fluid drops on arbitrary substrates," *Journal of Applied Physics*, vol. 118, no. 3, p. 035306, 2015.

[43] **P. Kumar**, **D. Shamoon**, **D. P. Singh**, **S. Mandal**, and **K. P. Singh**, "Optical probing of long-range spatial correlation and symmetry in complex biophotonic architectures on transparent insect wings," *Laser Physics Letters*, vol. 12, no. 2, p. 025901, 2015.

[44] **Y. Singh** *et al.*, "The H–T and P–T phase diagram of the superconducting phase in Pd: Bi_2Te_3," *Journal of Superconductivity and Novel Magnetism*, pp. 1–5, 2016.

[45] S. H. Chun, J.-W. Kim, J. Kim, H. Zheng, C. C. Stoumpos, C. Malliakas, J. Mitchell, **K. Mehlawat**, **Y. Singh**, Y. Choi, *et al.*, "Direct evidence for dominant bond-directional interactions in a honeycomb lattice iridate Na_2IrO_3," *Nature Physics*, vol. 11, no. 6, pp. 462–466, 2015.

[46] **K. Mehlawat**, **G. Sharma**, and **Y. Singh**, "Fragile magnetic order in the honeycomb lattice iridate Na_2IrO_3 revealed by magnetic impurity doping," *Physical Review B*, vol. 92, no. 13, p. 134412, 2015.

[47] **A. Balodhi**, A. Thamizhavel, and **Y. Singh**, "Evolution of magnetic, transport, and thermal properties in $Na_{4-x}Ir_3O_8$," *Physical Review B*, vol. 91, no. 22, p. 224409, 2015.

[48] S. Yoon, S. Baek, **A. Balodhi**, W. Lee, K. Choi, I. Watanabe, J. Lord, B. Büchner, B. Suh, and **Y. Singh**, "Spin dynamics in $Na_{4-x}Ir_3O_8$ ($x = 0.3$ and 0.7) investigated by ^{23}Na NMR and μsr," *Journal of Physics: Condensed Matter*, vol. 27, no. 48, p. 485603, 2015.

[49] **P. D. Rungta** and **S. Sinha**, "Random links enhance the sensitivity of networks to heterogeneity," *EPL (Europhysics Letters)*, vol. 112, no. 6, p. 60004, 2016.

[50] W. L. Ditto and **S. Sinha**, "Exploiting chaos for applications," *Chaos: An Interdisciplinary Journal of Nonlinear Science*, vol. 25, no. 9, p. 097615, 2015.

[51] B. Kia, S. Kia, J. F. Lindner, **S. Sinha**, and W. L. Ditto, "Coupling reduces noise: applying dynamical coupling to reduce local white additive noise," *International Journal of Bifurcation and Chaos*, vol. 25, no. 03, p. 1550040, 2015.

[52] S. De and **S. Sinha**, "Effect of switching links in networks of piecewise linear maps," *Nonlinear Dynamics*, vol. 81, no. 4, pp. 1741–1749, 2015.

[53] **A. Choudhary** and **S. Sinha**, "Balance of interactions determines optimal survival in multi-species communities," *PloS one*, vol. 10, no. 12, 2015.

[54] **A. Kumar**, **V. Agrawal**, and **S. Sinha**, "Spatiotemporal regularity in networks with stochastically varying links," *The European Physical Journal B*, vol. 88, no. 6, pp. 1–8, 2015.

[55] **A. Choudhary**, **V. Kohar**, and **S. Sinha**, "Preventing catastrophes in spatially extended systems through dynamic switching of random interactions," *Pramana*, vol. 84, no. 2, pp. 217–228, 2015.

[56] N. K. Kamal and **S. Sinha**, "Dynamic random links enhance diversity-induced coherence in strongly coupled neuronal systems," *Pramana*, vol. 84, no. 2, pp. 249–256, 2015.

[57] N. K. Kamal and **S. Sinha**, "Emergent patterns in interacting neuronal sub-populations," *Communications in Nonlinear Science and Numerical Simulation*, vol. 22, no. 1, pp. 314–320, 2015.

[58] K. Masui, H.-H. Lin, J. Sievers, C. J. Anderson, T.-C. Chang, X. Chen, A. Ganguly, M. Jarvis, C.-Y. Kuo, Y.-C. Li, Y.-W. Liao, M. McLaughlin, U.-L. Pen, J. B. Peterson, A. Roman, P. T. Timbie, T. Voytek, and **J. K. Yadav**, "Dense magnetized plasma associated with a fast radio burst," *Nature*, vol. 528, no. 7583, pp. 523–525, 2015.

9 Patents

Following patents were granted to / filed by the faculty members of IISER Mohali.

1. Noise-assisted reprogrammable nanomechanical logic gate and method (Granted on March 1, 2016) : W.L. Ditto, P. Mohanty, **Sudeshna Sinha**, A. R. Bulsara, D. Guerra, and K. Murali : US Patent 9276564

2. Increased expression of isoprenoid in Saccharomyces cerevisiae by carotenoid optimization and screening (Filed in India, Feb 2016) : Manisha Wadhwa and **Anand K. Bachhawat** (No. 642/DEL/2015).

3. Increased expression of isoprenoid in Saccharomyces cerevisiae by carotenoid optimization and screening (Filed in US, March 2016) : Manisha Wadhwa and **Anand K. Bachhawat**

4. A semi-automatic pipette filler instrument and a modified pipette : **Samrat Ghosh** : WO2015/092777A2

10 Awards and Honours

Professor S. K. Khanduja receiving the V. V. Narlikar Lecture Award (INSA)

10.1 Awards won by the faculty

1. **Rachna Chaba** IUSSTF Travel Award 2015 *for attending Sixth Indo-American Frontiers of Science Symposium (IAFOS 2015) at Irvine, CA, USA during August 9-12, 2015.*

2. **Kausik Chattopadhyay** DBT National BioScience Award 2014 *for Career Development.*

3. **Lolitika Mandal** Selected for Researcher Spotlight : Wellcome Trust (UK).

4. **Samrat Mukhopadhyay** Recipient of the Royal Society's Commonwealth Science Conference Follow-on grant *to visit the University of Manchester during summer 2015.*

5. **Kuljeet Singh Sandhu** Research grant from SERB (2016).

6. **Mahak Sharma** Co-recipient of IISER Mohali Best Teacher Award 2015 *for contributions in teaching.*

7. **Mahak Sharma** Young Associate of the Indian Academy of Sciences, Bangalore (2015) *for contributions in the field of Cell Biology.*

8. **Somdatta Sinha** INSA-French Academy of Sciences Bilateral Exchange Programme (2015) *for visiting and giving talks at Gif-sur-Yvette, Montpellier, and Rennes (France) during May 17 to June 1, 2015.*

9. **Arijit Kumar De** SERB Early Career Research Award (2016) *for project titled "Optical spectroscopy of trapped (and patterned) nano-particles and (macro)molecules in solution".*

10. **Santanu K. Pal** NASI Young Scientist Platinum Jubilee Award (2015) *for contributions in the field of Chemical Sciences.*

11. **Santanu K. Pal** Young Scientist Medal from the Indian National Science Academy (2015) *for contributions in the field of Chemical Sciences.*

12. **Santanu K. Pal** DST Travel Award, Department of Science and Technology (2015) *for attending 16th Topical Meeting on the Optics of Liquid Crystals (Poland) during September 13-18, 2015.*

13. **Sabyasachi Rakshit** The Wellcome Trust / DBT Intermediate Fellowship (2015) *for research and personal development.*

14. **N. Sathyamurthy** SASTRA-CNR Rao Award for Chemistry and Material Science 2016, SASTRA University, Thanjavur, Tamilnadu *for excellence in Chemistry and Materials Science.*

15. **V. L. Narayanan** Recognized as Outstanding Reviewer by the journal Advances in Space Research published by Elsevier 2015.

16. **V. L. Narayanan** Travel support from DST under International Travel Support scheme 2015 *for participating in 26th IUGG general assembly during 22 June - 2 July 2015 at Prague, Czech Republic.*

17. **Vinayak Sinha** Scientific Steering Committee Member from India : 2015-present: iLEAPS (Integrated Land Ecosystem-Atmosphere Processes Study), an ICSU and International Geosphere-Biosphere Program Scientific Project

18. **Vinayak Sinha** IGBP sponsored stay grant 2015 *for attending the American Geophysical Union Fall Meeting 2015 during December 13-18, 2015.*

19. **Parth R. Chauhan** Conference grant : Emerging Trends in South Asian Rock Art: Theories, Methods and Scientific Studies. Indian Council for Historical Research, New Delhi. [INR 1,50,000]

20. **Parth R. Chauhan** The impact of rock variability on hominin technological adaptations in India. Royal Society Commonwealth Science Conference Follow-On Grant. In collaboration with Prof. Bruce Bradley, Exeter University (UK). [3000 Pounds]

21. **Anu Sabhlok** Antipode International Workshop Award *for Caste, Class, Race, Gender, and Indigeneity: Placing Subalternity* along with colleagues at Indiana University. [12,000]

22. **Sudesh K. Khanduja** V. V. Narlikar Lecture Award from Indian National Science Academy 2015 *for contributions in Mathematics.*

23. **Kapil H. Paranjape** Member, National Board of Higher Mathematics, DAE (2015-2017) : To oversee mathematical activities supported by the DAE.

24. **Kapil H. Paranjape** Member, Council of the Indian Academy of Sciences, Bangalore (2016) : To oversee activities of the Indian Academy of Sciences.

25. **Kapil H. Paranjape** Chairman, Programme Advisory Committee Mathematical Sciences, SERB (2016) : To oversee mathematical activities supported by the SERB.

26. **I. B. S. Passi** Adjunct Professor, Central University of Punjab, Bathinda (Punjab).

27. **I. B. S. Passi** Member of the Advisory Committee of UGC-SAP(DRS-II), Himachal Pradesh University, Shimla (Himachal Pradesh).

28. **I. B. S. Passi** Member of the Council, Indian National Science Academy, New Delhi.

29. **I. B. S. Passi** Chairman, Selection Committee (Mathematics), for DST-INSPIRE faculty Scheme and Member APEX Committee.

30. **Mahender Singh** Granted DST-RSF Indo-Russian grant.

31. **Jasjeet S. Bagla** Elected council member of the Indian Associate for General Relativity and Gravitation.

32. **Abhishek Chaudhuri** Co-recipient of IISER Mohali Best Teacher Award 2015 *for contributions in teaching*.

33. **Manimala Mitra** Royal Society International Exchange Award, IPPP, Durham University, UK 2015.

34. **Sudeshna Sinha** J. C. Bose Fellowship from DST (2015).

10.2 Awards won by the students

1. Aastha Sindhwani: Best Research Poster Award: Research Scholars Convention: 2015: for best research poster presentation at the convention.

2. Chinmoy Sarkar: Received Young Scientist Travel Grant by International Geosphere-Biosphere Programme (IGBP) to attend Future Earth Early Career Scientist (ECS) workshop 2015 in Palo Alto, USA: 2015

3. Chinmoy Sarkar: Received Young Scientist Travel Grant by International Geosphere-Biosphere Programme (IGBP) and Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS) to attend American Geophysical Union (AGU) Fall Meeting 2015 in San Francisco, USA: 2015

4. Gayathri S. Singharaju : Won best poster award for her research presentation in International conference on Optics within Life Sciences, TIFR Mumbai, March 2016.

5. Harpreet Singh : Student grant from the European Congress on Magnetic Resonance, to attend the conference in Prague Czech Republic during July 5-9 2015.

6. Haseeb Hakkim: Best poster presentation for his poster entitled "Wet Scavenging Efficiency Of Monsoon Rains For Reactive Volatile Organic Compounds In The North-West Indo Gangetic Plain": by National Climate Science Conference Committee: Indian Institute of Science Bangalore: July 2-3, 2015

7. Prabhat Kumar Mahato: Department of Science and Technology, India (DST) international travel award to attend the Society for Neuroscience (SFN) meeting in Chicago, USA from October 17-21, 2015.

8. Pratima Pandey: Award for best paper/poster from the organisers at the XXXIII Annual Conference of the Indian Academy of Neuroscience held at Punjab University: Oct 31 - Nov 2, 2015.

9. Pratima Pandey: Was selected to give an oral presentation at the First Indian C. elegans Meeting in Lonavala: Jan 30 - Feb 2, 2016.

10. Ranjana Jaiswara, Richa Singh & Manjari Jain : Best Poster Award at the Conference on Insect Biodiversity Studies: Where does India stand in the Global Map: 29-31st March 2016: Entomological society of India: Central University of Kerala; Poster Title: Acoustic Monitoring of Ensiferan Diversity of India

11. Saikat Ghosh : DBT Travel Award to attend European Fly meet, 2015

12. Saikat Ghosh : Best Poster award, European Fly Meet, Hiedelberg, Germany.

13. Saikat Ghosh : Best Poster Award, All Indian Developmental Biology Conference, Hyderabad, July 2015

14. Saikat Ghosh : The Zeeshan Khan Memorial Award for the Best Paper Published using Light Microscopy in 2015, DSS-NCBS MicroImaging Award 2015

15. Saurabh Pandey: HHMI Travel Award toward attending the conference on The Long and Winding Road: Neuronal Trafficking in Physiology and Disease at Janelia Campus, USA during May 31 - June 3, 2015.

16. Saurabh Pandey: IBRO-SFN travel award to attend the Society for Neuroscience meeting that took place in Chicago, USA from October 17-21, 2015.

17. Shruti Arya : Biophysical Society's travel award to attend the Biophysical Society meeting in Los Angeles, USA.

18. Shruti Arya: International Travel Support from SERB to attend the Biophysical Society meeting in Los Angeles, USA.

19. Shruti Arya: Travel Award from the Immunology Foundation to attend the Biophysical Society meeting in Los Angeles, USA.

20. Sumanjit Datta and Ms. Ankita Das: 5th best poster presentation award in 9th International Conference on Yeast Biology 2015, Kolkata, India. Title: The N-end rule pathway in Schizosaccharomyces pombe.

21. Vina Tikiyani : S. S. Parmar Research Foundation (USA) Prize for best paper at the poster session at the XXXIII Annual Conference of the Indian Academy of Neuroscience held at Punjab University: Oct 31 - Nov 2, 2015

22. Vina Tikiyani: Was selected to be a participant at the IBRO-APRC NBRC School in Neurosciences held at the National Brain Research Centre: Mar 15-30, 2016.

23. Yogesh Dahiya: Was selected to give a talk at the First C. elegans Workshop held at TIFR, Mumbai: Jan 28-29, 2016.

11 Major Facilities Procured

1. Bruker Tensor II FTIR spectrometer.

2. Single Molecule Fluorescence Microscopy using Total Internal Reflection Fluorescence Microscopy.

3. Leco TruSpec CHNS analyzer for the measurement of percentages of C, H, N and S present in samples.

4. High Speed Book Scanner for digitizing historical records and manuscripts.

5. Experimental research facility on laser cooling experiments, atom chip and Bose Einstein condensation experiments.

6. Tetra-arc furnace.

12 Current projects and fellowships

S.No.	Project No.	Project Title	Principal Investigator	Funding Agency	Duration	Sanctioned Cost
1	MAX-011-0023	Tropospheric OH reactivity and VOC measurement within India	Vinayak Sinha	DST-MPG	2011-2016	₹ 11,841,716
2	JCB-12-0033	J. C. Bose Fellowship	Somdatta Sinha	DST	2012-2017	₹ 6,800,000
3	INSPIRE-12-0034	INSPIRE Faculty Award	Mahender Singh	DST	2012-2017	₹ 1,180,000
4	DST-12-0035	Liquid Crystal Nanocrystal – A New Resource Of Functional Soft Materials For Nanosciences	Santanu Kumar Pal	DST	2012-2015	₹ 2,655,000
5	JCB-12-0036	J. C. Bose Fellowship	Anand K. Bachhawat	DST	2012-2017	₹ 6,800,000
6	DBT-12-0037	Identification And Characterization Of Cell Type Specific Transcription Factors From Arabidopsis Stem Cell Niche To Construct A Gene Regulatory Network	Ram Kishor Yadav	DBT	2012-2015	₹ 4,181,000
7	DBT-12-0038	Deciphering The Function Of Claudins In The Nervous System	Kavita Babu	DBT	2012-2015	₹ 4,119,000
8	RJN-12-0039	Ramanujan Fellowship	Goutam Sheet	DST	2012-2017	₹ 7,300,000
9	DBT-12-0040	Identification Of Transcriptional Gene Networks Using Genomic Approaches	Ram Kishor Yadav	DBT	2012-2017	₹ 7,450,000
10	DBT-12-0041	Cell Type-Specific Role Of Homer Proteins In Synaptic Plasticity	Samarjit Bhattacharyya	DBT	2012-2014	₹ 5,419,800
11	DBT-12-0042	Towards Understanding The Mechanism Of Antigenicity.	Kavita Babu	Wellcome DBT	2012-2017	₹ 34,326,491
12	DBT-12-0043	Role Of Small GTP-Binding Proteins In Regulating Lysosomal Trafficking And Microbial Killing	Mahak Sharma	Wellcome DBT	2012-2018	₹ 32,711,140
13	DAE-12-0044	Passive Sensor Materials Based On Crystals	Santanu Kumar Pal	DAE	2012-2015	₹ 1,650,000

S.No.	Project No.	Project Title	Principal Investigator	Funding Agency	Duration	Sanctioned Cost
14	DST-12-0045	Logical Approaches To The Enantioselective Synthesis O Biologically Active Compounds	S. S. V. Rama Sastry	DST	2012-2015	₹ 2,525,000
15	DBT-12-0046	An Investigation On The Role Of Transcription Factors Ascl1A, Foxn4, Zic2B And Tumor Supressor Pten In Retina Regeneration And Funtional Analysis Of Pluripotency Factors In The Retinal Stem Cells.	Rajesh Ramachandran	Wellcome DBT	2012-2017	₹ 32,395,132
16	DST-12-0047	Fabrication Of Mesoscopic Electromechanical Systems For Ultra Low Temperature Studies	Ananth Venkatesan	DST	2012-2015	₹ 25,011,200
17	DAE-12-0048	A Study Of Polynomials Over Valued Fields	Sudesh K. Khanduja	DAE	2012-2015	₹ 189,500
18	DST-13-0049	Regulation On RNA Splicing	Shravan K. Mishra	DST	2013-2016	₹ 4,050,000
19	DST-13-0050	Invariants And Group Actions On Manifolds	Mahender Singh	DST	2013-2016	₹ 216,000
20	ICS-13-0051	Constructing The Nation: An Enthnographic Account Of Migrant Labour On The Indo-Tibetan Boarder Roads	Anu Sabhlok	ICSSR	1.5 Year 2013-2015	₹ 700,000
21	DST-13-0052	Dynamics Of Non-Smooth Model In Ecology	Soma De	DST	2013-2016	₹ 1,636,000
22	DST-13-0053	Comological Parameters: Observational Aspects And Theoretical Issues	Harvinder K. Jassal	DST	2013-2016	₹ 1,644,000
23	DST-13-0054	National Network For Mathematical And Computational Biology	Somdatta Sinha	DST	2013-2016	₹ 4,937,000
24	DST-13-0055	Magnetifc Moments Of The N* An Low Laying Negative Parity Baryons	Neetika	DST	2013-2016	₹ 1,812,000
25	DST-13-0056	Knot, Braids And Automorphism Groups	K. Gongopadhyay	DST	2013-2016	₹ 3,002,450
26	DAE-13-0057	Complex Hyperbolic Quasi-Fuchsian Group	K. Gongopadhyay	DAE	2013-2016	₹ 686,900
27	DST-13-0058	Evolution Of Galaxies And The Large-Scale Envrionments	Smriti Mahajan	DST	2013-2016	₹ 1,872,000
28	DBT-14-0059	Long Term Associateive Memory In Caenorhabditis Elegans : Role Of Creb-1 Dependent Genes	Yogesh Dahiya	DBT	2014-2018	₹ 2,637,600
29	DST-14-0060	Search For Spin Liquid And Other Novel Ground States	Yogesh Singh	DST	2014-2017	₹ 2,637,600

S.No.	Project No.	Project Title	Principal Investigator	Funding Agency	Duration	Sanctioned Cost
		Arising From An Interplay Between Electronic Correlations, Spin-Orbit Coupling And Geometric Magnetic Frustration				
30	CRFS-14-0061	Genetic And Biochemical Investigations On The Cystinocin Trasporter Using A Novel Genetic Screen	Anand K. Bachhawat	CRFS	2014-2016	₹ 0
31	INSPIRE-14-0062	INSPIRE Faculty Award	Sudhanshu Shekhar	DST	2014-2019	₹ 1,900,000
32	DST-14-0063	Nanoscale Biophysics Of Protein Amyloids Creating Nanoparticle Based Bsuperstructures	Mily Bhattacharya	DST	2014-2017	₹ 2,480,000
33	MHRD-14-0064	Establishment Of Centres Of Excellance For Training And Research In Frontier Areas Of Science And Technology (Fast)	Purnananda Guptasarma	MHRD	2014-2018	₹ 40,000,000
34	DST-14-0065	Investigating The Links Between Glutathione Depletion And Calcium Homeostasis In Yeast Apoptosis Using The Cha C1 Proteins	Anand K. Bachhawat	DST	2014-2017	₹ 5,282,000
35	DST-14-0066	Sepctroscopy And Imaging Down To Subnanometer Length Scales On Novel Electronic Systems And Their Nanostructured Devices	Goutam Sheet	DST	2014-2017	₹ 45,633,200
36	DBT-14-0067	Dop-2 Modulates Acetylcholine And Gaba Singaling In Caenorhabidities Elegans	Pratima Pandey	DBT	2014-2017	₹ 3,870,000
37	DST-14-0068	India-Japan Research Project Knot Invariants And Geomertric Manifolds	K. Gongopadhyay	DST	2014-2016	₹ 452,000
38	CSIR-14-0069	Invertigating The Role Of Novel Regulator Marb. In The Regulation Of The Chromosomally Encoded Multiple Antibiotic Resistance (Mar) In Enteric Bacteria	Rachna Chaba	CSIR	2014-2017	₹ 2,200,000
39	DST-14-0070	Self-Propulsive Mechanisms Of Automous Microswimmers	Dipanjan Chakraborty	DST	2014-2017	₹ 3,610,000
40	INSPIRE-14-0071	INSPIRE Faculty Award	Anandam Banarjee	DST	2014-2019	₹ 1,900,000
41	INSPIRE-14-0072	INSPIRE Faculty Award	V. Lakshmi Narayanan	DST	2014-2019	₹ 1,900,000
42	DBT-14-0073	Structural And Molecular Insights Into Initiation, Propagation And Regulation Of A Yeast Prion Determinant	S. Mukhopadhyay	DBT	2014-2017	₹ 8,557,200

S.No.	Project No.	Project Title	Principal Investigator	Funding Agency	Duration	Sanctioned Cost
43	INSPIRE-15-0074	INSPIRE Faculty Award	Manimala Mitra	DST	2015-2020	₹ 1,900,000
44	INSPIRE-15-0075	INSPIRE Faculty Award	Monkia Sharma	DST	2015-2020	₹ 1,900,000
45	DST-15-0076	Inverstigation Of Protein-Dna G- Quadruplex Spin Relaxation And Novel Numerically Optimised Pilses	Kavita Dorai	DST	2015-2018	₹ 782,250
46	ICHR-15-0077	Sanskrit And The British Empire	Rajesh Kochhar	ICHR	2015-2017	₹ 150,000
47	JCB-15-0078	J. C. Bose Fellowship	P. S. Ahuja	DST	2015-2018	₹ 4,380,000
48	DST-15-0079	Exploring The Quantum Measurement Problem In The Context Of Weak Quantum Measurements	Arvind	DST	2015-2018	₹ 2,473,600
49	CSIR-15-0080	Stereoselective C-H Functionalzation Route Toward Libraries Of Biactive Sugar And Iminosugar Moieties Fused Spirooxindoles And Spirobrassinin Elacomine, Formosanine Anticancer And Antimalarial Biological Activities	S. Arulananda Babu	CSIR	2015-2018	₹ 3,080,000
50	DST-15-0081	Phenomenlogy Cosmology Of The New Minimal Supersymunetric So(10) Gut	C. S. Aulakh	DST	2015-2018	₹ 2,857,920
51	RSCSC-15-0082	The Impact Of Rock Variability On Hominin Technological Adaptations In India	Parth R. Chauhan	RSCSC	2015-2018	3,000
52	DST-15-0083	Chemical Reactions In High Frequency, Strong Oscillating Fields	P. Balanarayan	DST	2015-2018	₹ 1,500,000
53	DST-15-0084	Collective Dynamics Of Activ Polymers Implication For Sytoskeletal Structure And Dynamics	Abhishek Chaudhuri	DST	2015-2018	₹ 1,000,000
54	DST-15-0085	Photoswitchable Reversible Molecular Transport Developing Model Systems	Sugumar Venkataramani	DST	2015-2018	₹ 1,400,000
55	DBT-15-0086	Deciphering The Mechano-Responsive Behavior Of Cadherins In Hearing	Sabyasachi Rakshit	Wellcome DBT	2015-2020	₹ 32,732,260
56	INSPIRE-15-0087	INSPIRE Faculty Award	Anoop Aambili	DST	2015-2020	₹ 3,500,000
57	INSPIRE-15-0088	INSPIRE Faculty Award	Ketan Patel	DST	2015-2020	₹ 3,500,000

S.No.	Project No.	Project Title	Principal Investigator	Funding Agency	Duration	Sanctioned Cost
58	DWF-15-0089	Delhi Winter Fog	Vinayak Sinha	IITM Pune	2015-2016	₹ 215,000
59	DST-15-0090	Chiral Bis (Amino) Cyclopropenylidenes And Bis (Amino Cyclopropenimines Catalysed Enantioselective Organ Catalytic Transformations)	R. Vijaya Anand	DST	2015-2018	₹ 4,923,000
60	JCB-15-0091	J. C. Bose Fellowship	Sudeshna Sinha	DST	2015-2020	₹ 6,800,000
61	DST-15-0092	Enhancement Of Immune Memory By Transient Treatment With Puromycin	Sharvan Sehrawat	DST	2016-2019	₹ 5,015,890
62	DBT-15-0093	Understanding The Molecular Mechanisms Of Epigenetically Regulated Genes Dureing Muller Glia Dedifferentiation And Retina Regeneration In Zebrafish	Rajesh Ramachandran / K. S. Sandhu	DBT	2016-2019	₹ 6,584,600
63	DBT-15-0094	Inver=Stigating The Role Of A Novel Transcriptional Regulator Dgor In The Regulation Of Long Chain Fatty Acid (Lcfa) Metabolism In Escherichia Coli	Rachna Chaba	DBT	2016-2019	₹ 7,129,600
64	INSPIRE-15-0095	INSPIRE Faculty Award	Vishal Bhardwaj	DST	2016-2021	₹ 8,300,000
65	DBT-15-0096	Structure-function studies on Vibrio parahaemolyticus thermostable direct hemolysin, a membrane-damaging pore-forming toxin	Kausik Chattopadhyay	DBT	2016-2019	₹ 6,815,600
66	INSPIRE-15-0097	INSPIRE Faculty Award	Satyajit Guin	DST	2016-2021	₹ 8,300,000
67	ICHR5-0098	Learning From The Utopian City: An International Network On Alternative Histories Of India'S Urban Futures	Anu Sabhlok	ICHR	2015-2016	₹ 225,000
68	INSPIRE-15-0099	INSPIRE Faculty Award	Divya Srivastava	DST	2016-2021	₹ 8,300,000
69	DST-15-0100	L-Functions And Iwasawa Theory	A. Chandrakant Sharma	DST	2016-2019	₹ 384,000
70	NACP-15-0101	National Carbonaceous Aerosols Programme	Baerbel Sinha	NACP	2015-2021	₹ 10,608,000
71	INSPIRE-16-0102	INSPIRE Faculty Award	Smriti Mahajan	DST	2016-2021	₹ 8,300,000
72	DST-16-0103	Optical Spectroscopy Of Trapped (And Patterned) Nano-Particles And (Macro) Molecules In Solution	Arijit Kumar De	DST	2016-2019	₹ 4,644,000

S.No.	Project No.	Project Title	Principal Investigator	Funding Agency	Duration	Sanctioned Cost
73	DBT-16-0104	Metabolic Engineering For The Production Of Carotenoid Torularhodin In Saccharomyces Cerevisiae And The Isolation Of Mutants For Increasing Flux In The Pathway	Anand K. Bachhawat	DBT	2016-2019	₹ 6,228,200
74	DST-16-0105	Experimental Investigation Of Quantum Decoherence On An Nmr Quantum Information Processor	Kavita Dorai	DST	2016-2019	₹ 1,870,000
75	DST-16-0106	Functional And Trans- Regulatory Constraints Of Long-Rang Spatial Cross –Talk Among Genes	Kuljeet Singh Sandhu	DST	2016-2019	₹ 2,503,000

13 Opportunities Cell

With the help of several student volunteers, Professor Sanjay Mandal, faculty-in-charge, conducted a few meetings to assist interested students, and invited eminent scientists and administrators for interacting with (and delivering talks to) the entire community of IISER Mohali. Prominently, Dr. Ramasami, former Secretary DST, delivered a talk and also spent unlimited hours in advising students. Mr. Das, Executive Director, CII, New Delhi, also delivered a talk and spent time with students, advising them about academia-industry linkages. During two meetings in the evening hours, Professor Mandal discussed PhD programs in various countries, job opportunities and writing of résumés. A meeting with students who gained admission into PhD programs abroad was also held. A database of all former students is being created, to allow current and former students to leverage resources in favor the new students. This will also help the Institute to keep track the students and utilize the information for national ranking, for example.

14 Institute Library

Situated in the Informatics Centre, the IISER Mohali library epitomizes the spirit of the institute, i.e., the pursuit of knowledge. The library is a space for creative and innovative exchange of scholarly information and also a place for peaceful learning and collective voice reading. The library houses a rich collection of electronic and print versions of books (general, text, and reference books) for undergraduates and postgraduates, print and e-journals, online databases for various fields of study, including Mathematics, Physics, Chemistry, Biology, Computer Science, Earth/Environmental Sciences and Humanities & Social Sciences etc.

The library provides access to essential and specialized resources which aid in teaching, learning, and research activities. In tune with recent advancements in the fields of Information and Communication Technology (ICT),

IISER Mohali has set up a library with state of the art technology and world class infrastructure.

The library space of IISER Mohali is applauded for its aesthetic ambiance and also for its infrastructure. This building exemplifies the theme "Learning Commons" with the mission to provide effective, informal, and efficient use of library resources. The user-friendly space of the library helps users to be creative and collaborative with their peers, and the atmosphere inspires students to be industrious and efficacious. IISER Mohali is proud to introduce the first library in India to implement the theme, "Learning Commons". The whole library furniture, facilities and services have been designed for the aforesaid central theme.

Library Services

The house keeping activities of Library like cataloging, circulation, patron Information etc, is being operated through the open source library management software 'Koha' and the library creates and maintains a repository of theses, dissertations, Institute articles, Institute publications, Institute event images, news clipping and films on IISER Mohali in the open source software 'Dspace'.

It provides information services like Online catalogue (Web OPAC) of Books, e-Journals, On-line Full text Databases, Online Bibliographic Service, Abstracting Databases, e-mail Alert Service, Anti-Plagiarism Software, Grammarly tool, Current Awareness service, Document Delivery Service, Inter-Library Loan facility, DELNET Services, Photocopying facilities, Reference Service, New Paper Clipping S&T News Services, Institutional Repository and so on.

Library Facilities

Under this Learning Commons concept, IISER Mohali provides the following facilities in the library.

1. **Discussion Rooms** Provides space for faculty to have discussion with research groups. Spaces are equipped with required infrastructure and multimedia accessories for making presentations.
2. **Group Study Rooms** Provides space for students to carry out group study, voice reading and discussions with their research/academic peers. Spaces are equipped with required infrastructure and multimedia accessories for presentation.
3. **Seminar Rehearsal Room** Before facing the actual seminar delivery, students can make use of this room to rehearse their presentations in the presence of their supervisor/ instructor/research team. The room is equipped with multi-interactive functionalities such as interactive/smart boards.
4. **Smart /Interactive Room** A space for readers to exchange academic and research dialogues with other groups/institutes/universities through online interviews/interactions.
5. **Audio-Visual Zone** A space for e-learning through installed documentary film on science and technology.
6. **Research Scholar's Zone** Study desks with electrical outlets and Wi-Fi for research scholars
7. **Knowledge Exchange** A place where one can leave unsolved subject related questions.
8. **Thought Provoking** An opportunity to have offline debate on current affairs. This is an area where one can start a debate by leaving a topic. Other users can express their written opinion/views on the topic.
9. **Sky Library** A space on top of the building replete with pleasure reading materials (mostly fiction).
10. **Institute Publications Zone** As soon as any research paper or book is published by faculty/students of IISER Mohali, it is displayed.

11. **Latest News on LED Screens** Flashing news on the latest publications of IISER Mohali, regular scientific news, institute events with photographs, new arrivals with the book image etc.
12. **Information Kiosks** Online library catalogue with touch screen and multimedia effects
13. **Wi-Fi Space** Wi-Fi is available in all floors of the library
14. **Digital Zone** Computers with network in all floors for accessing digital content, i.e, e-journals and database.
15. **Faculty Corner, Student Corner, Alumni Corner** The achievements, posters, projects, awards etc. of faculty/students/alumni of IISER Mohali will be displayed.

Library Resources

IISER Mohali is one of the core members of e-Shodsindhu (MHRD Project). It has seamless access to thousands of renowned electronic journals in the field of basic and applied sciences such as Annual Reviews, SciFinder, EPW, J-GATE,ISID, JSTOR,MathScinet, OUP,Project MUSE, SIAM, Web of Science.

Library subscribes to the following e-resources (Journals Packages) through various Consortia with maximum discounted price. Some of the Online full text journals / databases available under the period report are Science On-line, American Chemical Society(ACS - Web Edition), American Physical Society (APS), American Institute of Physics (AIP), American Mathematical Sciences (AMS), Mathematical Association of America, Royal Society of Chemistry (RSC), Institute of Physics (IOP), Nature main titles and 39 subtitles of Nature Publishing Group, Project MUSE, Sciencedirect, SciFinder, Thieme, Springer-online, Taylor & Francis, Wiley, WorldScientific etc and Bibliographical & Abstracts Databases are MathSciNet, Grammarly tool, End Note, Scopus, Web of Science, Turnitin etc.

Other Activities

1. 11th Annual Meet & Workshop of INDEST-AICTE Consortium on 29th and 30th April 2015 in association with IIT Delhi. More than 300 library Professionals, Professors-in-charge of Library from Member Institutes of INDEST, AICTE Institutes, Tricity institutes and also publishers participated in the event.

   The event was inaugurated by Professor Shevgaonkar, Chairman, National Steering Committee of INDEST-AICTE Consortium and Director, IIT Delhi in the presence of Professor M. K. Surappa, Director, IIT Ropar, Professor N. Sathyamurthy, Director, IISER Mohali, Dr. Jagdish Arora, Director, INFLIBNET and Professor B. D. Gupta, National Coordinator, INDEST-AICTE Consortium and Professor, Department of Physics, IIT Delhi. Two days technical sessions were started with two hours dedicated to a special workshop on "National Digital Library Project" of MHRD, being Coordinated by IIT Kharagpur.

   The valedictory function was graced by Professor Arun Kumar Grover, Vice Chancellor, Punjab University, Professor Timothy Gonsalves, Director, IIT Mandi, Professor N. Sathyamurthy, Director, IISER Mohali, Professor B. D. Gupta, National Coordinator, INDEST-AICTE Consortium, Dr. Sudip Mandal, Chairman, Library Committee, IISER Mohali.
2. A hands on Training workshop on 'Writing Skills in English" with the by using Grammarly Tool" on September 2015. attended by 87 participants.
3. Workshop On 'Scientific Writing" in association with Taylor & Francis on 12th September 2015 attended by 242 participants.
4. Library orientation programme for "BS-MS 2015 Batch" on 08.08.2015 attended by 92 participants.
5. Library orientation Programme for PhD & Integrated PhD 2015 Batch on 08.08.2015. attended by 23 participants.

6. Awareness Programme on all databases held in Aug 2015, attended by 42 participants.

Publications

[1] N. Hassan and **P. Visakhi**, "Krishiprabha@krishikosh:An ETD of ICAR," in *Evolving genre of Electronic Theses and Dissertations for Knowledge Discovery: Proceedings of 8th International Symposium on Electronic Theses and Dissertations* (R. Gaur, ed.), pp. 393–398, Excel India, New Delhi, 2015.

[2] **P. Visakhi**, R. Gupta, and B. M. Gupta, "Performance of IISERs : An Evaluative Study for the period 2010-14," in *Bibliometrics data and Impact Management in Information Science* (P. Jain et al, ed.), pp. 620–628, Book Well, New Delhi, 2016.

[3] B. M. Gupta, S. M. Dhawan, and **P. Visakhi**, "Social Media and Libraries: A Scientometric Assessment of World Output, 2003-2014," *SRELS Journal of Information Management*, vol. 53, no. 1, 2016.

[4] **P. Visakhi**, R. Gupta, and B. M. Gupta, "Contribution and impact of IISERs: A Scientrometric Assessment of Publications during 2010-14," *Library Philosophy and Practice (e-journal)*, p. Paper 1352, 2015.

[5] **P. Visakhi**, S. M. Dhawan, B. M. Gupta, and A. Gupta, "Highly cited publications output by IISERs in Chemistry during 2008-15: A Scientometric Assessment," *International Journal of Information Dissemination and Technology*, vol. 6, no. 1, pp. 21–26, 2016.

15 Computer Centre

Computer centre completed the task of furnishing computer labs during 2015-16. With this the computer labs can simultaneously host teaching sessions in two labs, with up to sixty students in each lab. Each of the labs has projection facilities and seating has been arranged so that each student has an all in one computer with ample space around them. Each student has a clear view of the main projection screen and they can also see the instructor.

In the two semesters during 2015-16, computer labs were used for six courses with more than three hundred students in all. This is apart from the usage of labs by students at other times. Computer labs are open on all

days. During semesters, labs are open for up to eleven hours on working days.

Computer centre completed the task of networking all buildings on campus using underground optical fibre cables. The work was carried out by BSNL. Switching equipment has been installed and is expected to be configured and put into use in coming months.

Installation of a datacentre was completed. The datacentre has been set up for hosting network servers, switching equipment and servers and workstations purchased by faculty members for their scientific work. The datacentre has directly cooled racks and a long duration power backup. Network servers were procured and installed during this year. These are being configured and will be deployed in coming months.

Computer centre hosted a one day introductory workshop on scientific computing on July 13, 2015. The workshop was sponsored by Intel and conducted by resource persons from CDAC. Participants from IISER Mohali and several neighbouring institutes attended this workshop. Computer centre organized a two day workshop on high performance scientific computing during July 14-15, 2015. The workshop was arranged with help from CDAC-Pune. Resource persons from NPSF-CDAC: Dr. Sandeep Joshi, Dr. Venkatesh Shenoi, Mr. Pankaj Dorlikar, Ms. Chaitali Chandratre and Ms. Nisha Agarwal gave lectures and coordinated hands on sessions with more than twenty participants. Faculty members, research associates and PhD students from IISER Mohali attended this workshop. A few participants from neighbouring institutes also attended the workshop. A workshop on basics of Linux and system administration was organized by the computer centre. The workshop was arranged with help from CDAC Pune during March 28 - April 2, 2016.

16 Lectures by Visitors

Professor Venki Ramakrishnan delivering a Public Lecture

16.1 Foundation Day Lecture

September 27, 2015 : **Professor M. M. Sharma**, *Frontiers at the Chemistry - Allied Sciences Interface*.

16.2 Public Lectures

1. February 06, 2016 : **Professor C. N. R. Rao**, *Doing Science in India*.
2. January 04, 2016 : **Professor Venki Ramakrishnan**, *One hundred years of visualising molecules*.

16.3 Institute Colloquia

1. March 22, 2016 : K. Muniyappa, Department of Biochemistry, Indian Institute of Science, Bangalore : *Molecular Insights into Meiotic Chromosome Pairing From Single - Molecular Analysis.*
2. March 10, 2016 : Janez Plavec, Slovenian NMR center, National Institute of Chemistry, Ljubljana, Slovenia : *NMR studies of exciting new DNA topologies*
3. March 09, 2016 : Pradip K Chakraborti, Institute of Microbial Technology, Chandigarh : *Towards Understanding Mycobacterial Signaling: A Journey with a Eukaryotic-Type SER/THR Kinase.*
4. February 26, 2016 : Rajiv Sinha, IIT Kanpur : *River Science and River Health: Challenges ahead*
5. February 24, 2016 : Mustansir Barma, TIFR Centre for Interdisciplinary Sciences, Hyderabad : *Order from Disorder*

6. February 22, 2016 : P. K. Ghosh, formerly of IIT Kanpur : *Protein mass spectrometry*

7. February 23, 2016 : V. Nagaraja, Indian Institute of Science, Bangalore : *Perturbation of topology modulation*

8. February 17, 2016 : Arunaloke Chakrabarti, Department of Medical Microbiology, PGIMER Chandigarh : *Challenges in fungal infections in India*

9. February 02, 2016 : Shiv Grewal, National Institutes of Health, Bethesda, Maryland USA : *Epigenetic genome control by non-coding RNAs and its implications for human diseases*

10. January 20, 2016 : Iain Stewart, Sustainable Earth Institute, Plymouth University UK : *Communicating geoscience through the popular media*

11. December 11, 2015 : S. Umapathy, Indian Institute of Science, Bangalore : *Laser spectroscopic applications from physics to medicine.*

12. October 29, 2015 : Suresh Babu Kalidindi, Poornaprajna Institute of Scientific Research, Bangalore: *Design and Host-guest chemistry of Crystalline Porous Frameworks.*

13. October 28, 2015 : Martin Schultz, Forschungszentrum Julich, Germany: *Global surface ozone observations and analyses - Insights from the WMO Global Atmosphere Watch Programme and the Tropospheric Ozone Assessment Report.*

14. August 26, 2015 : Rajan Sankaranarayanan, Centre for Cellular and Molecular Biology, Hyderabad: *Chiral proofreading' during protein synthesis.*

15. August 06, 2015 : Shyam Lal, Physical Research Laboratory, Navrangpura Ahmedabad: *Atmospheric Trace Gases: Effects of changing their abundances.*

16. April 13, 2015 : Raghavan Varadarajan, IISc Bangalore: *HIV-1 and influenza immunogen design.*

17. April 10, 2015 : Philip Maini, Wolfson Centre for Mathematical Biology, Mathematical Institute, Oxford University, UK: *Case Studies in Modelling Collective Cell Motion.*

18. April 08, 2015 : J. P. Mittal, Chemistry and Isotope Group, BARC: *Excitement and Challenges in Radiation Research.*

19. April 07, 2015 : V. Ravindranath, Centre for Neuroscience, IISc Bengaluru: *Human Brain: Complexity Behind The Simplicity.*

16.4 Institute Seminars

1. March 31, 2016 : Arindam Indra, Group leader, Technische Universitat Berlin, Berlin, Germany : *Catalysis: from Sustainable Energy Conversion to Organic Reactions.*

2. March 30, 2016 : Y. Snehi, Ambedkar University, New Delhi : *'Meta-narratives' and the 'Everyday'.*

3. March 29, 2016 : Renji Remesan, School of Energy, Environment and Agrifood, Cranfield University, United Kingdom : *Quantifying catchment processes under changing climate.*

4. March 28, 2016 : Shiladitya Sengupta, Weizmann Institute of Science, Department of Chemical Physics, Israel : *Dynamics and statics of glass-formers and granular matter via computer simulation and analytic modelling.*

5. March 16, 2016 : Vijay Nair, National Institute of Interdisciplinary Science and Technology, Trivandrum : *Recent Advances in C-C Bond-forming Reactions involving NHC-Organocatalysis.*

6. March 14, 2016 : Prem Singh Kaushal, NYS-Department of Health Wadsworth Center Albany, NY, 12201 USA : *Cryo-electron microscopy (cryo-EM) studies of ribonucleoprotein complexes: the group II intron and ribosomes.*

7. March 11, 2016 : Haradhan Maity, TIFR Centre for Applicable Mathematics, Bangalore : *Conditional Statistics of Reynolds Shear Stress over Scour-Hole Geometry.*

8. March 11, 2016 : Anindita Sahoo, Amity University, Noida : *Typology vs. Universals through the Lens of Passives.*

9. March 10, 2016 : Sankarasekaran Shanmugaraju, School of Chemistry, Trinity College Dublin, Ireland : *Coordination-Driven Self-Assembly of Supramolecular Complexes: From Molecular Design to Potential Applications.*

10. March 08, 2016 : Arun Kumar Haldar, Duke University Medical Center, USA : *The Molecular Kiss of Death: Finding the Enemy Within-How Cells Recognize and Respond to a Microbial Pathogen Hidden in a Vacuole.*

11. March 04, 2016 : Anna Pratoussevitch, University of Liverpool : *Complex Hyperbolic Triangle Groups*

12. March 03, 2016 : Girish Kulkarni, Institute of Astronomy, Cambridge UK : *Small-scale Structure of the Intergalactic Medium and its First Measurement*

13. March 3, 2016 : Umamaheshwari, Indian Institute of Advanced Studies, Shimla: *Doing People's History.*

14. March 01, 2016 : Pankaj Kumar, Korea Astronomy and Space Science Institute, Daejeon, South Korea : *Multi-wavelength investigations of solar eruptions and associated physical processes*

15. March 01, 2016 : Amit Lahiri, Yale University School of Medicine, USA : *How genetic polymorphisms contribute to inter-individual variation in immune responses making SNPs make sense!*

16. February 25, 2016 : Pintu K. Kundu, Department of Chemistry, IIT Bombay : *Stimuli-Responsive Molecules and Novel Materials*

17. February 19, 2016 : Chaman Kumar, Indian Statistical Institute Delhi : *Explicity Approximations with varying coefficients: The case of super-linear coefficients*

18. February 18, 2016 : Animesh Ray, Keck Graduate Institute, Claremont, CA USA : *A measure of genomic robustness through genetic interaction analysis*

19. February 18, 2016 : Rajendra Raj Rathore, Marquette University, Milwaukee, USA : *Development of conceptual understanding of hole transport in pi-conjugated molecular wires using a combined experimental and computational approach*

20. February 17, 2016 : Smita Sirker, Jadavpur University : *Cognitive Science*

21. February 17, 2016 : Sukumar Vellakkal, PHFI Gurgaon : *India's National Health Mission and Equity in the Uptake of Maternal Healthcare Testing the effects of program design and inverse inequity hypothesis using a quasi-natural experiment study design*

22. February 16, 2016 : Urmidola Raye, Department of Geology, Queen's University, Canada : *The iron isotope ratios of Paleoproterozoic Iron Formations: Implications on sedimentology, oceanography and paleoenvironment*

23. February 16, 2016 : Sukumar Vellakkal, PHFI, Gurgaon : *India's National Health Mission and Equity in the Uptake of Maternal Healthcare Testing the effects of program design and 'inverse inequity hypothesis' using a quasi-natural experiment study design.*

24. February 15, 2016 : Ravi Rangarajan, National Taiwan University : *Understanding and reconstructing climate change driven extreme events in Asian monsoon systems using stable isotopic tracers*

25. February 15, 2016 : Greg Conner, Brigham Young University : *Wild Topology, Group Theory and a conjecture in Number Theory*

26. February 12, 2016 : Tamal Das, Max Planck Institute for Intelligent Systems, Stuttgart Germany : *Mechanobiology of Collective Cell Migration*

27. February 12, 2016 : Vaibhav Wasnik, Saarland University Germany : *Protein localization in biological systems*

28. February 11, 2016 : Debabrata Patra, University of Zurich : *Colloidal Capsules: Self-assembly of Nanoparticles at Liquid-Liquid Interface*

29. February 10, 2016 : Rajesh Gupta, ICTP : *Black Hole Entropy and Holography*

30. February 09, 2016 : Sandeep Kumar, Lund University, Sweden.

31. February 04, 2016 : Rajesh N. Patkar, National University of Singapore : *A Chemical Bond That Breaks Plant Innate Immunity*

32. February 02, 2016 : Amit Mishra, IIT Kanpur : *Aerosol Variability and its Climatic Implications: Present & Future Challenges*

33. January 29, 2016 : Koushik Sen, Wadia Institute, Dehradun : *Geodynamic evolution of the intra-continental Karakoram Fault and its bearing on India-Asia collisional tectonics*

34. January 29, 2016 : Jasbir Chahal, Brigham Young University : *Application of number theory to some geometric problems*

35. January 28, 2016 : Ajay Singh Nagpure, Centre for Science Technology and Environmental Policy University of Minnesota, Twin Cities USA : *Urban Infrastructure, Environment, and Health*

36. January 28, 2016 : Kamlesh Kumar, Eindhoven Universityof Technology, Netherlands : *Principles and applications of liquid crystals and liquid crystal polymers*

37. January 25, 2016 : Bappaditya Dey, Johns Hopkins University, School of Medicine, Howard Hughes Medical Institute : *Development of strategies for protection against Tuberculosis*

38. January 25, 2016 : Felix Bast, Centre for Plant Sciences, Central University of Punjab Bathinda : *Phylogeography and Phylogenetic Systematics: Disentangling the Tangled Bank*

39. January 22, 2016 : Siva Kumar Vallabhapurapu: *Balancing the Act : Regulation of the NF-kB signaling in normal homeostasis and disease*

40. January 18, 2016 : Ravinder Kumar Kaundal, Department of Immunobiology, Yale University School of Medicine : *Legacies of Past Environmental Exposures: novel models and methods*

41. January 15, 2016 : Thomas Sicking, University of Goettingen, Germany : *The dimension problem for groups and Lie rings*

42. January 14, 2016 : Sajal Dhara, University of Rochester : *Electron transport and circular photogalvanic effect in nanowires*

43. January 13, 2016 : Bhaswar Ghosh, Max Planck Institute for Terrestrial Microbiology, Marburg Germany : *Cellular Noise Suppression and Optimized Information Processing in Yeast Mating Pathway*

44. January 13, 2016 : Anindya Dutta, IIT Bombay, Mumbai : *Ultrafast dynamics in molecules and materials*

45. January 12, 2016 : Abhishek Kumar, Molecular Genetic Epidemiology, Deutsches Krebsforschungszentrum DKFZ, Heidelberg, Germany *Genomic applications in Basic to Translational Biology*

46. January 11, 2016 : Arabinda Halder, National University of Singapore : *Reconfigurable Magnonics: A Brillouin Light Scattering Spectro-microscopy study*

47. January 11, 2016 : V. V. Robin, National Centre for Biological Sciences, Tata Insitute of Fundamental Research, Bangalore : *Islands within sky islands of Western Ghats revealed from genetic and song divergences*

48. January 08, 2016 : Phoolan Prasad, IISC Bangalore : *Power Series Solution, Cauchy-Kowalevskaya Theorem and Classification of PDE*

49. January 08, 2016 : Pankaj Sharma, The University of Adelaide, Australia : *High Energy Physics@LHC: A TOP Perspective*

50. January 07, 2016 : Anupam Roy, University of Texas at Austin, USA : *Molecular Beam Epitaxy Growth and Characterization of Layered Chalcogenides*

51. January 06, 2016 : Christophe LEN, University of Technology of Compiegne (UTC), France : *Aqueous excursion in organic chemistry*

52. January 06, 2016 : Virinder S. Parmar, University of Delhi : *Biocatalytic Synthesis of Novel Polymeric Nanoparticles: Applications in Health and Industrial Sectors*

53. January 05, 2016 : Jagdish K Vij, Trinity College, The University of Dublin, Ireland : *Recent discovery of a new nematic phase - Twist Bend Nematic Phase*

54. January 05, 2016 : Alston Angelo D'Silva, Film & Media Studies, University of California, Santa Barbara : *Wooing ISEE-3: Temporality, Materiality and Our Re-engagement with Obsolete Extraterrestrial Machines.*

55. December 31, 2015 : Sujoy Modak (KEK, Japan) : *Black Hole Information Paradox: a Door to New Physics?*

56. December 16, 2015 : Priyanka Singh, Max Planck Institute for Molecular Physiology : *Cell cycle regulator & coordinator: From tumor suppressor protein to centrosome.*

57. December 14, 2015 : Arnob Dutta, Stowers Institute for Medical Research : *Regulating a chromatin remodeler: From modifications to subunit architecture.*

58. December 10, 2015 : Shijulal Nelson, Sathi Institute of Molecular Evolution, Heinrich-Heine University, Düsseldorf, Germany: *Major gene influxes in prokaryote genome evolution - Lateral gene transfer and origin of archaeal higher taxa.*

59. December 04, 2015 : Pinky Kain, University of California, Riverside: *Neural circuitry for detection of insect repellent DEET and attractive sugar in Drosophila.*

60. December 03, 2015 : Parul Mishra, University of Massachusetts Medical School: *Mechanistic insights into the in vivo function of Heat shock protein 90 (Hsp90).*

61. November 23, 2015 : Atanu Kumar Das, Pacific Northwest National Laboratory, USA: *Metal Complexes with Redox-Active Ligands: Electronic Structure Determination and Reactivities towards Small Molecule Activation.*

62. November 23, 2015 : Dhanashree Ashok Paranjpe, Univ. of California Santa Cruz, USA.: *How does environment shape life history and behavior of organisms?*

63. November 20, 2015 : Roman Mikhailov, St. Petersburg State University: *A new look at homotopy groups of spheres.*

64. November 19, 2015 : Arnab Saha: *Active Matter: Macrosopic and Microscopic Perspectives.*

65. November 19, 2015 : K. Satchidanandan, National Fellow, Indian Institute of Advanced Study, Shimla.: *Indian Democracy and Its Contemporary Challenges.*

66. November 19, 2015 : R. Umamaheshwari, Fellow, Indian Institute of Advanced Study, Shimla: *On Violence.*

67. November 17, 2015 : K. P. Singh, TIFR Mumbai: *AstroSat - India's first astronomy satellite.*

68. November 16, 2015 : Aniruddha Mitra: *The taste of smell: Drosophila detects volatile odorants through taste organ.*

69. November 12, 2015 : Chandrama Mukherjee, Ohio State University, USA: *Cytoplasmic capping; a new take on mRNA cycle and proteome complexity.*

70. November 12, 2015 : Joyee Mitra, CSIR-CSMCRI Bhavnagar: *Structural-Functional Analogues of Molybdenum Enzymes.*

71. November 09, 2015 : Anamika Mukhopadhyay, IISER Mohali: *Spectroscopic investigation of natural phenomena: From atmospheric processes to clathrate formation.*

72. November 09, 2015 : Shri Ram Yadav, Indian Institute of Technology, Roorkee: *A near-death experience during phloem cell differentiation and symplastic cell-cell communication during Arabidopsis vascular development.*

73. November 06, 2015 : Vimal Kumar Hatwal, University of South Bohemia in Ceske Budejovice Czech Republic: *Do Pharmaceuticals and Personal Care Products Present a Risk to Aquatic Environment?.*

74. November 06, 2015 : Valeriy G Bardakov, Sobolev Institute of Mathematics, Novosibirsk: *Automorphisms of Free Groups and Braid Groups.*

75. November 05, 2015 : Soumya Bera: *Disorder driven quantum phase transition.*

76. November 05, 2015 : Manas K. Panda, New York University Abu Dhabi, UAE: *Single Crystal in Motion: Towards Artificial Molecular Machinery and Smart Materials.*

77. November 05, 2015 : Geetha K. Nayak, Karnataka Biodiversity Board, Bangalore: *What matters most to the pollinators: Landscape structure or habitat quality?.*

78. November 03, 2015 : Amandeep Bains: *Nonlinear wave structures in superthermal plasma (I) & Observations of solar prominences transition region (II).*

79. October 30, 2015 : Ipsita Mandal: *UV/IR mixing in Non-Fermi Liquids.*

80. October 27, 2015 : Partha Sarathi Mukherjee, IISc Bangalore: *Cage Catalysis and Molecular Marriage in Cage Formation.*

81. October 13, 2015 : Shobi Veleri, National Institute of Health, Bethesda USA: *Retinal homeostasis and diseases: Insights on molecular mechanisms.*

82. October 13, 2015 : Mighfar Imam: *Ab initio investigation of materials properties at interfaces.*

83. October 12, 2015 : Andrei Vesnin, Sobolev Institute of Mathematics, Novosibirsk, Russia: *Hyperbolic tetrahedral manifolds and Mahler measure.*

84. October 12, 2015 : Sudarshan Ananth, IISER Pune: *Spacetime and Quantum Mechanics.*

85. October 09, 2015 : Pranab Sardar, Chennai Mathematical Institute: *Combination theorems for Gromov hyperbolic groups.*

86. October 08, 2015 : Atanu Das, University of Texas at Austin, Texas USA: *Molecular Simulation: A Profound Computational Bridge.*

87. October 05, 2015 : Satyajit Guin, ISI Delhi: *On the Dirac type calculus in Noncommutative Geometry.*

88. September 30, 2015 : Shalin Mehta, Scientist Marine Biological Laboratory, Woods Hole, US: *Imaging molecular order in living systems with fluorescence polarization.*

89. September 30, 2015 : Satyajit Jena, CERN : *Creating the Primordial Quark-Gluon Plasma in the Laboratory.*

90. September 29, 2015 : S. G. Dani: *Continued fraction expansions for complex numbers.*

91. September 29, 2015 : Baljinder Singh, Panjab University: *Continued fraction expansions for complex numbers.*

92. September 28, 2015 : Sounik Saha, Stephenson Cancer Center, University of Oklahoma HSC, USA: *Bare nanomaterials: Prospects in therapy and as artificial enzymes.*

93. September 24, 2015 : Sudarsu Venkata Ramana, Natural Resource Institute (IRENA), University of Leon, Spain: *Bio-catalysed electrochemical systems for wastewater treatment, energy and generating value added bio-products.*

94. September 24, 2015 : Amrita Bhattacharya: *From band gap engineering to thermoelectricity: A first principles study.*

95. September 23, 2015 : Viney P. Aneja, North Carolina State University, Raleigh U.S.A.: *Agricultural Reactive Nitrogen and Sulfer Emissions : Challenges in a Changing Atmosphere.*

96. September 18, 2015 : Eshu Singhal Sinha, National Dairy Research Institute Karnal: *Defining the molecular mechanism of hepatocyte growth factor-mediated immunoregulation of dendritic cells.*

97. September 16, 2015 : Bhaskar Mukhopadhyay: *Provincializing human rights? Rethinking human rights from the perspective of the global south.*

98. September 15, 2015 : Jitendra Pattanaik, IISER Kolkata: *Application of cosmogenic radionuclides 10Be and 26Al in the field of Earth sciences.*

99. September 14, 2015 : Anoop Ambili, IISER Kolkata: *Lake sediments as climate archives in the Indian summer monsoon domain.*

100. September 11, 2015 : Kiran Keshavamurthy, Cultural Studies, Centre for Studies in Social Sciences, Calcutta : *Dandapani Jeyakantan: Loving Outcastes and Reformation.*

101. September 11, 2015 : Nisha Pawar : *Self Assembly in soft matter and nanoscience.*

102. September 10, 2015 : Sushil Chauhan: *Search for Beyond Standard Model Physics with Photon+X Final state at the CMS Experiment.*

103. September 09, 2015 : Somnath Ghosh: *Exploring Novel Quantum Phenomena in Photonic Settings.*

104. September 08, 2015 : Rudranil Basu: *Flat Space Holography.*

105. September 08, 2015 : Felix Padel, North East India Studies Programme, Jawaharlal Nehru University, New Delhi: *The Economics of War & Peace.*

106. September 07, 2015 : Devleena Tiwari, CSIR-National Geophysical Research Institute, Hyderabad: *Organic Geochemistry of the Near-surface and Buried Sediments in a Petroleum System.*

107. September 04, 2015 : Vijaya Srinivasan, Institute of Microbial Technology , Chandigarh: *Protein Kinases, A central hub for several cellular responses including Antimicrobial Resistance: An Emerging Paradigm in Klebsiella Signalling.*

108. September 03, 2015 : Thirupathaiah Setti: *Electronic structure studies of iron pnictides using angle-resolved photoelectron spectroscopy (ARPES).*

109. August 31, 2015 : Amit Rai: *Quantum Physics with integrated Waveguide Arrays.*

110. August 28, 2015 : B. Sury, ISI Bangalore: *Primes, Polynomials and Progressions.*

111. August 27, 2015 : Vijaykant Khorwal, Postdoctoral fellow, IIT Indore: *Excited State Proton Transfer in Pyridyl benzimidazoles in Restricted Microenvironment.*

112. August 25, 2015 : Vibhor Singh: *Optomechanics with superconducting quantum circuits.*

113. August 22, 2015 : Parimal K. Bharadwaj, Poonam and Prabhu Goel Chair and J. C. Bose National Fellow, Head Department of Chemistry, IIT Kanpur: *Design and Synthesis of Metal Organic Frameworks for Applications.*

114. August 21, 2015 : Pratibhamoy Das, TU Berlin: *Uniform Error Estimates for Singularly Perturbed Differential Equations: A priori and A posteriori Approach.*

115. August 20, 2015 : Dinesh Kumar Chinthapalli, National Centre for Mass Spectrometry, IICT Hyderabad: *What does a Mass Spectrum speak about in Chemical and Biological Sciences.*

116. August 19, 2015 : P Rama Kant, Complex Systems Group, Department of Chemistry, University of Delhi: *Does Nanoscopic Electrode Disorder Matter in Electrochemical Processes?*

117. August 19, 2015 : Parbati Biswas, Dept. of Chemistry, University of Delhi: *A Generalized Approach to Understand Intrinsically Disordered Proteins.*

118. August 18, 2015 : V. Srinivas, TIFR Mumbai: *Algebraic versus topological entropy for surfaces over finite fields.*

119. August 14, 2015 : B. Sury, ISI Bangalore: *Fifteen, two hundred and ninety and Bhargava.*

120. August 13, 2015 : Samir Kumar Biswas.: *Developing opto-acoustic based diagnostic devices: theory, design, optimization and patient measurement.*

121. August 13, 2015 : Ayanjeet Ghosh, Post Doc., Department of Chemistry University of Wisconsin Madison, USA: *Vibrational dynamics in proteins using two-dimensional infrared spectroscopy.*

122. August 06, 2015 : Malay Kumar Rana, Department of Chemical Engineering, IIT Kanpur: *Solvation behavior of nanoscopic hydrophobic solutes in polar liquids & Carbon capture.*

123. August 06, 2015 : M. C. Kumar, IMSc: *Threshold and RG improved Higgs boson production to* $\mathrm{N^3LO}$ *in QCD.*

124. July 31, 2015 : Shreedevi Masuti, Institute of Mathematical Sciences, Chennai.: *Zariski's theorem on complete ideals.*

125. July 30 2015 : Santosh Kumar, University of Edinburgh UK.: *Unravelling the Biophysical and Regulatory facets of RNA-protein interactions.*

126. July 27, 2015 : Kaliyamoorthy Alagiri, Laboratory of Synthetic Organic Chemistry, Institute of Microbial Chemistry, Japan.: *Chemistry of Enolates and Stereoselective aldol reactions.*

127. July 20, 2015 : Smritimoy Pramanik, Frontier Institute for Biomolecular Engineering Research , Konan University Japan.: *Thermodynamics of nucleic acid structure formation under homogeneous and heterogeneous cell mimicking conditions.*

128. July 17, 2015 : Ritwik Mukherjee, TIFR Mumbai.: *Enumerative geometry of singular curves in a general linear system.*

129. July 17, 2015 : Umesh Varshney, Microbiology and Cell Biology Department, IISc Bangalore.: *Is initiation of protein synthesis in Escherichia coli an exclusive property of the initiator tRNA?.*

130. July 06, 2015 : K. Muthamizh selvan, Pondicherry University: *Ecology of sympatric large carnivores and human carnivore conflicts in north eastern India.*

131. July 03, 2015 : Krishna Kishore Inampudi, IECB, France & Yale University USA : Two lectures on *Computational protein design (CPD) for enzyme design and protein engineering using directed evolution* and *Charging non-canonical amino acids or short peptides on tRNA using Flexizymes to study the stalling peptides in ribosomal complexes by X-ray crystallography*

132. July 01, 2015 : Arundhati Ray, Amity Institute of Neuropsychology and Neurosciences, Noida: *Neural-immune interactions in brain development and disease*

133. June 17, 2015 : Laure Bourgeois, Monash Centre for Electron Microscopy, Victoria 3800 Australia: *Probing surfaces and interfaces at the sub-nanoscale in nanostructured materials*

134. June 12, 2015 : Monika Raj, Seton Hall University, NJ, USA: *Aldehyde Capture Ligation for Synthesis of Native Amide Bond*

135. June 04, 2015 : Angela K. Baker, Max Planck Institute for Chemistry, Mainz, Germany: *Atmospheric Observations of NMHCs and other Trace Gases using Passenger Aircraft: Results from the IAGOS-CARIBIC Observatory*

136. May 27, 2015 : Kuppusamy Mohan, School of Mechanical and Building Sciences VIT Chennai: *Response of benthic foraminifera to methane fluxes from marine gas hydrates at Blake Ridge during the late Neogene*

137. May 26, 2015 : Mr S. P. Sethi, Former Principal Advisor (Energy) Planning Commission, Government of India: *India's Energy Needs*

138. May 25, 2015 : Sanjeev Sharma, Sagar University: *Development and conflicts of natural resources in the western Himalaya: Strategy and solution by adopting participatory management approach*

139. May 22, 2015 : Chetan Balwe, TIFR Mumbai: A^1*-connectedness of schemes*

140. May 21, 2015 : Siddhartha Lal, IISER Kolkata: *Hall phases and a Lifshitz transition in a 2D Electron Gas with competing orders*

141. May 18, 2015 : Rajesh K Kushawaha: *From double-slit interference to structural information in simple hydrocarbons*

142. May 12, 2015 : Arkoprovo Biswas, IISER Bhopal: *Ambiguity in interpretation of Self-Potential anomaly and integrated study around South Purulia Shear Zone, India.*

143. May 06, 2015 : Tulasi Nandan Parashar, University of Delaware: *Kinetic Physics of Collisionless Turbulent Plasmas.*

144. May 01, 2015 : Om Prakash: *Manufacturing inventory models with trade credit finance under different realistic environments.*

145. September 16, 2015 : Bhaskar Mukhopadhyay, Centre for Cultural Studies, University of London : *Provincializing Human Rights? Rethinking Human Rights from the Perspective of the Global South.*

146. April 23, 2015 : Radhika Krishnan, Linnaeus University, Sweden : *Exploring the Industry-Ecology-Community Interface: Workers, Adivasis and Peasants in the Development Project.*

147. April 22, 2015 : Ashis Das, Department of Biological Sciences, BITS,Pilani.: *Translation Research in Malaria: Molecular aspects of complicated human malaria and new approaches to diagnosis.*

148. April 21, 2015 : Abhay G. Bhatt, Indian Statistical Institute, Delhi Centre.: *Pattern Races.*

149. April 20, 2015 : Snehangshu PATRA, University of Evry, LAMBE, France.: *Electrochemistry of Materials: (bio) electrochemical systems for energy and sensors.*

150. April 20, 2015 : Shashank Tiwari, IIT Labs, USA : *Introducing Science Technology and Society Program at IISER Mohali.*

151. April 17, 2015 : Tilok Thakuria, Department of History & Archaeology, NEHU : *Recent archaeological research in northeast India: Jars of NC Hills.*

152. April 16, 2015 : Karthick Kumar, University of California at Irvine, USA.: *Spectral Diffusion and Chemical Exchange dynamics using 2D-IR spectroscopy.*

153. April 15, 2015 : Raghavan Varadarajan, IISc Bangalore.: *Insights into protein structure, function and folding from saturation mutagenesis.*

154. April 13, 2015 : Amit Kumar Bhattacharjee: *Particle and Field based methods for complex fluids and soft materials.*

155. April 13, 2015 : Siddharth Rai, Humanities, IIT Gandhinagar : *The Study of the Past: Application of Modern Technologies in Archaeological Research.*

156. April 10, 2015 : Silvio Dolfi, Dipartimento di Matematica e Informatica, Ulisse Dini: *Character degrees and conjugacy class sizes of finite groups.*

157. April 10, 2015 : Mihir Mandal, Virginia Polytechnic Institute and State Univ Blacksburg, VA, 24061: *Plant-Environment Sensing Through Small Molecules & Metabolites*

158. April 09, 2015 : Suresh Das, National Institute for Interdisciplinary Science and Technology , Trivandrum India: *Self-Assembled Photoresponsive Materials.*

159. April 08, 2015 : Philip Maini, Wolfson Centre for Mathematical Biology, Mathematical Institute, Oxford University: *Multi-scale modelling of vascular cancer growth.*

160. April 08, 2015 : Brajesh Mani: *Properties simulation and results of perovskite materials at finite temperatures.*

161. April 06, 2015: Shilpi Rajpal, Department of History, University of Delhi : *A Social History of Madness in North India, 1780s-1950s.*

162. April 1, 2015 : Gayatri Panda, Centre for Womens' Development Studies, Delhi : *Caste, Class, and Gender Dynamics in Schooling: A Study of a Multi-Caste Village in Odisha.*

17 Postdoctoral fellows at the Institute

1. **Abhay Soman**
2. **Ajay Deep Kachhvah**
3. **Anamika Mukhopadhyay**
4. **Anil Tiwari**
5. **Arpana Kumari**
6. **Arun Sehrawat**
7. **Debadutta Deb**
8. **Dilip Kumar Paluru**
9. **G. P. Manjunath**
10. **Geeta D. Sharungbam**
11. **Golam Mohiuddin**
12. **Gowri Jayamurugan**
13. **Jagdeep Grover**
14. **Javed Masood Khan**
15. **Jesse Sebastian Samuel**
16. **Jitendra Gupta**
17. **Malay Patra**
18. **Mamta Gulati**
19. **Manabendra Sharma**
20. **Mehra Singh Sidhu**
21. **Mily Bhattacharya**
22. **Minaxi Sharma**
23. **Mohd. Shafique**
24. **Monika Mahajan**
25. **Nagarjuna Kumar S**
26. **Navjot Kaur**
27. **Navprit Kaur**
28. **Neetika**
29. **Nidhi Kumari**
30. **P. Esakki Karthik**
31. **Poonam Sharma**
32. **Prakram Singh Chauhan**
33. **Prasanta Bhowmik**
34. **Pratima Pandey**
35. **Praveen Kumar**
36. **Pritam Ghosh**
37. **Rajbir Kaur**
38. **Ram Lal Awasthi**
39. **Ranjai Kumar**
40. **Ranjana Jaiswara**
41. **Rishu Dhiman**
42. **Rochishnu Dutta**
43. **Saleem Shaik**
44. **Saonli Roy**
45. **Shilpa Sanwlani**
46. **Shilpi Rajpal**
47. **Shri Krishna**
48. **Sirshendu Gayen**
49. **Smriti Mahajan**
50. **Sourav Singha Roy**
51. **Sugnadha Maheshwary**
52. **Suman Ahmed**
53. **Yogyata Pathania**

18 Graduates of 2015

18.1 BS-MS Graduates

S.No.	Name	Reg. No.	Major
1	Prabhanjan Ramesh Borwankar	MS08041	Physics
2	Aditya Verma	MS09009	Chemistry
3	Deep Raj Meena	MS09044	Chemistry
4	Yatendra Singh Arya	MS09139	Biology
5	D Jeiyendira Pradeep	MS10001	Chemistry
6	Pranay Deep Rungta	MS10004	Physics
7	Prashant	MS10005	Chemistry
8	Pratip Chakraborty	MS10006	Chemistry
9	Upakul Sarma	MS10008	Chemistry
10	Prachi Madhukar Dabhade	MS10009	Biology
11	Sharmi Sen	MS10012	Biology
12	Shachikanta Nongthombam	MS10013	Biology
13	Ananya Rastogi	MS10015	Biology
14	Debanjana Kundu	MS10017	Mathematics
15	Nidhi Kaihnsa	MS10020	Mathematics
16	Ane Nishitha V	MS10023	Biology
17	Preetha Saha	MS10024	Physics
18	Prerna Paliwal	MS10025	Chemistry
19	Aneeshma Peter	MS10026	Chemistry
20	Irfana Saleem	MS10028	Biology
21	Cigole Thomas	MS10029	Mathematics
22	Jagadish Prasad Hazra	MS10031	Chemistry
23	Jagdale Gargi Satishraj	MS10032	Chemistry
24	Akhil.V.Gopal	MS10036	Chemistry
25	Abhishek Gaurav	MS10037	Physics
26	Rahul Chajwa	MS10038	Physics
27	Kshitij Mohan	MS10039	Biology
28	Asha Raju	MS10040	Biology
29	Ashish Kumar	MS10043	Chemistry
30	Shiji.L.V	MS10045	Biology
31	Shivaprasad Gangadhar Patil	MS10047	Biology
32	Priyanka Jeeth D.P	MS10049	Biology
33	Krishna K. Das	MS10051	Biology
34	Rajat Garg	MS10053	Chemistry
35	Tejinder Singh Chechi	MS10054	Biology
36	Ankur Kumar Gupta	MS10056	Chemistry
37	Ankit Kumar Agrawal	MS10057	Chemistry
38	Sukriti	MS10059	Biology

S.No.	Name	Reg. No.	Major
39	Sukanya.V.S	MS10060	Biology
40	Lilit Jacob	MS10061	Chemistry
41	Pallavi	MS10062	Mathematics
42	Sumit Chandra Mishra	MS10065	Mathematics
43	Tanya Kaushal Srivastava	MS10066	Mathematics
44	Gunidhar Yengkhom	MS10067	Biology
45	Soniya Rani	MS10068	Chemistry
46	Monika	MS10069	Mathematics
47	Anoop Kumar	MS10071	Biology
48	Vipin T. Raj	MS10073	Chemistry
49	Rupali Chawla	MS10074	Chemistry
50	Harshita Pawar	MS10075	Chemistry
51	Parvathy Ramesh	MS10077	Biology
52	Karande Kranti Yuvaraj	MS10078	Biology
53	Nishant Agrawal	MS10079	Mathematics
54	Haseeb Hakkim	MS10081	Chemistry
55	Pushkal Shrivastava	MS10084	Physics
56	Deshmukh Neeraj Ravindra	MS10085	Mathematics
57	Reshma Murali	MS10086	Biology
58	Nitesh Bhardwaj	MS10087	Mathematics
59	Nitish Kumar	MS10088	Chemistry
60	Nitin Kumar Singh	MS10089	Chemistry
61	Anu Yadav	MS10092	Biology
62	Lourembam Thoithoi	MS10094	Biology
63	Anubhuti Singh	MS10097	Chemistry
64	Raut Akshay Hemant	MS10098	Chemistry
65	Divya Sharma	MS10099	Mathematics
66	Vivek B Raina	MS10100	Biology
67	Aaveg Aggarwal	MS10101	Physics
68	Ravi Ranjan	MS10102	Chemistry
69	Shweta Kumari	MS10104	Physics
70	Chougale Sayali Rangarao	MS10105	Biology
71	Piyush Mishra	MS10106	Chemistry
72	Arya. J.S	MS10107	Chemistry
73	Manpreet Kaler	MS10108	Chemistry
74	Mahima	MS10109	Biology
75	Bharti Kumari	MS10110	Chemistry
76	Nirdosh Dadwal	MS10111	Biology

18.2 MS Graduates

S.No.	Name	Reg. No.	Supervisor	Title of the thesis
1	**S. Srikanth**	MP12014	Dipanjan Chakraborty	*Dynamics of Interacting Colloids*
2	**Leena**	MP12015	Amit Kulshrestha	*Classification of Quadratic Forms*

18.3 PhD Graduates

S.No.	Name	Reg. No.	Supervisor	Title of the thesis
1	**George Thomas**	PH08004	Ramandeep S. Johal	*Quantum thermodynamic machines : The role of interaction and information*
2	**Ajay Kumar**	PH08009	Chanchal Kumar	*A study of homological properties of certain classes of monomial ideals*
3	**Shelly Garg**	PH08018	Dinesh Khurana	*Perspectivity of modules and some additive decompositions of elements in rings*
4	**Karan Paul**	PH09022	Kausik Chattopadhyay	*Structure-function studies on Vibrio cholerae cytolysin: a β-barrel pore- forming toxin*
5	**Vivek Kohar**	PH10074	Sudeshna Sinha	*Emergent patterns in nonlinear systems and their applications*
6	**Dilpreet Kaur**	PH10043	Amit Kulshrestha	*A study of real special 2-groups using quadratic maps over fields of characteristic 2*
7	**Gurpreet Kaur**	PH09032	Angshuman R. Choudhury	*Supramolecular Synthons Comprising of C-H$\cdots$F Hydrogen Bonds : Insights Through Structural, Computational and Charge Density Studies*
8	**Shiv Parsad**	PH10060	Krishnendu Gongopadhyay	*Classification of the isometries of the complex and quaternionic hyperbolic spaces*

19 Account Statement

19.1 Plan Grant

The Institute received a sum of ₹ 109.00 crore as Grant-in-Aid from the Ministry of Human Resource Development in the Year 2015-16. There is no opening balance for the year 2015-16. Thus out of the total amount of ₹ 109.00 crore available under plan grant, the following expenditure has been made under different budget heads in 2015-16.

S.No.	Budget Head	(₹, in crore)
I.	Salary Component	19.42
II.	Non-Salary Component	25.72
III.	Purchase of Equipments	19.99
IV.	Purchase of Furniture	3.58
V.	Construction of Building (*including deposit money*)	16.61
VI.	Library Books	0.55
VII.	Computer Accessories & Peripherals	1.45
	Total	₹ 87.31 crores

That leaves a closing balance of ₹ 21.69 crore.

19.2 Research & Development Grant

In addition to the Plan Grant, the Institute also received a sum of ₹ 15.98 crore (in 2015-16) under Research & Development Account (with an opening balance of ₹ 3.55 crore carried over from the year 2014-15). The details of this account are as follows:

S.No.	Details	(₹, in crore)
I.	Opening Balance as on 01.04.2015	3.55
II.	Grant received in 2015-16	15.98
	Total	₹ 19.53 crores

19.3 Expenditure

S.No.	Details	(₹, in crore)
I.	Pay and Allowances	0.87
II.	TA	0.37
III.	Scholarship	7.89
IV.	Purchase of Equipment	1.79
V.	Contingency	0.42
VI.	Consumables	2.39

VII.	Overheads	0.50
VIII.	Other Expenditure	1.17
	Total	₹ 15.40 crores

This leaves a closing balance of ₹ 4.16 crore

19.4 Endowment Fund

The balance available under this account is ₹ 18.63 crores as on 31.03.2016.

19.5 Student Welfare Account

The balance available under this account is ₹ 0.75 crore as on 31.03.2016.

Some graduates of 2015

A night view of hostels

Professor C. N. R. Rao with students

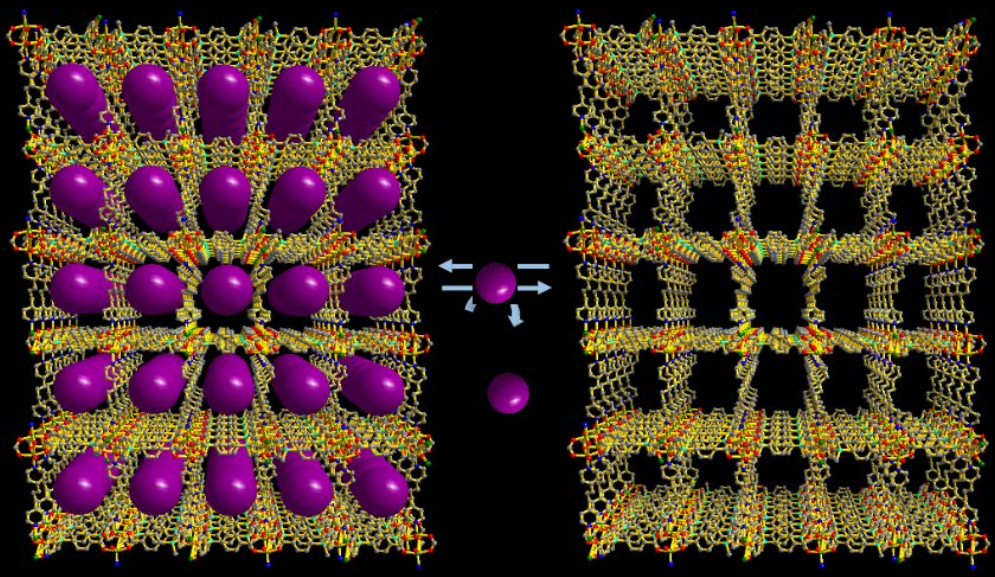
Professor C. N. R. Rao in a conversation

The convocation hall

Professor Venki Ramakrishnan being felicitated

Credits : Opening photos of departmental research activities

	Optical bench : **Mandip Singh**
Biological Sciences	Larval hematopoietic organ in Drosophila : **Lolitika Mandal / S. K. Sharma**
Chemical Sciences	A highly stable hydrogen bonded Metal Organic Framework : **Sanjay Mandal**
Earth & Environmental Sciences	Blue eye in IISER Mohali sky : **Purnananda Guptasarma**
Humanities & Social Sciences	A painting of Alan Turing : **Mayank Mishra**
Mathematical Sciences	Schlafly Double-six : **Kapil H. Paranjape**
Physical Sciences	Molecular dynamics simulation snapshot : **Dipanjan Chakraborty**



An example of reversible host-guest chemistry in porous Metal Organic Frameworks
from the research work of Sanjay Mandal

Indian Institute of Science Education and Research Mohali
Knowledge City, Sector-81, SAS Nagar, PO Manauli (Punjab) - 140 306