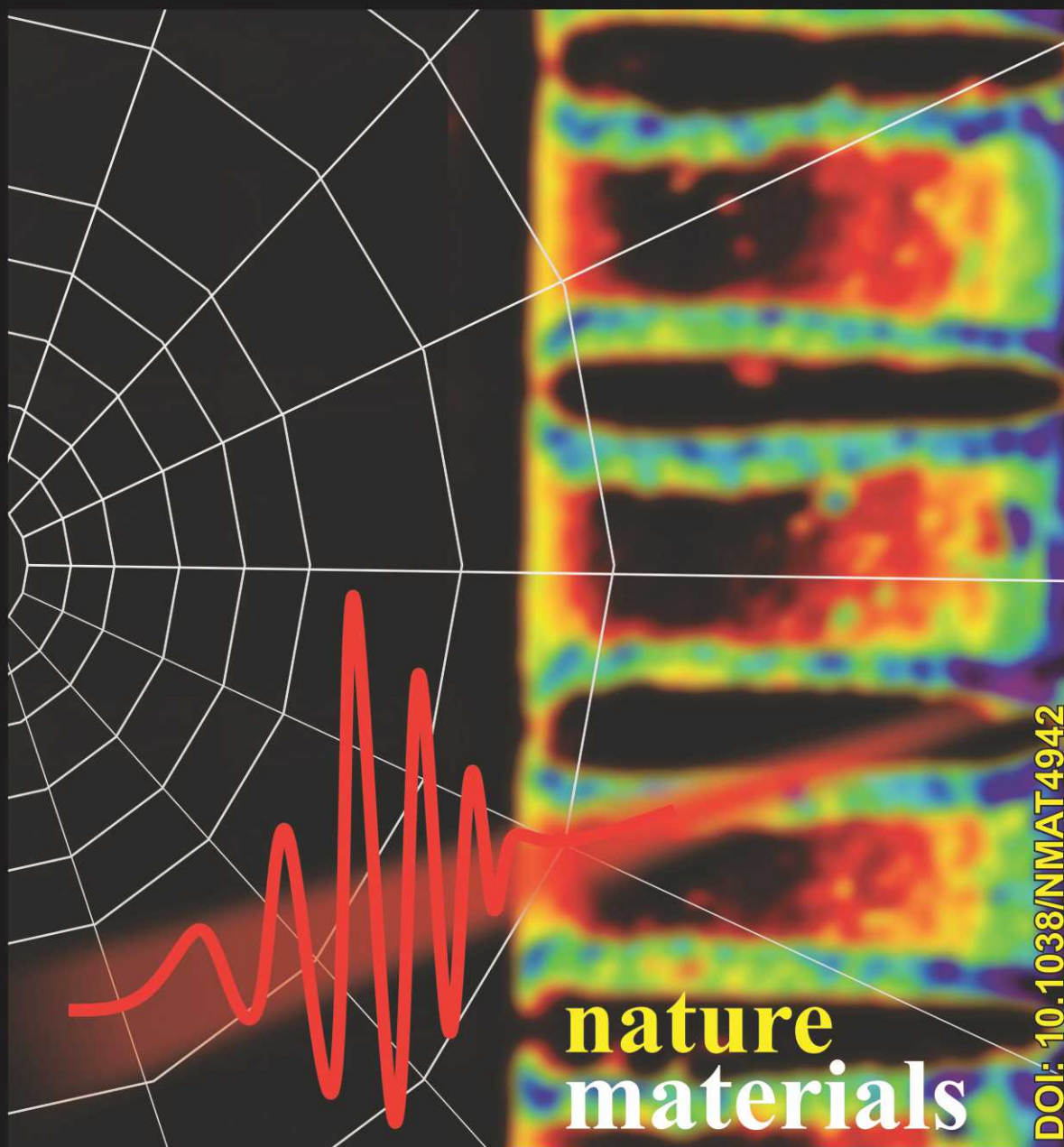


Annual Report

2017-18



Indian Institute of Science Education and Research Mohali
in pursuit of Knowledge



Academic Area



Administration

Annual Report

2017-18



Indian Institute of Science Education and Research Mohali



Library

Complied by: Professor Purnananda Guptasarma

Published by: Director, Indian Institute of Science Education and Research Mohali

©2018 INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH MOHALI

Contents

Preface	1
1 Board of Governors	4
2 Academic Senate	5
3 Research Advisory Committee	6
4 Administration	7
5 Faculty	9
5.1 Faculty Members	9
5.2 Honorary Faculty	14
5.3 Visiting Faculty	15
5.4 Adjunct Faculty	15
5.5 INSPIRE Faculty Fellows	15
6 Events: 2017-18	16
6.1 Meetings of Institute Bodies	16
6.2 Convocation 2017	16
6.3 Foundation Day 2017	17
6.4 Independence Day 2017	18
6.5 Republic Day 2018	20
6.6 Outreach Activities	23
6.7 Teachers' Day	23
6.8 Students Activities	23
7 Scientific Meetings/Conferences/Workshops	25
7.1 2nd Indian C. elegans Meeting. Organizers:	25
7.2 International Conference on Intrinsically Disordered Proteins: Forms, Functions and Diseases	25
7.3 PHENO1@IISERM: First Workshop on Beyond Standard Model Physics	26
7.4 Royal Society of Chemistry Roadshow @IISERM:	26
7.5 Indo-Russian 70th Anniversary celebration workshop: "Groups and Related Structures", ...	26
7.6 Convened Science Academy's Lecture Workshop on Topics in Algebra and Number Theory	26
7.7 Symposium on GW-GRB 170817	27
7.8 Measuring and modelling biogenic volatile organic compounds (BVOCs)	27
7.9.1 Knots, Braid Groups and 3-Manifolds	27
7.9.2 Groups and Related Structures	28
7.9.3 TEW on Group Theory	28
7.9.4 7th East Asian Conference on Algebraic Topology (EACAT)	28
7.10 Workshop on Mass Spectrometry Based Proteomics	28
7.11 26th meeting of the International Bioacoustics Congress, IBAC 2017	28
7.12 Global Initiative for Academic Networks (GIAN) Course: Conservation and Evolution	29
in Developmental Gene Regulatory Networks (DGRN)	
7.13 24th National Conference on Liquid Crystals (NCLC-2017)	29
7.14 24th meeting of the National Magnetic Resonance Society of India (NMRS-2018)	29
8 Research Activities	31
8.1 Department of Biological Sciences	32
8.1.1 Summary of the research work	32
8.1.2 Visits of faculty members	40

8.1.3	Talks delivered	41
8.1.4	Conferences attended by researchers	45
8.1.5	Publications : Biological Sciences	48
8.2	Department of Chemical Sciences	51
8.2.1	Summary of the research work	51
8.2.2	Visits of faculty members	59
8.2.3	Talks delivered	59
8.2.4	Conferences attended by researchers	61
8.2.5	Publications : Chemical Sciences	64
8.3	Department of Earth & Environmental Sciences	72
8.3.1	Summary of the research work	72
8.3.2	Visits of faculty members	73
8.3.3	Talks delivered	74
8.3.4	Conferences attended by researchers	75
8.3.5	Publications : Earth and Environmental Sciences	76
8.4	Department of Humanities & Social Sciences	78
8.4.1	Summary of the research work	78
8.4.2	Visits of faculty members	80
8.4.3	Talks delivered	80
8.4.4	Conferences attended by researchers	82
8.4.5	Publications : Humanities & Social Sciences	82
8.5	Department of Mathematical Sciences	84
8.5.1	Summary of the research work	84
8.5.2	Visits of faculty members	88
8.5.3	Talks delivered	89
8.5.4	Conferences attended by researchers	91
8.5.5	Publications : Mathematical Sciences	92
8.6	Department of Physical Sciences	93
8.6.1	Summary of the research work	93
8.6.2	Visits of faculty members	100
8.6.3	Talks delivered	101
8.6.4	Conferences attended by researchers	104
8.6.5	Publications : Physical Sciences	106
9	Patents	110
10	Awards and Honours	110
10.1	Awards won by the faculty	110
10.2	Awards won by the students	111
11	Major Facilities Procured	115
12	Current projects and fellowships	116
13	Institute Library	127
14	Computer Centre	130
15	National Institutional Ranking Framework (NIRF) rank	131

16	Lectures by Visitors	133
16.1	Public Lectures	133
16.2	Institute Colloquia	133
16.3	Institute Seminars	134
17	Postdoctoral fellows at the Institute	140
18	Graduates of 2017	141
18.1	BS-MS Graduates	141
18.2	MS Graduates	144
18.3	PhD Graduates	145
19	Account Statement	147
19.1	Plan Grant	147
19.2	Research & Development Grant	147
19.3	Endowment Fund	148
19.4	Student Welfare Account	148

Preface

A decade ago a seed called IISER Mohali was sown in this fertile land of Punjab. My predecessor Professor N. Sathyamurthy had prime responsibility of nurturing it. The seed germinated, became a sapling, turned into a small tree, and even started bearing fruits. I was watching it happen from a close distance. Little did I know that I would be assigned the responsibility of further writing the story of this seed. It was indeed an honour to join this Institute as its Director on September 18, 2017. I am privileged to present to you the Annual Report for 2017-18.



IISER Mohali continues to grow, in terms of numbers and research impact. Every year the number of students graduating from this Institute is increasing, slowly and steadily. Our sixth convocation was held on May 27, 2017 where 102 students were awarded BS-MS degree, 6 students were awarded MS degree and 22 of our research scholars were conferred the degree of PhD. Dr. Anil Kakodkar, Former Chairman, Atomic Energy Commission, Government of India delivered the Convocation address

In September 27, 2017 we had the opportunity to host another distinguished guest, Dr. Madhavan Nair Rajeevan, Secretary, Ministry of Earth Science, Government of India, who delivered our foundation day lecture.

Our faculty members and students have been working together to attain new heights in scientific research. I am happy that we are receiving due recognition from the scientific community. Professor Kulinder Pal Singh has been elected as a fellow of the Indian National Science Academy, Dr. Goutam Sheet has received the prestigious NASI Scopus award, Dr. Mahak Sharma has received the INSA young scientist award, Dr. Ramasastry received the bronze medal of the Chemical Research Society of India for 2018. He has also been inducted into the Editorial Advisory Board of the journal Organic and Biomolecular Chemistry. Dr. Debashis Adhikari has received an Early Career Award from DST. I am happy that the website of the International Liquid Crystal Society featured an artwork based on the research from Dr. Santanu Pal's lab. Further, research papers from several research groups appeared on the covers of journal issues.

As in the previous years, most faculty members published research papers in some of the best journals in their fields. In particular, Dr. K.P. Singh's group from Physics published an article in Nature Materials, and Dr. Shravan Mishra's group from Biology published an article in the EMBO Journal, both being journals with high impact factors in double digits.

Our colleagues have also been receiving prestigious and very competitive grants. The Department of Biological Sciences has been awarded a DST-FIST grant of Rs. 4.2 crores for purchasing a super-resolution microscope, and a metabolic analyser. Dr. Lolitika Mandal from the department has received the DBT-Wellcome Senior Research Fellowship award. The Department of Earth and Environmental Sciences has been awarded an Indo-Israel UGC grant of Rs 1.4 crores to study the role of Criegee intermediates in the atmospheric oxidants.

While the primary focus of our work has been fundamental research, our efforts have also had direct contribution on society at large. Our Department of Earth and Environmental Sciences participated in the Delhi winter fog campaign and evaluated the efficiency of the odd-even scheme in Delhi to curb pollution. Dr. Monika Sharma received media attention for her work on mRNA binding proteins and their relevance as drug targets. Dr. Samrat Ghosh was in the news for his work on smokeless firecrackers.

Our students and postdocs have been constantly making us proud. Preetika Sharma, a PhD scholar in the Department of Humanities and Social Sciences received a Fulbright Doctoral Fellowship. A team of our undergraduate and graduate students consisting of Jai Ashwin, Prateek Chawla, Manisha Wadhwa, Nitish Tayal, and Bhupinder Singh won Rs. 10 lakh grant from the DBT to participate in the international iGEM genetic engineering competition in Boston. In addition, he won a bronze medal for their project titled "gEco- A paper based biosynthetic system for detection and capture of noxious gases and harmful phenolic compounds". A group of BS-MS students, Nevil Shah, Shaswat Kumar, Ruchira Mishra, R. Bharathkumar, Anshuman Acharya, and Samyak Prasad participated in a contest called 'Touch the Jovian Moon' held by the Liquid Propulsions Systems Centre, ISRO, and were shortlisted for the final round. They were required to propose a space mission to one of the satellites of Jupiter along with a science payload. Their science payload proposal and the power solutions were much appreciated by the judges. Our student Ankit won a travel award from the 'Volkswagen Foundation' to attend a Summer School in Konstanz (Germany) and secured the best presentation award for his presentation titled "A coupled approach to decipher state and source of organic matter using stable isotopes".

While the world outside recognized the innovation and imagination of our students, we continued to celebrate their academic achievements. On August 15, 2017 as many as 11 of our BS-MS students from 2016 batch were awarded CNR Rao foundation prize; each one scored a perfect 10. This is a record in the short history of IISER Mohali.

Dr. Samrat Mukhopadhyay also organized one of the largest international conferences on intrinsically disordered protein in December, attracting over twenty speakers from 6 continents. Under the flagship of Global Initiative for Academic Networks (GIAN), a course on Conservation and Evolution in Developmental Gene Regulatory Networks : A Systemic View was organized by colleagues from Biological sciences during November 2017. Professor Volker Hartenstein, from University of California was the Foreign Expert Faculty. As the country marked 70 years of our bilateral relations with erstwhile USSR in 2017, Indo-Russian 70th Anniversary Workshop titled Groups and Related Structures was organized by our Mathematics colleagues in December 2017. The Department also organized 7th East Asian Conference on Algebraic Topology. This year, we also got the opportunity to host National Conference on Liquid Crystals, and the conference of the National Magnetic Resonance Society in October 2017 and February 2018, respectively.

The institute continues to nurture and exchange scientific ideas through such activities, and thus lives up to its motto, In Pursuit of Knowledge.

We are glad to be included in the top 100 institutes in overall category in NIRF ranking 2017. We were placed at 52nd position in the entire nation. For an institute which is just about 10 years old, this is no less an achievement. We have better hopes for future. In Nature Index for science, all IISERs together have been ranked 3 in terms of quality research output, a reason to be proud of.

IISER Mohali's annual cultural fest "Insomnia" was held in March 2018. The fest saw a footfall of over 2000 participants and events across a variety of art, theatre, music, dance and academic activities. Our students from the Debating Society took part in the Parliamentary Debate Competition held at National Law School, Bangalore. In quizzing, our students also won and qualified for the finals of multiple prestigious events, including Tata Crucible.

In December 2017, IISER Mohali also hosted the Inter IISER Sports Meet for the second time. We hosted over 1100 athletes from sister institutes, IISERs, NISER and IISc Bangalore, for a 5 day sports extravaganza.

It fills our hearts with joy when we hear that those who were initiated into science in our own campus are themselves capable of handholding others. Our alumnus S. Shwetha, who is now pursuing PhD at Massachusetts Institute of Technology won the award for outstanding teaching in Chemistry. Likewise, Srijit Mukherjee got Graduate Teaching Excellence award at the University of Colorado, Boulder and Anuj Pennathur got the outstanding teaching award at University of Southern California. We are proud of our alumni. Now, alumni association has been created and their first meet took place at IISER Mohali in December 2017. There is a long way to go and we look forward to an everlasting bonding with our alumni.

I feel highly honoured and privileged to be associated with this great temple of learning which is lying on a strong platform set by my predecessor Hon'ble Professor N. Sathyamurthy (2007-2017). I see it as our duty to build on his legacy and develop IISER Mohali further and take it to greater heights. All of us at the institute have a role to play in this endeavor: faculty members are expected to excel in research and teaching while mentoring young minds, and the administrative staff are expected to ensure smooth functioning of the institute so that the faculty and students may focus on their scientific work at all times, support staff ensures smooth operations in laboratories, while students and post-doctoral fellows are expected to focus on learning and research. A large number of people work hard to make sure that the campus is clean and green. I recognize contribution of each and everyone who makes the IISER Mohali tick, and look forward to further improvements in coming years. Since I joined on 18 September 2017, I feel privileged being a part of the institute. I look forward to help and support from everyone in making IISER Mohali an even greater institute.

Professor Debi Prasad Sarkar
Director, IISER Mohali

1 Board of Governors

Dr. Madhuchanda Kar (Chairperson)
Clinical Director of Oncology,
Peerless Hospital, Kolkata 700 094.

Shri R. Subrahmanyam, IAS (Member)
Secretary (HE), Ministry of Human Resource
Development, Department of Higher
Education 127-C, Shastri Bhawan, New Delhi-
110001
011-23383202, 23386451/23382698(O),
(Fax),23385807
Email: secy.dhe@nic.in

Shri Karan Avtar Singh, I.A.S. (Member)
Chief Secretary, Govt. of Punjab
Room no. 28, 6th Floor, Punjab Civil,
Secretariat, Chandigarh-160001
Email: cs@punjabmail.gov.in
Ph.: 2740156, 2740860, 2742488

The Secretary (Member)
Ministry of Micro, Small & Medium
Enterprises, Room No. 169, Udyog Bhawan,
Rafi Marg, New Delhi-110011
Phone: 011-23061431
Email: secretary-msme@nic.in

The Secretary, (Member)
Department of Bio-Technology, CGO Complex,
Lodhi Road, New Delhi
Phone:011-24362950,24362881, 24360747
Email : vijay.dbt@nic.in

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

Professor Sarit Kumar Das (Member)
Director, IIT Ropar Nangal Road, Rupnagar
Punjab 140 001.

Ms. Darshana M. Dabral, IAS (Member)
Financial Advisor, Dept. of Higher Education,
Ministry of Human Resource and Development,
Shastri Bhavan New Delhi 110 001.

Prof. R. S. Dubey (Member)
Department of Biochemistry
Faculty of Science, Banaras Hindu University,
Varanasi - 221005.
Phone (O): 0542-6701607, 6702589, (R):
0542-2317190, (M): 09415992028.
E-mail: rsdbhu@rediffmail.com

Dr. Anushree Gupta,
Associate Professor, (Member)
Department of Biotechnology,
All India Institute of Medical Sciences,
Ansari Nagar, New Delhi-110029
anushree.gupta@gmail.com

Professor N. Sathyamurthy (Member)
Director, (Till 15-09-2017) IISER Mohali,
Knowledge City Sector-81,
S.A.S. Nagar, Mohali
P.O. Manauli 140 306.

Professor Debi Prasad Sarkar (Member)
Director, (From 18-09-2017) IISER Mohali,
Knowledge City, Sector-81, S.A.S. Nagar,
Mohali, P.O. Manauli 140 306.

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

Professor P. Guptasarma (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, (Till 15-09-2017) IISER Mohali
Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P. O. Manauli 140 306.

Professor Debi Prasad Sarkar (Chairman)
Director, (From 18-09-2017) 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)
IISER Mohali, Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P. O. Manauli 140 306.

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

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

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

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

Dr. Ramandeep Singh Johal (Member)
IISER Mohali, Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P. O. Manauli 140 306.

Dr. N. G. Prasad (Member)
IISER Mohali, Knowledge City
Sector-81, S.A.S. Nagar, Mohali
P. O. Manauli 140 306.

Dr. S. Arulananda Babu
IISER Mohali
Sector 81, Mohali

Dr. Amit Kulshrestha
IISER Mohali
Sector-81, Mohali

Dr. P. Visakhi
IISER Mohali, Sector-81, Mohali

Dr. Abhishek Chaudhuri
Warden, IISER Mohali, Sector 81, Mohali

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

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 Mathematics, Panjab University, Chandigarh
-

4 Administration

Director	Professor N. Sathyamurthy, (Till 15-09-2017) Professor Debi Prasad Sarkar, (From 18-09-2017)
Dean Faculty	Professor Sudeshna Sinha
Dean Academics	Dr. Ramandeep S. Johal
Dean Students	Dr. N. G. Prasad
Dean R&D	Professor P. Guptasarma
Registrar	Dr. P. Bapaiah
Assistant Registrars	Shri Sandeep Ahlawat Shri Mukesh Kumar Shri Bipul Kumar Chaudhary
Deputy Librarian	Dr. P. Visakhi
Executive Engineer cum Estate Officer	Shri Praveen Kumar Srivastava
Honorary Counsellor	Mrs. Suguna Sathyamurthy
Counsellor	Ms. Yogee Brar
Wardens (Boys)	Dr. Rhitoban Ray Choudhary Dr. Ritajyoti Bandipadhyay Dr. Neeraja Sahasrabudhe Dr. P. Balanarayan
Wardens (Girls)	Dr. Baerbel Sinha Dr. Sanchita Sengupta Dr. Manjari Jain Dr. V.Rajesh
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 Shri Mansa Ram Gupta
Office Superintendent Library Information Assistants	Shri Arup Kumar Saha Shri Peeyush Dwivedi Shri Shameer K. K.
Office Assistants	Ms. Kavita Pandey Ms. Deepika Shri Tarandip Singh Ms. Neena Kumari Shri Charanjit Singh
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. **Debashis Adhikari** (Assistant Professor, Chemistry)
Catalysis, Small Molecule Activation, M–L Multiple Bonding
2. **Anoop Ambili** (Assistant Professor, Earth & Environmental Science)
Paleoclimate and Geochemistry
3. **R. Vijaya Anand** (Associate Professor, Chemistry)
Synthetic organic chemistry
4. **Chandrakant S. Aribam** (Assistant Professor, Maths)
Number theory
5. **Arvind** (Professor, Physics)
Quantum information theory, Quantum optics
6. **Charanjit S. Aulakh** (Professor, Physics)
Theoretical High Energy Physics
7. **S. Arulananda Babu** (Associate Professor, Chemistry)
Synthetic organic chemistry
8. **Kavita Babu** (Assistant Professor, Biology)
Neurobiology
9. **Anand K. Bachhawat** (Professor, Biology)
Glutathione and Sulphur Metabolism in Yeasts
10. **Jasjeet Singh Bagla** (Professor, Physics)
Cosmology, Astrophysics
11. **P. Balanarayan** (Assistant Professor, Chemistry)
Computational & Theoretical Chemistry
12. **Chetan T. Balwe** (Assistant Professor, Mathematics)
Applications of Homotopical Algebra to Algebraic Geometry
13. **Ritajyoti Bandyopadhyay** (Assistant Professor, Humanities and Social Sciences)
Urban History, Informal Economy and Infrastructure Studies
14. **Indranil Banerjee** (Assistant Professor, Biology)
Cellular Infectiology of Human Pathogenic Viruses
15. **Samarjit Bhattacharyya** (Assistant Professor, Biology)
Neurobiology

16. **Samir Kumar Biswas** (Assistant Professor, Physics)
Problem, Instrumentation, microscope, PAT, Angiogenesis
17. **Rachna Chaba** (Assistant Professor, Biology)
Bacterial Genetics and Physiology
18. **Dipanjan Chakraborty** (Assistant Professor, Physics)
Soft Condensed Matter, Statistical Physics
19. **Kausik Chattopadhyay** (Associate Professor, Biology)
Structure-Function Studies on Pore-Forming Protein Toxins
20. **Abhishek Chaudhuri** (Assistant Professor, Physics)
Soft condensed matter physics
21. **Parth R. Chauhan** (Assistant Professor, Humanities and Social Sciences)
Paleoanthropology & Archaeology
22. **Rhitoban Ray Choudhury** (Assistant Professor, Biology)
Evolution, Genetics and Genomics
23. **Angshuman Roy Choudhury** (Assistant Professor, Chemistry)
X-ray Crystallography
24. **Adrene F. D'cruz** (Assistant Professor, Humanities and Social Sciences)
English Literature
25. **Arijit Kumar De** (Assistant Professor, Chemistry)
Ultrafast non-linear spectroscopy and fluorescence microscopy
26. **Kavita Dorai** (Associate Professor, Physics)
Biomolecular NMR, Quantum computing
27. **Shane D'mello** (Assistant Professor, Mathematics)
Topology of Real Algebraic Varieties
28. **Abhik Ganguli** (Assistant Professor, Mathematics)
Number Theory
29. **Jino George** (Assistant Professor, Chemistry)
Molecular Strong Coupling
30. **Krishnendu Gongopadhyay** (Associate Professor, Mathematics)
Groups, Geometry & Dynamics
31. **Samrat Ghosh** (Assistant Professor, Chemistry)
Materials chemistry

32. **Ujjal K. Gautam** (Assistant Professor, Chemistry)
Functional nanomaterials and applications
33. **Sandeep Goyal** (Assistant Professor, Physics)
Quantum optics and quantum information theory
34. **Purnananda Guptasarma** (Professor, Biology)
Protein Engineering & Structural Biochemistry
35. **Manjari Jain** (Assistant Professor, Biology)
Behavioural Ecology & Evolutionary Biology
36. **Harvinder Kaur Jassal** (Assistant Professor, Physics)
General Relativity and Cosmology
37. **Satyajit Jena** (Assistant Professor, Physics)
Experimental High Energy Particle and Nuclear Physics
38. **Ramandeep Singh Johal** (Associate Professor, Physics)
Statistical Physics, Thermodynamics and Quantum Theory
39. **Rajeev Kapri** (Assistant Professor, Physics)
Statistical Mechanics
40. **Tanusree Khandai** (Assistant Professor, Mathematics)
41. **Amit Kulshrestha** (Associate Professor, Mathematics)
Quadratic forms, Central simple algebras and related structures
42. **Chanchal Kumar** (Associate Professor, Mathematics)
Algebraic Geometry and Combinatorial Commutative Algebra
43. **Sanjeev Kumar** (Assistant Professor, Physics)
Condensed Matter Theory: Correlated electron systems, disordered systems
44. **Soma Maity** (Assistant Professor, Mathematics)
Riemannian Geometry
45. **Alok Kumar Maharana** (Assistant Professor, Mathematics)
Algebraic Geometry
46. **Lolitika Mandal** (Assistant Professor, Biology)
Hematopoiesis, Cardiogenesis and Molecular pathways in stem and progenitor cell development in *Drosophila*
47. **Sanjay Mandal** (Professor, Chemistry)
Organometallic Chemistry, Nanomaterials, and X-ray Diffractometry

48. **Sudip Mandal** (Assistant Professor, Biology)
Mitochondrial regulation of cellular function
49. **Shravan Kumar Mishra** (Assistant Professor, Biology)
RNA Splicing
50. **Arunika Mukhopadhyaya** (Associate Professor, Biology)
Immunology
51. **Samrat Mukhopadhyay** (Associate Professor, Biology/Chemistry)
Protein folding, Misfolding, Prion & Amyloid biology
52. **S. K. Arun Murthi** (Assistant Professor, Humanities and Social Sciences)
Philosophy of Science
53. **Santanu Kumar Pal** (Associate Professor, Chemistry)
Liquid Crystals, Interfacial Phenomena, Colloid and Gel Chemistry, Chemical and Biological Sensing, Nanoscale Science and Engineering
54. **Yashonidhi Pandey** (Assistant Professor, Mathematics)
Algebraic Geometry
55. **Shashi Bhushan Pandit** (Assistant Professor, Biology)
Computational structural and systems biology, protein-ligand interactions, metabolomics
56. **Kapil Hari Paranjape** (Professor, Mathematics)
Geometry
57. **Ketan M. Patel** (Assistant Professor, Physics)
Theoretical High Energy Physics
58. **Sunil Anil Patil** (Assistant Professor, Earth & Environmental Science)
Environmental Microbiology and Biotechnology
59. **N. G. Prasad** (Associate Professor, Biology)
Evolutionary genetics
60. **V. Rajesh** (Assistant Professor, Humanities and Social Sciences)
History
61. **Sabyasachi Rakshit** (Assistant Professor, Chemistry)
Single Molecule Manipulation & Imaging and Nanobiology
62. **Rajesh Ramachandran** (Assistant Professor, Biology)
Cellular basis of tissue regeneration

63. **Ramesh Ramachandran** (Associate Professor, Chemistry)
Development of Solid-state NMR methods, Quantum mechanics
64. **Raj Kumar Roy** (Assistant Professor, Chemistry)
Polymer Chemistry
65. **Anu Sabhlok** (Associate Professor, Humanities and Social Sciences)
feminist geography, Political-economy of contemporary India, Globalization, Identity (gender and nation), Participatory Action Research, Ethnography
66. **Neeraja Sahasrabudhe** (Assistant Professor, Mathematics)
Theoretical and Applied Probability
67. **Lingaraj Sahu** (Assistant Professor, Mathematics)
Operator Theory, Operator Algebras
68. **Kuljeet Singh Sandhu** (Assistant Professor, Biology)
Systems Biology of Gene Regulation
69. **Debi Prasad Sarkar** (Professor & Director, Biology)
Molecular Virology and Drug/Gene Targeting
70. **Pranab Sardar** (Assistant Professor, Mathematics)
Geometric Group Theory
71. **N. Sathyamurthy** (Professor, Chemistry) (till 15/09/2017)
Molecular Reaction Dynamics and Potential Energy Surfaces
72. **Sharvan Sehrawat** (Assistant Professor, Biology)
Immunology and immunopathology
73. **K. R. Shamasundar** (Assistant Professor, Chemistry)
Quantum Chemistry
74. **Sanchita Sengupta** (Assistant Professor, Chemistry)
Functional Organic Material
75. **Mahak Sharma** (Assistant Professor, Biology)
Cell Biology
76. **Goutam Sheet** (Assistant Professor, Physics)
Condensed Matter Physics and Scanning Probe Microscopy
77. **Kamal P. Singh** (Associate Professor, Physics)
Ultrafast Quantum Dynamics and Stochastic nonlinear dynamics
78. **Mahender Singh** (Assistant Professor, Maths)
Topology and Groups

79. **Mandip Singh** (Assistant Professor, Physics)
Quantum Optics and Bose Einstein Condensation
80. **Sanjay Singh** (Associate Professor, Chemistry)
Synthetic Inorganic and Organometallic Chemistry
81. **Yogesh Singh** (Assistant Professor, Physics)
Experimental Condensed Matter Physics
82. **Barbel Sinha** (Assistant Professor, Earth & Environmental Science)
Environmental Science
83. **Sudeshna Sinha** (Professor, Physics)
Nonlinear Dynamics, Chaos, Complex Systems, Networks, Computation
84. **Vinayak Sinha** (Associate Professor, Earth & Environmental Science)
Environmental Science: Atmospheric Chemistry Field Experiments
85. **Varadharaj R. Srinivasan** (Assistant Professor, Mathematics)
Differential Algebra
86. **Sripada S. V. Rama Sastry** (Associate Professor, Chemistry)
Synthetic Organic Chemistry
87. **Sugumar Venkataramani** (Assistant Professor, Chemistry)
Physical Organic Chemistry
88. **Ananth Venkatesan** (Assistant Professor, Physics)
Mesoscopic Electronic & Electromechanical systems
89. **K. S. Viswanathan** (Professor, Chemistry)
Spectroscopy
90. **Ram Kishor Yadav** (Assistant Professor, Biology)
Plant Developmental Genetics
91. **K. P. Yogendran** (Assistant Professor, Physics - relieved on deputation)
Quantum Aspects of Gravity

5.2 Honorary Faculty

- | | |
|---|---|
| 1. P. Balaram (Professor, Biology) | Biochemistry |
| 2. Raghvendra Gadagkar (Professor, Biology) | Ecology |
| 3. N. Mukunda (Professor, Physics) | Theoretical Physics |
| 4. I. B. S. Passi (Professor, Mathematics) | Algebra |
| 5. T. Ramasami (Professor, Chemical Sciences) | Chemistry |
| 6. Sudesh Kaur Khanduja (Professor, Mathematics) | INSA Senior Scientist, Mathematic
Earth Sciences |

5.3 Visiting Faculty

- | | |
|-----------------------|-------------------------------|
| 1. Shobha Madan | Visiting Faculty, Mathematics |
| 2. Somdatta Sinha | Visiting Faculty, Biology |
| 3. Kulinder Pal Singh | Visiting Faculty, Physics |
-

5.4 Adjunct Faculty

- | | |
|-------------------------------------|---|
| 1. Amitabh Joshi (Biology) | Professor, JNCASR, Bangalore |
| 2. Amitabha Chattopadhyay (Biology) | Professor, CCMB, Hyderabad |
| 3. Shiv Grewal (Biology) | Distinguished Investigator, NIH, USA |
| 4. Sriram Subramaniam (Biology) | Senior Investigator Laboratory of
Cell Biology NCI/CCR |
| 5. T Padmanabhan (Biology) | Distinguished Professor at the Inter-University
Center for Astronomy and Astrophysics
(IUCAA) at Pune |
-

5.5 INSPIRE Faculty Fellows

- | | |
|---------------------------|-------------|
| 1. Bimalendu Adhikari | Chemistry |
| 2. Anandam Banerjee | Mathematics |
| 3. Vishal Bhardawaj | Physics |
| 4. Satyajit Guin | Mathematics |
| 5. Debrina Jana | Chemistry |
| 6. Kinjalk Lochan | Physics |
| 7. Smriti Mahajan | Physics |
| 8. Monika Sharma | Chemistry |
| 9. Anirban Bose | Mathematics |
| 10. Sanjib Day | Mathematics |
| 11. Sugandha Maheshwary | Mathematics |
| 12. Shubhra Sharma | EES |
| 13. Sharmila Bhattacharya | EES |

6 Events : 2017-18

6.1 Meetings of Institute Bodies

During 2017–18, various administrative bodies of the Institute met for deliberations.

Board of Governors Meetings

28 th meeting of the Board of Governors	27/05/2017
29 th meeting of the Board of Governors	08/09/2017
30 th meeting of the Board of Governors	16/12/2017
31 st meeting of the Board of Governors	28/03/2018

Finance Committee Meetings

24 th meeting of the Finance Committee	18/03/2017
25 th meeting of the Finance Committee	08/09/2017
26 th meeting of the Finance Committee	16/12/2017
27 th meeting of the Finance Committee	28/03/2018

Academic Senate Meetings

25 th meeting of the Academic Senate	16/05/2017
26 th meeting of the Academic Senate	28/07/2017
27 th meeting of the Academic Senate	12/12/2017
28 th meeting of the Academic Senate	05/01/2018

6.2 Convocation 2017



The 6th Convocation of IISER Mohali was held on May 27, 2017, with Dr. Anil Kakodkar, Former Chairman, Atomic Energy Commission, Govt. of India as the Chief Guest. Chairman Board of Governors, presided over

the function. In this convocation 102 graduates received their BS-MS degrees, 6 received MS degrees and 22 received PhD degrees. The Director congratulated the graduates and also the award and medal winners.



Chief Guest, Dr. Anil Kakodkar, delivering the convocation address

6.3 Foundation Day 2017



Dr. Madhavan Nair Rajeevan delivering the Foundation Day lecture

The IISER Mohali Foundation Day was celebrated on September 27, 2017. The Foundation Day Lecture was delivered by Dr. Madhavan Nair Rajeevan, Secretary, Ministry of Earth Sciences, Government of India. Prof. Debi Prasad Sarkar, Director, gave the welcome address and spoke about the achievements of the institute during the year that had passed since the last foundation day. He also spoke about his vision of IISER Mohali and his plans for IISER Mohali, as its new Director. Dr. Madhavan Nair Rajeevan spoke at length

about how Earth-System Science in general can be applied to socio-economic benefits. In particular, he also dwelt upon atmospheric science, climate and weather and spoke about how the importance of understanding these and modelling these has become paramount in the modern world which relies greatly upon the accuracy of predictions. Professor Purnananda Guptasarma, Dean R&D, gave the vote of thanks.

6.4 Independence Day 2017



Independence Day 2017 celebrated at IISER Mohali Campus. National Flag was hoisted by Prof N Sathyamurthy Director IISER Mohali in the presence of Dr. P. Bapaiah Registrar IISER Mohali, faculty members and other staff members. CNR Rao foundation award and Academic Excellence awards were presented to the students by the Director on this occasion.

CNR Rao Foundation Prize for the Best Performing First Year student of the BS-MS program in the second semester of the academic session 2016-17.

- Shradha Sapru(MS16034)
- Abhijit Bhalachandra(MS16035)
- Rahul Ramesh(MS16036)
- Upayan Roy(MS16041)
- Sonell Malik(MS16066)
- Ruchira A Mishra(MS16071)
- Satvik Singh(MS16075)
- Anshuman Acharya(MS16080)
- R Bharathkumar (MS16097)

- Satyapan Munshi (MS16099)
- Puneeth Deraje (MS16184)

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 2016-17.

2015 Batch

- Anjana R Kammath (MS12021)
- Kabeer Manali Rahul (MS15152)
- Tisya Banerjee (MS15181)

2014 Batch: Biology

- Dandavate Vaishnavi Ravindra (MS14081)
- Greeshma. P. Bose (MS14155)
- Archi Sharma (MS14157)
- Avneet Kaur (MS14173)

2014 Batch: Chemistry

- Amandeep Singh (MS14001)
- Rishabh Gupta (MS14053)
- Md Misbahur Rahman (MS14056)
- Suresh Kumar (MS14060)
- Umang Gupta (MS16069)
- Shiny Maity (MS14113)
- Pinku Tung (MS14113)
- Irin P. Tom (MS11072)

2014 Batch: Mathematics

- Tejasi Bhatnagar (MS14071)

2014 Batch: Physics

- Ravneet Singh Bedi (MS14012)
- Meenakshi (MS14077)
- Jorawar Singh (MS14085)

2013 Batch: Biology

- Swathi Jayaram (MS13150)
- Jayesh Kumar S (MS13054)
- Sumanjit Datta (MS13111)

2013 Batch: Chemistry

- Divita Gupta (MS13056)

2013 Batch: Mathematics

- Simran S Tinani (MS13010)

2013 Batch: Physics

- Shreyan Ganguly (MS13149)

Certificate of Academic Excellence for the Best Performing Students (first & second year of Integrated PhD program) in the second semester of the academic session 2016-17

2016 Batch: Biology

- Sharanya P (MP16013)

2016 Batch: Chemistry

- Pankaj Seliya (MP16005)

2016 Batch: Physics

- Vassu Doomra (MP16016)

2015 Batch: Chemistry

- Ipsita Pani (MP15002)
- Kaustav Chatterjee (MP15012)

2015 Batch: Physics

- Tasha Gautam (15005)

6.5 Republic Day 2018

Sixty-ninth Republic Day of the Nation was celebrated in the Institute on January 26, 2018. 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 2017-18.

- Achuthan Raja Venkatesh (MS17034)
- Sahil Sharma (MS17075)
- Abhigyan Writwik Medhi (MS170108)

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 2017-18.

2016 Batch

- Kartik Chhajed (MS16001)
- Shradha Sapru (MS16034)
- Abhijit Bhalachandra (MS16035)
- Rahul Ramesh (MS16036)
- Upayan Roy (MS16041)
- Ruchira A Mishra (MS16071)
- Satvik Singh (MS16075)
- Puneeth Deraja (16184)

2015 Batch: Biology

- Sunandini Ramnarayana (MS15143)
- Tisya Banerjee (MS15181)
- Tirupa Tapas Chakraborty (MS15204)

2015 Batch: Chemistry

- Parmeet Kaur Dhindsa (MS15017)
- Anjana R Kammath (MS15021)
- Sudha Yadav (MS15129)
- Arghadip Koner (MS15131)

2015 Batch: Mathematics

- Kabeer Manali Rahul (MS15152)

2015 Batch: Physic

- Yash Rana (MS15042)
- Shridhar Vinayak (MS15060)
- R.Ranjani (MS15104)
- Nikhil Tanwar (MS15111)
- Hayman Gosain (MS15125)

2014 Batch: Biology

- Archi Sharma (MS14157)
- Avneet Kaur (MS14173)

2014 Batch: Chemistry

- Nayana C B (MS14128)

2014 Batch: Mathematics

- Ramandeep Singh Arora (MS14030)

2014 Batch: Physics

- Jorawar Singh (MS14085)

Certificate of Academic Excellence for the Best Performing Students (first & second year of Integrated PhD program) in the first semester of the academic session 2017-18

2017 Batch: Chemistry

- Jay Prakash Maurya (MP17015)

2017 Batch: Mathematics

- George Shaji (MP17009)
- Arpit Babbar (MP17010)

2016 Batch: Physics

- Sanjay Kumar (MP17002)

2016 Batch: Biology

- Sharanya P (MP160013)

2016 Batch: Chemistry

- Pankaj Seliya (MP16005)

2016 Batch: Mathematics

- Debjit Basu (MP16004)

2016 Batch: Physics

- Vassu Doonra (MP16016)

6.6 Outreach Activities

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.
2. Summer research program 2017: About 50 summer students came to IISER Mohali under the summer research program. They worked with various faculty members for their projects at IISER Mohali. Dr. Rachna Chhabra from biology department coordinated the program. Apart from the regular project work four lectures by eminent scientists were organized for the summer students. On the whole the program which is in its 9th year went very well.
3. Foundation Day Program October 6, 2018: A one day event for school students was organized in connection with our foundation day celebrations. In this program about 500 school students visited IISER Mohali and about 120 IISER students, faculty and staff organized activities for them. Dr. Ram Yadav of Biology department was the faculty coordinator for the events. The events included various science demonstrations, a quiz program and an open house with scientists.



IISER Mohali student is demonstrating an Experiment during the foundation program.



Treasure hunt competition for school students during the foundation day program.

6.7 Teachers' Day

Teachers' Day was celebrated in the Institute on September 05, 2017. On this occasion Dr. Vinayak Sinha (Department of Earth & Environmental Sciences) and Dr. P. Balanarayan (Department of Chemistry Sciences) was awarded the Best Teacher Award for the year 2017.

6.6 Students Activities





Moods of INSOMNIA 2018

The Academic Year 2017-2018 was a very fruitful one for Student Activities. The annual outreach program to celebrate the foundation day was celebrated with much fanfare in September and attended by school students all over the tricity. IISER Mohali students also qualified for the Mumbai Round of MTV Colors of Youth for the third time in a row. IISER Mohali was also the host for the Zonal Round of IIT-Roorkee's annual fest "Thomso" and IISER Pune's flagship "Mimamsa".

IISER Mohali also hosted the Inter IISER Sports Meet in December. We hosted over 1100 athletes from sister IISER's and NISER for a 5 day sporting extravaganza. Over 20 sporting events were held on campus (Tennis, Table Tennis, Badminton, Chess, Cricket, Football, Volleyball, Basketball, Athletics were some of these) and the overall rolling trophy was won by IISER Mohali. IISER Mohali students were also a regular feature in multiple half and full marathons in Chandigarh and nearby areas.

IISER Mohali's annual cultural fest "Insomnia" was held in March amidst much fanfare. IISER Mohali witnessed the comedian Angad Singh Ranyal and one of India's top bands The Local Train live in action across a 3 day fiesta. The fest saw artists and quizzers from not only the tricity area but also from the Delhi Circuit. The fest saw a footfall of over 2000 participants and events across a variety of art, theater, music, dance and academic activities. Our students from the Literary and Debate Society also represented the institute in the Parliamentary Debate Competition held at National Law School Bangalore. Students from the IISER Mohali Quiz Club also won and qualified for the finals of multiple prestigious events including TATA Crucible, Thappar, BITS-Pilani (Zonals) and Chitkara National Business Quiz.

7 Scientific Meeting/ Conferences/ Workshop

7.1 2nd Indian C. elegans Meeting. Organizers: Arnab Mukhopadhyay, NII and Kavita Babu, IISER Mohali. Held at NII, New Delhi:

We organized the 2nd Indian C. elegans meeting to bring together the C. elegans community in India to enable them to present their research and listen to excellent talks from Indian and International speakers. Approximately 120 participants including 14 Indian and 13 International speakers attended the meeting. This meeting helped students and postdoctoral fellows from the C. elegans community meet and network with each other.

7.2 International Conference on Intrinsically Disordered Proteins: Forms, Functions and Diseases, held at the Indian Institute of Science Education and Research (IISER), Mohali from December 9 to 12, 2017:

The conference on “Intrinsically Disordered Proteins: Forms, Functions and Diseases” (IDP 2017) was held at the Indian Institute of Science Education and Research (IISER), Mohali from December 9 to 12, 2017. This conference was co-organized by Samrat Mukhopadhyay (IISER Mohali) and Elizabeth Komives (University



Prof. Chris Dobson (right) and Prof. P. Balaram (left) with the organizer, Dr. Samrat Mukhopadhyay (middle)



The recipients of the best poster awards



Group photos

of California San Diego) and brought a large number of world-leading scientists together in a single forum. Intrinsically disordered proteins (IDPs) challenge the tenets of the traditional structure-function paradigm and are involved in a diverse range of physiological functions and human diseases such as Alzheimer's and Parkinson's diseases, cancers and so forth. IDP 2017 had several exciting and emerging topics including Cellular Functions and Dysfunctions, Bioinformatics and Systems Biology, Structural Biology and Disorder-to-Function Relationships, Conformational Dynamics and Heterogeneity, Chemical Biology and Drug Design, Intracellular Phase Separation and Membrane-less Organelles, Pathological Amyloids, Functional Prions and Amyloids, Emerging Single-Molecule Fluorescence Methods, Nanoscale Biophysics, NMR spectroscopy, Mass Spectrometry, Folding Disorders From Test Tubes to Cells, Molecular Simulations and Computational Biology, Disorder in Lipid-Protein Interactions, and Disease Models and Therapeutic Strategies. Some of the notable speakers at the conference were Christopher Dobson, Peter Tompa, Monika Fuxreiter, Raffaele Mezzenga, Daniel Otzen, Thomas Kiefhaber, Peter Wright, Jane Dyson, Elizabeth Komives, Richard Kriwacki, Vladimir Uversky, Rohit Pappu, Jayant Udgaonkar, Matthew Chapman, P. Balaram, Timothy Lohman, Joan-Emma Shea, Amitabha Chattopadhyay, Sudipta Maiti and several others. There were over 100 posters and 8 young researcher talks at the conference. Young researchers, especially, students, postdocs and young investigators were very excited to meet and discuss with some of the world leaders of IDP field. Everyone was impressed with the quality of posters. IDP 2017 was a great opportunity for the young investigators to share their exciting scientific findings. This conference is likely to foster several high-quality international collaborations/ exchanges. The invited speakers and participants have enthusiastically supported the proposal for holding the second IDP conference at IISER Mohali in 2020.

7.3 PHENO1@IISERM: First Workshop on Beyond Standard Model Physics

7.4 Coordinated the Royal Society of Chemistry Roadshow @IISERM: The Royal Society of Chemistry (RSC) based in Bangalore conducted a daylong event at IISER Mohali on 14 November 2017 in LH7, IISER Mohali. Apart from scientific presentations by eminent scientists, RSC's Board members and delegates spoke on the various aspects of publishing, i.e., preparing manuscripts/posters, peer review process, and Open Access.

7.5 Indo-Russian 70th Anniversary celebration workshop: "Groups and Related Structures", December 7–8, 2017.

7.6 Title and date of the Workshop: Convened Science Academy's Lecture Workshop on Topics in Algebra and Number Theory at Ranchi College, Ranchi during September 22 - 24, 2017.

The workshop was attended by 110 students from six colleges in and around Ranchi, including the Central University of Jharkhand. The aim of this workshop was that talented young students experience excitement and challenge, love of creativity and thrill of tackling problems. The students were given glimpses of various topics in Algebra and Number Theory and informed about ways of exploring new ideas. There were twelve lectures of 75 minutes duration each and three discussion sessions of one hour each. The workshop had seven dedicated resource persons: Dr. Amit Kulshreshtha (IISER Mohali), Dr. Abhishek Banerjee (IISc, Bengaluru), Dr. Kaneenika Sinha (IISER Pune), Prof. Sudesh Kaur Khanduja (IISER Mohali), Prof. K. C. Prasad (Former Head, Dept. of Math, Ranchi University), Dr. A. K. Mahato (Ranchi College) and Dr. Jagmohan Tanti (Central University of Jharkhand). The lectures in Group Theory were delivered by Dr. Amit Kulshreshtha. He presented interesting ways of connecting real world experiences to ideas in groups. Dr. Abhishek Banerjee presented some new ways of looking at finiteness. Dr. Kaneenika Sinha

spoke on the use of some arithmetical functions connected to the Prime Number Theorem and presented Ramanujam's proof of Bertrand's Postulate. Prof. Sudesh K Khanduja spoke on several fascinating properties of prime numbers, tracing the history and development of Number Theory in search of a proof of Fermat's Last Theorem. She also spoke on some irreducibility criteria for polynomials with integer coefficients. Prof. K C Prasad explained a new way of proving the Binomial Theorem and also described a formula for adding r -th powers of consecutive integers (r being any number), which was one of the early interests of Ramanujam. Dr. A K Mahato spoke on various proofs and applications of the Fundamental Theorem of Arithmetic. Dr. Jagmohan Tanti discussed a natural geometric way of constructing a group law on points of an elliptic curve by drawing chords.

7.7 Symposium on GW-GRB 170817

A one day symposium on the first multi-messenger detection of a Gamma ray burst in Gamma rays and also in Gravitational waves was organised on Dec.1, 2017 at IISER Mohali. The symposium had six lectures on different aspects of the event. Topics covered were as follows: Gravity Wave detection of GW 20170817 and inferences from gravity wave observations (Professor J S Bagla), GRB 20170817A and afterglow observations, and inferences from these (Professor Kulinder Pal Singh), Implications of GW and GRB observations for the equation of state for neutron stars, and merger rates (Professor Dipankar Bhattacharya, IUCAA Pune), Implications of GW and GRB observations for the equivalence principle and theories of gravity (Dr. Kinjalk Lochan), Measuring H_0 using GRB and GW observations, and implications for models of dark energy (Dr. H K Jassal), and, Non-detection of neutrinos from GW-GRB event. Expectations and possible constraints from such events (Dr. Ketan Patel) The lectures were followed by discussions. Professor Dipankar Bhattacharya joined on a video link for his presentation.

7.8 Convened a scientific session entitled "Measuring and modelling biogenic volatile organic compounds (BVOCs)" on at the Fifth International Land Atmosphere Ecosystem Processes Study (iLEAPS) Open Science Conference held in Oxford, UK from 11th-14th September 2017.

The abundant and diverse range of biogenic volatile organic compounds (BVOCs) plays an important role in the Earth system at different spatial scales, from cellular-level antioxidant protection to modulation of atmospheric chemistry at the ecosystem level. Depending on tropospheric conditions, BVOC emissions can impact air quality and radiative forcing, leading to complex feedbacks in the Earth system. However, considerable uncertainties persist with regard to measuring and modelling BVOCs from the leaf to ecosystem level. Models struggle to characterize the diversity of plant species and BVOC emissions and the complex atmospheric chemistry which depends on the local atmospheric composition. Measurement techniques continue to improve for better characterisation and quantification of the magnitude and source of BVOC emissions given their short atmospheric lifetimes and relatively low abundance at any given time. The session involved 20 presentation including five oral presentations from leading world experts presenting recent developments in BVOC modelling and/or measurements for improving our understanding of the mechanistic processes behind BVOC dynamics in ecosystems across the globe.

7.9.(1) Co-organiser, Knots, Braid Groups and 3-Manifolds, Sobolev Institute of Mathematics, Novosibirsk, Russia, 20 July 2017

The year 2017 was celebrated as the 70th anniversary of establishment of diplomatic relations between Russia and India. To make our contribution, we organized the workshop "Knots, Braid Groups and 3-Manifolds" at the Sobolev Institute of Mathematics, Novosibirsk, Russia on 20 July 2017. The Novosibirsk research group has a long story of collaboration with Indian colleagues on areas such as knots, braid groups and 3-manifolds. Our joint research was supported by the DST-RSF grant "Modern Problems of

Low-Dimensional Topology in Crossroad with Geometry and Algebra" co-ordinated by Prof. Andrei Vesnin from Russia and by Dr. Mahender Singh from India.

7.9.(2) Co-organiser, Groups and Related Structures, Department of Mathematical Sciences, IISER Mohali, 07-08 December 2017: The year 2017 was celebrated as the 70th anniversary of establishment of diplomatic relations between Russia and India. To make our contribution, we organized two workshops "Knots, Braid Groups and 3-Manifolds" at the Sobolev Institute of Mathematics, Novosibirsk, Russia on 20 July 2017. The workshop "Groups and Related Structures" held at IISER Mohali during 7-8 December 2017 was a follow-up of the Novosibirsk workshop. Our joint research was supported by the grant "Modern Problems of Low-Dimensional Topology in Crossroad with Geometry and Algebra" co-ordinated by Prof. Andrei Vesnin from Russia and by Dr. Mahender Singh from India.

7.9.(3) Co-organiser, TEW on Group Theory, Analysis and Topology, Doon University, Uttarakhand 09-14 October 2017: The Teacher Enrichment Workshop (TEW) is a programme funded by the National Centre for Mathematics (A joint centre of TIFR and IIT Bombay). The TEW is meant primarily local college teachers. The lectures in this workshop covers specific topics which are relevant for the teachers' classroom instructions. An important component of this programme is the discussion hour during which the teachers will have opportunities to get their doubts cleared and work-out routine to an advanced exercise. (The event was organised by Dr. Mahender Singh (IISER Mohali))

7.9.(4) Co-organiser, 7th East Asian Conference on Algebraic Topology (EACAT), IISER Mohali, 01-06 December 2017: The East Asian Conference on Algebraic Topology (EACAT) is a biannual conference on the broad area of Algebraic Topology. The first EACAT was held in Seoul (Seoul National University) in 2007. Before then, the annual China-Japan-Korea (CJK) Conference had been held for a couple of years. In 2007 this conference was expanded to the East Asian Conference since Singapore, Taiwan and Vietnam also started to participate. The second EACAT was held in Singapore (National University of Singapore) in 2008, the third was held in Hanoi (Vietnam National University) in 2009, the fourth at Tokyo (University of Tokyo) in 2011, the fifth at Beijing (Chinese Academy of Sciences) in 2013, and the sixth at Daejeon (National Institute of Mathematical Sciences) in 2015. The seventh conference of this series was held for the first time in India at IISER Mohali during 01-06 December 2017. The conference was organised jointly by IISER Mohali and IIT Ropar. The organising committee consisted of Dr. Madeti Prabhakar (IIT Ropar), Dr. Mahender Singh (IISER Mohali) and Prof. Jie Wu (National University of Singapore).

7.10 Workshop on Mass Spectrometry Based Proteomics(November 20-24, 2017): A workshop on Proteomics by Mass Spectrometry was held during November 20-24, 2017. The head of Mass Spectrometry Core facility at the Max Planck Institute of Biochemistry, Dr. Nagarjuna Nagaraj, conducted the workshop for the students of IISER Mohali. A total of 16 students from the Department of Biological Sciences and Department of Chemical Sciences participated in the workshop. The workshop began with a general lecture delivered by Dr. Nagaraj on the subject. It was followed by hands-on training of participants in preparing of samples for proteomics.

7.11 Part of organising committee of IBAC 2017: 26th meeting of the International Bioacoustics Congress, Haridwar, India (8th-13th October 2017):

7.12 Organised a course along with Dr Sudip Mandal under the flagship of Global Initiative for Academic Networks (GIAN) Course

Conservation and Evolution in Developmental Gene Regulatory Networks (DGRN): A systemic view. November 1 – 8, 2017 at IISER Mohali, Punjab, INDIA:

This interdisciplinary course was designed to intersect diverse research fields that includes developmental biology, molecular biology, systems biology, modeling, evolution, and functional genomics. Prof Volker Hartenstein, from University of California was the Foreign Expert Faculty who along with five other experts from India conducted this course. Through lectures, discussion sessions and hands-on experimental sessions participants were introduced to various aspects of DGRN. The course was aimed at orienting the young minds for cross-disciplinary training to have a holistic understanding of the genomic regulatory mechanism that governs developmental processes.

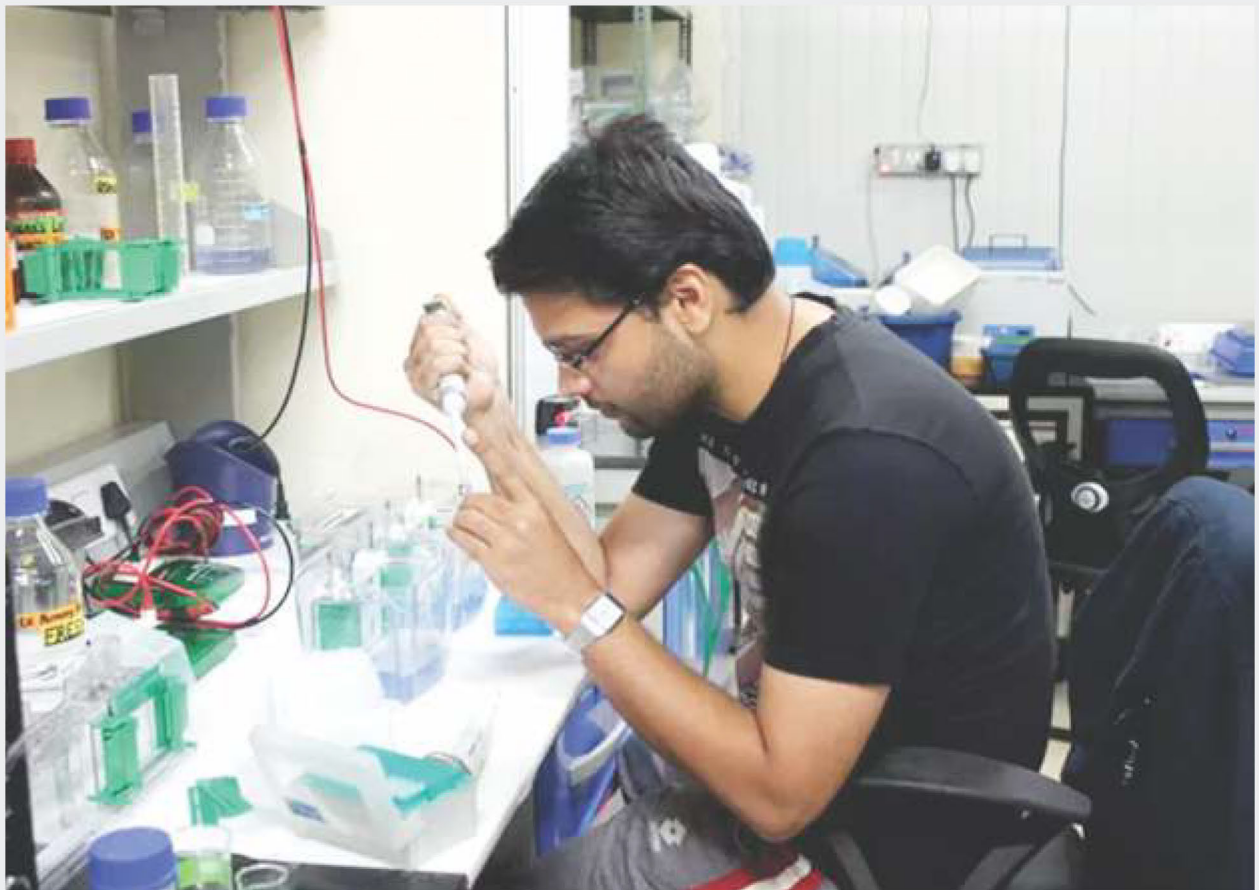
7.13 24th National Conference on Liquid Crystals (NCLC-2017):

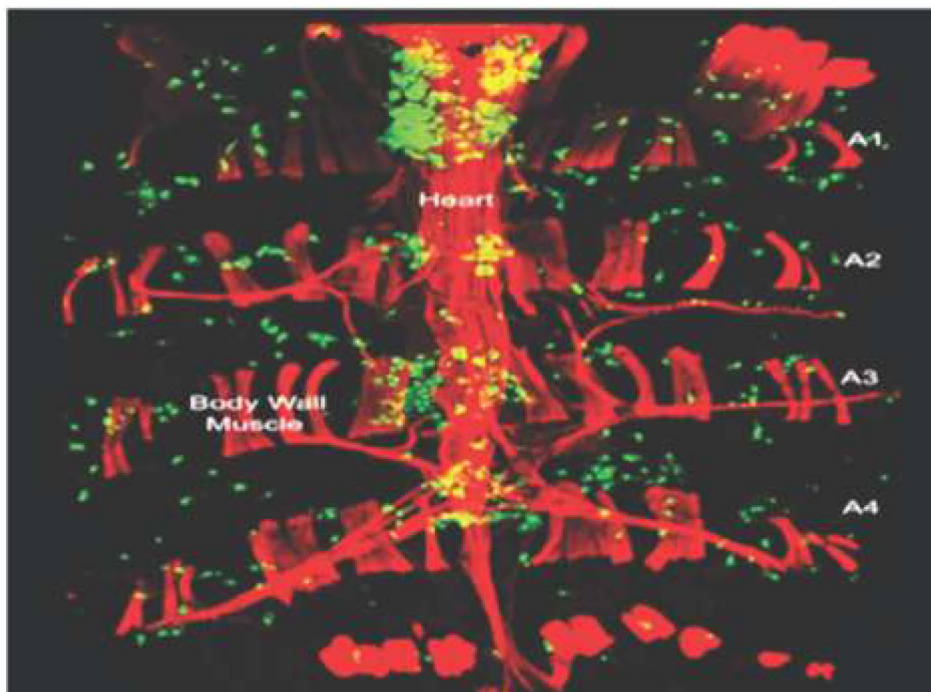
The 24th National Conference of Liquid Crystal (NCLC) was organized at Indian Institute of Science Education and Research (IISER) Mohali in association with Indian Liquid Crystal Society for three days, from 11th October to 13th October, 2017. The aim of the conference was to bring together young and senior researchers from nationally and internationally reputed institutions working in the field of soft matter, liquid crystals and biological systems. This conference provided a platform to discuss recent advancements in the field of liquid crystals as well as emerging interdisciplinary areas of soft matter, nanotechnology and biological systems. Emphasis was given to eco-friendly, energy efficient devices based on these materials.

7.14 24th meeting of the National Magnetic Resonance Society of India (NMRS-2018) at IISER Mohali:

Dr. Kavita Dorai & Sandeep Kumar Goyal organized the "24th Conference of the National Magnetic Resonance Society of India NMRS-2018" at IISER Mohali, during February 16-19, 2018. The theme of the NMRS-2018 conference was "Frontiers of Interdisciplinary NMR: Applications to Physics, Chemistry, Biology and Medicine", and included sessions on all aspects of magnetic resonance ranging from Biomolecular NMR and Diffusion NMR to NMR Metabolomics and Imaging. The conference had around 300 participants and several eminent scientists from India and abroad delivered plenary as well as invited talks.

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. We have recently shown that a cadherin present at the NMJ is required for maintaining normal release of the neurotransmitter GABA at the NMJ. This work was recently published in PLoS Genetics.

Anand Bachhawat: Our lab works on glutathione homeostasis and has also been looking at the role of cystine transporters in these processes. We recently proposed a new “Glutathione Cycle” to replace the existing g-glutamyl cycle based on our current understanding of glutathione degradation and transport pathways. In addition we have been investigating the mammalian Cystinosin, a lysosomal transporter that is involved in the efflux of cystine from the lysosome to the cytosol. Mutations in the human cystinosin gene (CTNS) cause cystinosis, a recessive autosomal disorder. Studies on cystinosin have been limited by the absence of a robust genetic screen. We have developed a dual strategy for evaluating cystinosin function that is amenable to rapid genetic analysis. We show that human cystinosin expressed in this yeast confers growth on cystine when the protein is mistargeted to the plasma membrane by the deletion of the C-terminal targeting signal, GYQDL. We also screened a vacuolar protein sorting deletion library, and subsequently created multiple vps deletion mutants for kinetic studies. The double deletion, vps1Δvps17Δ, greatly enhanced uptake. This enabled validation by kinetic studies, including first studies on the WT CTNS protein (that contained the GYQDL motif). Using this screen we isolated several gain of function mutants, G131S/D, G309S/D, A137V, G197R, S270T, L274F and S312N showing enhanced growth on low concentrations of cystine. The results indicate that the screen could be effectively used for interrogating and understanding the CTNS protein.

Samarjit Bhattacharyya: Cellular and Molecular Mechanisms of Protein Trafficking in the Central Nervous System An essential requirement for maintenance of homeostasis in any living organism is the ability of cells to sense the external environment and, in the case of multicellular organisms, for cells to communicate with each other via mediators released into the extracellular milieu. In the brain, a variety of neurotransmitters and neuromodulators act on target receptors to activate cellular signaling events which transfer information from one cell to the next. 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 still know very little about the protein machineries that mediate trafficking of neurotransmitter receptors in the brain, the regulatory events that control these protein machineries, and the functional consequences of these regulatory events. At this point research in our laboratory is directed to elucidate the cellular and molecular mechanisms that regulate the trafficking of (a) ionotropic glutamate receptors and (b) G-protein coupled receptors (GPCRs) in the central nervous system. These trafficking events are thought to be critical for various physiological processes. For example, glutamate receptor trafficking is believed to be involved in virtually all forms of experience-dependent plasticity including learning and memory. On the other hand, GPCR trafficking is believed to play crucial role in various physiological processes as well as in various neuropsychiatric disorders. Our laboratory employs multi-disciplinary approaches ranging from biochemistry and molecular biology to cell biology, imaging, and mouse genetics to address these questions.

Rachna Chaba: My research group at IISER-Mohali is interested in identifying and characterizing new players in metabolic pathways and understanding the interconnection between metabolism and stress responses in bacteria, with a special focus on the metabolism of two important carbon sources, long chain fatty acids (LCFAs) and sugar acids.

Long chain fatty acids (LCFAs) are carboxylic acids with a long unbranched aliphatic chain of 12-20 carbon atoms. Being rich in energy, LCFAs represent an important carbon source for several bacterial pathogens, and is a desired raw material for industrial production of fuels and chemicals. However, LCFAs also confer various stresses on bacteria. We previously performed a genetic screen in *Escherichia coli* on the LCFA, oleate, and compared our results with published genome-wide screens of multiple non-fermentable

carbon sources. This large-scale analysis revealed that genes involved in the biosynthesis of ubiquinone, an electron carrier in the ETC, are highly required for growth in LCFAs when compared with other carbon sources. In our recent work, using genetic and biochemical approaches, we show that this increased requirement of ubiquinone is to mitigate elevated levels of reactive oxygen species generated by LCFA degradation. Importantly, among the various oxidative stress combat players in *E. coli*, we find that ubiquinone acts as the cell's first line of defense against LCFA-induced oxidative stress. We are now working towards delineating the mechanism by which ubiquinone counteracts LCFA-mediated oxidative stress. *E. coli* utilizes a variety of sugar acids (oxidized derivatives of sugar) as carbon and energy source. Genome-scale studies in the last couple of decades have emphasized the importance of the metabolic pathway of a sugar acid, D-galactonate, in the physiology of enteric bacteria. Although there are a few biochemical studies on metabolic enzymes involved in D-galactonate metabolism, the molecular and functional characterization of its putative transcriptional repressor is still lacking. Using a combination of genetic, biochemical and bioinformatics approaches, we have identified the promoter, operator and effector of the repressor, and have established the repressor as a GntR family transcriptional regulator. Taken together, through our work on LCFA and D-galactonate metabolism, we intend to provide new information that can be harnessed to design novel antibacterials and to improve industrial microbes.

Dr. Kausik Chattopadhyay: Pore-forming protein toxins (PFTs) represent a special class of membranedamaging 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:

1. Mechanistic details of oligomeric membrane channel formation by PFTs.
2. 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 group is interested in proteins, and our work mostly falls in the areas of Cell & Molecular Biology, Protein Engineering and Design, Molecular Biophysics & Structural Biochemistry of Proteins. Currently, work in the laboratory revolves around studies of (1) the mechanistic and structural enzymology of two hyperthermophile glucanotransferases that double as exo-amylases, (2) insights into a bacterial dodecameric aminopeptidase which cooperates with proteasomes in mediating turnover of cellular proteins, (3) the structure, function and interactions of a bacterial DNA-binding protein, HU, which packages DNA into nucleoids and also appears to have a function in the formation of biofilms, (4) the structure, calcium-binding and differential interactions of two cell adhesion proteins known as N-cadherin and C-cadherin, (5) the production and characterization of three or four hyperthermophile-derived hydrolases that degrade cellulosic biomass, and (6) minimal engineering of interferon-gamma to produce a variant which is highly expressed, soluble and active without requiring glycosylation.

Over the last twenty one years (seven at IISER Mohali), our group has studied over fifty different recombinant and engineered proteins, membrane-anchored proteins, and protein domains from the proteomes of mesophile and hyperthermophile organisms. In the bargain, we have solved various problems relating to poor expression, solubility, folding and degradation of proteins even while asking fundamental questions relating to their biosynthesis, folding, structure, stability, function(s), misfolding, aggregation, evolution, therapeutic use, disease-involvement, metabolic role, large-scale production, and interactions with other macromolecules (other proteins, DNA), as well as small molecules (cofactors, substrates, metals). Typically, every second or third researcher in the lab is encouraged to get interested in a new protein. In addition to discoveries, inventions and hypotheses, we have developed new methods in protein engineering, spectroscopy, mass spectrometry, fluorescence microscopy, biomolecular separation techniques and sequence/structure bioinformatics. We hold process and products patents in protein engineering in nine countries. Our group has also spun-off a company, RecDesProt, for the production-on-demand of over a hundred specialty recombinant and designed protein research reagents and kits. To learn more about our group, visit <http://www.guptasarmalab.in>.

Manjari Jain: My research group is working on different topics under the overarching theme of Behavioural Ecology using different invertebrate and vertebrate model systems. A major focus of our work is on animal communication, its context, complexity and evolution. Apart from that the lab also works towards understanding patterns of biodiversity in India and towards developing tools to measure it.

We have discovered a new species of a field cricket belonging to the genus *Teleogryllus* from India. We have received confirmation from the Natural History Museum, Paris for the same this year. In this year we also mapped the diversity of moths on IISER Mohali campus looking at changes in their abundance and diversity patterns on a temporal scale. In doing so, we have documented 89 species (belonging to 12 different families) of moths from IISER campus including 33 species that have been reported for the first time from Punjab. We started a new project to look at the foraging patterns and strategies of selected fruit bat species and the cues that they may use from target plant species in order to find their forage. We are in the process of chemical characterisation of selected fruits consumed by these plants in order to understand the underlying chemical ecology of bat foraging.

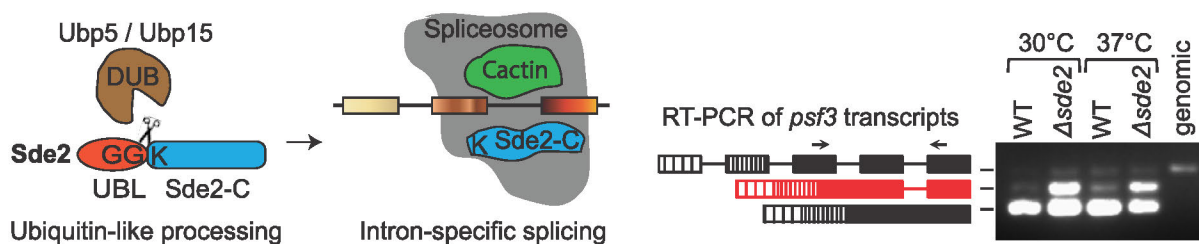
Lolitika mandal: My research group worked towards unravelling signals and gene networks that are essential for maintenance of hematopoietic progenitors, stem cells and their microenvironment. The model system used for our research is *Drosophila melanogaster*.

Sudip Mandal: Our research group strives for understanding the regulation of cell biological function by the metabolic state of the cell, particularly by mitochondrial function. For our studies we employ molecular biological, cytological, biochemical and genetic tools in the model organism, *Drosophila melanogaster*.

Shravan Kumar Mishra: We study function and regulation of proteins related to ubiquitin in cellular processes of pre-messenger RNA splicing and signaling. For these studies we perform experiments in molecular cell biology, genetics, and biochemistry in the budding yeast *Saccharomyces cerevisiae* and fission yeast *Schizosaccharomyces pombe*. We use mammalian cell cultures and multi-cellular organisms through collaborations to highlight functional conservations of the findings made in these organisms and their potential applications to humans.

Ubiquitin and ubiquitin-like modifiers, for example, Hub1, SUMO, NEDD8, Sde2 etc., are a group of small proteins harboring ubiquitin fold, and function as central regulators for a large number of processes in the cell. The covalent attachment of ubiquitin to target proteins, termed ubiquitination, requires a set of dedicated enzymes. The process of ubiquitination is key for determining fate of target proteins through their degradation in the proteasome. The process also diversifies functions of its targets by modulating their properties in non-proteolytic ways. Other ubiquitin-like modifiers also attach to target proteins as modules or tags, both covalently and non-covalently, and play regulatory roles a similar large number of processes. These modifiers often operate as molecular switch in processes such DNA repair, signal transduction, protein sorting etc.

The ubiquitin-like protein Hub1 is conserved from budding yeast to humans. It binds to splicing factors non-covalently, and functions in pre-mRNA splicing in a unique way, for efficient splicing of a subset of introns and to promote alternative splicing. The ubiquitin-fold harboring Sde2 protein is conserved in intron-rich eukaryotes from fission yeast to humans. The protein gets incorporated in the splicing machinery, spliceosome, for intron-specific pre-mRNA splicing after cleavage of its ubiquitin fold by specific deubiquitinating enzymes. Defects in heterochromatin silencing and genome stability are known to be hallmarks of many diseases including cancer. Our recent discoveries suggest that the process of intron-specific pre-mRNA splicing becomes critical for heterochromatin silencing and genome stability.



The processing of the ubiquitin-like domain (UBL) from Sde2 precursor by the deubiquitinating enzymes (DUB) Ubp5 and Ubp15 activates the spliceosomal regulator Sde2-C for intron-specific pre-mRNA splicing

Arunika Mukhopadhyaya: During an infection, the pathogen brings an arsenal of antigens with it to the host system. These antigens modulate the host responses in various ways. Understanding the role of various antigens in terms of their host-modulatory responses are important for designing the best therapeutic strategy or vaccine development, specially in the perspective of emergence of multiple drug resistant strains. Research in our laboratory, is mainly focused on understanding the mechanism of host-

modulatory responses by gram-negative enteric bacterial ligands/antigens. Our major goal is to look at the immune network, triggered by a single bacterial ligand on single cell-type aspect and also in vivo in multiple cell types aspect. Following are the major aims which we are currently working:

1. Understanding the host-immunomodulatory responses by OmpU porin of human pathogenic *Vibrio* spp, such as, *Vibrio cholerae*, *Vibrio parahaemolyticus*, *Vibrio vulnificus*.
2. Understanding the host-cell death pathway triggered by OmpU porin of human pathogenic *Vibrio* spp.
3. Understanding the host immunomodulatory role of some of the translocation effector proteins of *Salmonella typhimurium*.

Samrat Mukhopadhyay: Amyloids are ordered protein aggregates that are responsible for a range of debilitating diseases such as Alzheimer's, Parkinson's, Huntington's and prion diseases. Recent studies have revealed the (beneficial) functional roles of some special amyloids termed as functional amyloids. We have worked on two functional amyloids that are formed from intrinsically disordered proteins. Curli is a functional amyloid found in the extracellular matrix of enteric gram-negative bacteria. In general, the oligomeric intermediates accumulated during the amyloidogenesis are known to be toxic. The underlying mechanism by which bacteria allow the curli assembly on the surface and overcome the cytotoxicity associated with the amyloid intermediates remains elusive. We elucidated the mechanism of curli amyloidogenesis and provided the molecular insights into the strategy by which bacteria can potentially bypass the detrimental consequences of toxic amyloid intermediates. Our findings suggest that the electrostatic interaction between lipids and protein molecules play a pivotal role in efficiently sequestering the amyloid fold on the lipopolysaccharide membrane surface without significant accumulation of toxic oligomeric intermediates. In another part, we worked on the functional prion. The prion determinant of a yeast prion protein, Sup35^{NM}, assembles into β -rich amyloid fibrils that switch the non-prion [psi⁻] state to the prion [PSI⁺] state of yeast. In order to discern the residue-specific structural and dynamical attributes associated with the amyloids that display strain-diversity, we took advantage of non-occurrence of tryptophan in the NM-domain and created 18 single tryptophan variants spanning the entire polypeptide length. The fluorescence readouts from these locations reported the site-specific structural details in fibrils. Highly sensitive picosecond fluorescence depolarization measurements at these positions allowed us to construct a conformational mobility map. The altered local conformational dynamics in two distinct amyloid states provide molecular insights into the varied fragility and severing efficiency that govern the inheritance pattern of strong and weak prion strains. We have also initiated our work on liquid-liquid phase separation from low-complexity and prion-like domains.

Shashi Bhushan Pandit: The main research interest of our group is to explore the role of promiscuous enzymes in imparting robustness to metabolic networks. Additionally, we are interested in understanding structural aspects of enzyme promiscuity.

Microorganisms show diverse metabolic capability with remarkable resilience to both genetic and environmental perturbations. This metabolic robustness is usually attributed to the alternate pathways in the metabolic network that maintain the constant fluxes of essential metabolites. However, recent studies suggest that promiscuous activities of enzymes can facilitate fluxes through important metabolites. Promiscuous activities of enzymes refer to their adventitious secondary less efficient catalytic activities of enzymes apart from their physiologically specialized or evolved activity. To study the effect of enzyme promiscuity on metabolic networks, we are reconstructing metabolic networks including promiscuous reactions. Further, we are systematically investigating the role of structural and sequence properties of

enzymes or substrates binding sites, which confers them promiscuity. Recently, we have developed meta-predictor catalytic residues prediction method (CSmetaPred) to better characterize enzymes. For enzyme function classification, we have developed motif-based methods to classify enzymes into subfamilies. We have also used Molecular dynamics approach to unveil the molecular basis of enzyme functions.

Many enzymes are multi-domain proteins and experimental tertiary structures are not yet known for most multi-domain enzymes. For tertiary structure prediction of multi-domain enzymes, we are developing robust structure prediction method employing our recently developed structure prediction method TASSER (Threading ASSEMBly and Refinement). In this process, we have shown that domain-domain interfaces are structurally redundant and this can facilitate modelling of domain-domain interfaces in multi-domain proteins.

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: Our research focus on understanding the molecular mechanisms during zebrafish retina regeneration. We use various genetic, cell biological and pharmacological approaches to unravel the phenomena of retina regeneration. We also explore the regeneration with special reference to fundamental pathways such as Sonic hedgehog signalling, epigenome modifiers like histone deacetylases, proto-oncogene mycb, cytokines like Tgf-beta. We also explore the regenerating retina using holistic approaches such as RNAseq. Recently we are also interested in unravelling the regeneration enigma through chromatin interaction at various phases of regeneration, for which we employ a high throughput HiC analysis of retinal chromatin isolated from zebrafish

Sharvan Sehrawat: The lab is working on deciphering mechanisms and molecules in CD8 T cell differentiation during viral infections. We have shown the critical role of one of the regulator galectin-3 in induction of CD8 T cell responses. We also have demonstrated a differential effect of an immunosuppressive corticosteroid on naïve and activated CD8 T cells. In addition we have generated a phage display library of single domain antibodies that consists of more than 20million clones.

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: My research at IISER Mohali focuses on understanding the mechanisms regulating membrane trafficking towards lysosomes and lysosome positioning. Previously, we had delineated the mechanisms by which a conserved protein complex that mediates vesicle fusion with lysosomes is targeted to this compartment to mediate its endocytic function (Journal of Cell Science **2015**, 128(9):1746-1761; Cellular Logistics **2015**, 5(3):e1086501). More recently, we have resolved the mechanisms regulating localization and function of a lysosomal adaptor protein, mutation in which causes “osteopetrosis” wherein the process of bone resorption is impaired and results in increased bone density and skeletal abnormalities (Journal of Cell Biology **2017**, 216(4):1051-1070). My lab is also studying how intracellular pathogens modulate the host late endocytic machinery for their own growth and survival within their vacuolar niche inside the cells. We have recently reported that the causative agent of Salmonellosis- *Salmonella typhimurium* uses host late endosomal proteins to acquire both membranes and nutrition from the host late endosomes and lysosomes for its own intravacuolar replication (PLOS Pathogens **2017**, 13(10):e1006700. DOI: 10.1371/journal.ppat.1006700).

Ram Yadav: Elucidating the transcriptional gene regulation that underlie the development of multicellular organism is fundamental for understanding the mechanisms of cell and tissue specialization. *Arabidopsis* shoot apical meristem (SAM) is comprised of ~ 500 cells that are organized into three distinct zones. Stem cells reside in the central zone (CZ) and self-renew; however, their progenitors undergo cell proliferation and differentiation in the peripheral zone and underneath the CZ in the rib meristem, respectively. One of the key challenge is to decipher the gene regulatory networks (GRNs) that direct the self-renewal and differentiation of stem cells into distinct cell types in SAM. We have identified sixty-five transcription factors (TFs) from the epidermal and sub-epidermal cell types of SAM stem cell niche and characterized them to build a comprehensive GRN. In situ hybridization and promoter reporter studies revealed predominate spatiotemporal expression pattern of the TFs. To systematically map the interactions among the TFs (proteins) and their TF promoter DNA elements, a high throughput yeast-one-hybrid assay was developed. In total, 16250 protein-DNA interactions were setup involving 47 DNA baits and 327 TFs. We found 165 interactions between 37 regulatory elements and 53 TFs. Majority of the TFs that interacted with target promoters are broadly expressed. To determine the regulatory hierarchy and their function in development, we used both genetics and molecular biology approaches. We identified molecular phenotype for 75% of the interactions.

8.1.2 Visits of faculty members

- **Kavita Babu:**
 - Visited IISER Pune to give an invited talk at a workshop: CRISPR-Cas9 in *C. elegans* as part of a Workshop on CRISPR Cas9 that is part of the Indian Society for Developmental Biology (InSDB) meeting to be held at IISER, Pune, India in June 2017.
- **Manjari Jain.**
 - Visited National Centre for Biological Sciences, Bangalore during July 04 – 07, 2017
 - Visited Amity Institute of Wildlife Sciences, Noida during July 10 – 13, 2017
 - Visited Indian Academy of Science, Bangalore on February 19th, 2018
- **LOLITKA MANDAL**
 - Visited Centre for Genomic Regulation, Barcelona Spain. April 24-25, 2017.
 - Visited National Center for Cell Science (NCCS). May 22-24, 2017.
 - Visited Indian Institute of Science Education and Research Pune (IISER PUNE). June 24-27, 2017.
 - Visited the Biological Sciences and Bioengineering Department at IIT Kanpur. 15th and 16th December 2017.
- **SUDIP MANDAL**
 - National University of Singapore (NUS), Singapore.
 - Indian Institute of Science Education and Research Pune (IISER PUNE)
 - Indian Institute of Science Education and Research Bhopal (IISER BHOPAL)
- **Shravan Kumar Mishra**
 - Visited the University of Bayreuth, June 05-06, 2017.
- **Samrat Mukhopadhyay**
 - Department of Chemical Sciences, Indian Institute of Science Education and Research (IISER), Kolkata (March 2018)
 - Indian Institute of Technology Gandhinagar (March 2018)
 - Ahmedabad University (March 2018)
 - Department of Chemical and Systems Biology, Stanford University, USA (February 2018)
 - Department of Chemistry and Biochemistry, University of California Santa Barbara, USA (February 2018)
 - Department of Biomedical Engineering, Washington University in St. Louis, USA (February 2018)
 - Department of Biological Sciences, Indian Institute of Science Education and Research (IISER), Kolkata (January 2018)
 - Indian Association for the Cultivation of Science (IACS), Kolkata (January 2018)
 - Department of Chemical Engineering, Indian Institute of Science, Bangalore (August 2017)

- Department of Chemistry, University of Melbourne, Australia (April 2017)
- **Sharvan Sehrawat**
 - MHC tetramer technology to identify immunogenic epitopes for intracellular pathogens. In 30th annual conference of Indian Association of Veterinary Microbiologist, Immunologists and specialists in infectious diseases. Held at Nagpur Veterinary college, Nagpur Maharashtra. February, 10-13, 2017
 - Nuclear reprogramming: Redefining immune analysis. In the National Symposium on Recent trends in Regenerative Medicine. Held at Panjab University March 31, 2017.
 - Immunology: basic concepts and applications thereof. DAV college Chandigarh March 09, 2018.
- **Mahak Sharma.**
 - Visited Tata Institute of Fundamental Research (Mumbai) India, during December 21-23, 2017
 - Visited Institute of Life Sciences (Bhubaneswar) India, during December 11-13, 2017
 - Visited Department of Biochemistry and Molecular Biology, University of Nebraska Medical Center (Omaha) USA, during November 25-28, 2017
 - Visited Department of Genetics, University of Delhi South Campus (Delhi) India, during October 12-13, 2017
 - Visited Centre for Genomic Regulation (Barcelona) Spain during April 22-25, 2017
- **Ram Yadav**
 - Punjab Agricultural University Ludhiana visited on 24th April 2017.

8.1.3 Talks delivered

1. Kavita Babu: Invited talk: Invited speaker at the InSDB meeting to be held at IISER, Pune, India, June 2017.
2. Kavita Babu: Invited talk: Was invited to talk about our work on Wnt secretion at the TATA Institute of Fundamental Research (TIFR), Mumbai, India, October, 2017.
3. Kavita Babu: Invited talk: Was invited to talk about our work on CASY-1 and its isoform specific function in *C. elegans* at the 1st NGN meeting at IISER, Pune, October, 2017.
4. Kavita Babu: Invited talk: Was invited to talk about the role of Claudins in maintaining post-synaptic receptors work on at the *C. elegans* neuromuscular junction at the 2nd Indian Worm Meeting at NII, Delhi.
5. Yogesh Dahiya: Invited talk: Invited speaker at the CRISPR Cas9 Workshop preceding the InSDB meeting held at IISER, Pune, India, June 2017.
6. Yogesh Dahiya: Invited talk: Invited speaker at the 1st NGN meeting held at IISER, Pune, India, October 2017
7. Shruti Thapliyal: Invited talk: Selected speaker at the 2nd Indian Worm Meeting at NII, Delhi, February, 2018.

8. Anand K Bachhawat: JV Bhat Memorial Lecture, CFTRI, Mysore, Nov 2017
9. Anand K Bachhawat: Indian Association for the Cultivation of Science, Dec 2017
10. Anand K. Bachhawat: Indian Institute of Sciences, Bangalore, January 2018
11. Anand K Bachhawat: CHASSCON, Chandigarh,
12. Samarjit Bhattacharyya: Metabotropic Glutamate Receptor trafficking: Ins and Outs, Neurogroup meeting at Khandala, Maharashtra, September 8, 2017.
13. Rachna Chaba: Systems-level analysis of non-fermentable carbon sources in *E. coli* reveals that ubiquinone is a key antioxidant for metabolism of long chain fatty acids. Symposium on "Novel Innovations in Biochemistry" organized by the Department of Biochemistry, Panjab University, India: Dec 22, 2017.
14. Kausik Chattopadhyay: Invited lecture at the Saha Institute of Nuclear Physics, Kolkata on 20th November, 2017.
15. Kausik Chattopadhyay: Invited lecture at the Department of Biochemistry, Calcutta University on 19th November, 2017.
16. Kausik Chattopadhyay: Invited lecture at the Department of Biochemistry, Indian Institute of Science (IISc) Bangalore on 21st November, 2017.
17. Kausik Chattopadhyay: Invited speaker in 86th Conference of Society of Biological Chemists (SBC) India, held at Jawaharlal Nehru University (JNU), New Delhi, during 16-19 November, 2017.
18. Manjari Jain: Bioacoustics in ecology. DST-SERB School in Chemical Ecology, National Centre for Biological Sciences, Bangalore. July 6th, 2017.
19. Manjari Jain: Understanding animal behaviour through sensory ecology. Maulana Azad College, Kolkata, July 2017.
20. Manjari Jain: Not just a number: Influence of age, size and weight on aggression in male crickets. 41st meeting of Ethological Society of India, Gujarat Institute of Desert Ecology, Bhuj, November 24th, 2017.
21. Manjari Jain: Understanding the causes and consequences of animal behaviour. DST-Inspire Camp. HNB Garhwal University, Srinagar. December 12th, 2017.
22. Mahendran V: How costly is it, to defend of females for a harem male? Effect of female group size in harem forming short-nosed fruit bat, *Cynopterus sphinx*. 41st meeting of Ethological Society of India, Gujarat Institute of Desert Ecology, Bhuj, November 24th, 2017.
23. Nakul Raj: Repertoire of vocalization and diel rhythm of behaviours of Common Myna (*Acridotheres tristis*). 41st meeting of Ethological Society of India, Gujarat Institute of Desert Ecology, Bhuj, November 24th, 2017.
24. Richa Singh: Talks get hotter: Effect of temperature on the song parameters of the field cricket, *Acanthogryllus asiaticus* 41st meeting of Ethological Society of India, Gujarat Institute of Desert Ecology, Bhuj, November 24th, 2017.
25. Sonam Chorol: Complex communication and heterospecific signal recognition in a social passerine. 41st meeting of Ethological Society of India, Gujarat Institute of Desert Ecology, Bhuj, November 24th, 2017.

26. Sonam Chorol: Heterospecific signal recognition and response in two social passerine species. YETI 2018, MS University, Baroda, January 25th, 2018.
27. Lolitika Mandal: EMBO Young Scientist networking Meeting 2017. Centre for Genomic Regulation, Barcelona Spain. April 24-25, 2017.
28. Lolitika Mandal: 3rd Mini-Symposium on Cell Biology at National Center for Cell Science (NCCS). May 22-24, 2017.
29. Lolitika Mandal: Indian Society of Developmental Biologist Biennial Meeting 2017. Indian Institute of Science Education and Research Pune (IISER PUNE). June 24-27, 2017.
30. Lolitika Mandal: "Developmental insights into disease mechanisms" organized by The Biological Sciences and Bioengineering Department at IIT Kanpur. 15th and 16th December 2017.
31. Lolitika Mandal: An Indo-Israeli symposium on "Recent advances in molecular genetics with new biomedical insights" under the bilateral co-operation between INSA and the Israeli Academy of Sciences, INSA February 12-13, 2018
32. Sudip Mandal: 18th International Congress of Developmental Biology at National University of Singapore (NUS) Singapore. 18-22 June 2017.
33. Sudip Mandal: Metabolism and Mitochondria Network Meeting at IISER Pune. 10-11 November, 2017.
34. Sudip Mandal: 3rd Biennial Indian Drosophila Research Conference at IISER Bhopal. 6-9 December, 2017.
35. Shravan Kumar Mishra: Institute of Life Sciences (ILS) Bhubaneswar, India, July 2017
36. Shravan Kumar Mishra: Amar Klar Memorial Symposium, IMTECH Chandigarh, April, 26, 2017
37. Prashant Arun Pandit: 9th RNA Group Meet, BHU, Varanasi, Oct. 26-29, 2017.
38. Arunika Mukhopadhyaya: Delivered an invited lecture in the Second Annual Meeting on "Infectious Diseases" at the Centre for Infectious Disease Research (CIDR), IISc on 23rd Nov 2017
39. Arunika Mukhopadhyaya: Delivered an invited lecture in the 'Immunocon 2017', the 44th annual conference of the Indian Immunological Society (IIS) at Institute of Science, Nirma University, Ahmedabad on 14th-16th December, 2017
40. Samrat Mukhopadhyay: Department of Chemical Sciences, Indian Institute of Science Education and Research (IISER), Kolkata (March 2018)
41. Samrat Mukhopadhyay: Indian Institute of Technology Gandhinagar (March 2018)
42. Samrat Mukhopadhyay: Ahmedabad University (March 2018)
43. Samrat Mukhopadhyay: Department of Chemical and Systems Biology, Stanford University, USA (February 2018)
44. Samrat Mukhopadhyay: Department of Chemistry and Biochemistry, University of California Santa Barbara, USA (February 2018)
45. Samrat Mukhopadhyay: Department of Biomedical Engineering, Washington University in St. Louis, USA (February 2018)

46. Samrat Mukhopadhyay: Department of Biological Sciences, Indian Institute of Science Education and Research (IISER), Kolkata (January 2018)
47. Samrat Mukhopadhyay: Indian Association for the Cultivation of Science (IACS), Kolkata (January 2018)
48. Samrat Mukhopadhyay: Department of Chemical Engineering, Indian Institute of Science, Bangalore (August 2017)
49. Samrat Mukhopadhyay: CRSI-ACS joint meeting at IICT Hyderabad (July 2017)
50. Samrat Mukhopadhyay: Department of Chemistry, University of Melbourne, Australia (April 2017)
51. Sharvan Sehrawat: MHC tetramer technology to identify immunogenic epitopes for intracellular pathogens. In 30th annual conference of Indian Association of Veterinary Microbiologists, Immunologists and specialists in infectious diseases. Held at Nagpur Veterinary college, Nagpur Maharashtra. February, 10-13, 2017
52. Sharvan Sehrawat: Nuclear reprogramming: Redefining immune analysis. In the National Symposium on Recent trends in Regenerative Medicine. Held at Panjab University March 31, 2017.
53. Sharvan Sehrawat: Immunology: basic concepts and applications thereof. DAV college Chandigarh March 09, 2018.
54. Mahak Sharma: Current Trends in Intracellular Transport and Molecular Motors, IIT (Mumbai) and TIFR (Mumbai) India, December 21-23, 2017.
55. Mahak Sharma: India EMBO Autophagy Symposia, Institute of Life Sciences, (Bhubaneswar) India, December 11-13, 2017.
56. Mahak Sharma: Department of Biochemistry and Molecular Biology, University of Nebraska Medical Center (Omaha) USA, November 25-28, 2017.
57. Mahak Sharma: Cell Fate and Signaling Symposium, Department of Genetics, University of Delhi South Campus (Delhi) India, October 12-13, 2017.
58. Mahak Sharma: Young Scientist Networking Meeting, Centre for Genomic Regulation (Barcelona) Spain, April 22-25, 2017.
59. Ram Yadav: Gene regulatory network of epidermal and sub-epidermal cell population enriched transcription factors revealed regulatory hierarchies underlying cell proliferation and cell differentiation, 8th Ramalingaswami Conclave 15th - 17th February, 2018.
60. Ram Yadav: Gene regulatory network of epidermal and sub-epidermal cell population enriched transcription factors revealed regulatory hierarchies underlying the cell proliferation and differentiation in shoot apex. International Conference on Plant Development Biology and 3rd National Meeting on Arabidopsis Research at NISER Bhubaneswar 12-16 December 2017.
61. Ram Yadav: Understanding the inner functioning of Arabidopsis shoot apical meristem. 24th April 2017. Punjab Agricultural University Ludhiana.

8.1.4 Conferences attended by researchers

- **Kavita Babu**

- InSDB meeting to be held at IISER, Pune, India, June 2017.
- 1st NGN meeting at IISER, Pune, October, 2017.
- 2nd Indian Worm Meeting at NII, Delhi, February 2018.
- Gordon Research Conference (GRC) Meeting on Excitatory Synapses at Les Diablerets, Switzerland, May 2017.
- YOGESH DAHIYA- NGN meeting held at IISER, Pune, India, October 2017
- PRATIMA SHARMA- 2nd Indian Worm Meeting at NII, Delhi, February 2018.
- SHRUTI THAPLIYAL- 2nd Indian Worm Meeting at NII, Delhi, February 2018.
- SHWANI BHARDWAJ- 2nd Indian Worm Meeting at NII, Delhi, February 2018.
- PALLAVI SHARMA- 2nd Indian Worm Meeting at NII, Delhi, February 2018.
- VINA TIKIYANI- 2nd Indian Worm Meeting at NII, Delhi, February 2018.
- NAGESH KADAM- 2nd Indian Worm Meeting at NII, Delhi, February 2018.
- ANURADHA SINGH- 2nd Indian Worm Meeting at NII, Delhi, February 2018.

- **Anand K Bachhawat**

- Yeast Biology Conference, JNU, Feb 8-10, 2018

- **Samarjit Bhattacharya**

- Dr. Samarjit Bhattacharyya. Neurogroup meeting at Khandala, Maharashtra, September 8-9, 2017.
- Ravinder Gulia. Society for Neuroscience meeting: November 11-15, 2017. Washington DC, USA.
- Rohan Sharma. IBRO/APRC neuroscience meeting. October 12, 2017. Panjab University, Chandigarh.
- Prachi Ojha. IBRO/APRC neuroscience meeting. October 12, 2017. Panjab University, Chandigarh.
- Mekhla Rudra: IBRO/APRC neuroscience meeting. October 12, 2017. Panjab University, Chandigarh.
- Mekhla Rudra: GIAN course on "Neuropharmacology of Addiction", October 9th-October 13th, 2017. Panjab University, Chandigarh.

- **Rachna Chaba**

- Symposium on "Novel Innovations in Biochemistry". Dec 22, 2017. Department of Biochemistry, Panjab University, India

- **Kausik Chattopadhyay**

- 7th Congress of European Microbiologists (FEMS 2017 Congress)" held in Valencia, Spain,

during July 9-13, 2017.

- **Manjari Jain**

- Manjari Jain, Mahendran V, Richa Singh, Soniya Yambem, Sonam Chorol, Lata Kalra, Anindya Chaudhuri, Nakul Raj: 26th meeting of the International Bioacoustics Congress, Haridwar, India October 8 – 13, 2017.
- Esha Haldar, Mukul Gupta: International Conference in Zoological Sciences and Ants, Punjabi University, Patiala October 26 – 28, 2017
- Manjari Jain, Mahendran V, Richa Singh, Sonam Chorol, Nakul Raj: 41st meeting of Ethological Society of India, Gujrat Institute of Desert Ecology, Bhuj, November 24– 25, 2017.
- Sonam Chorol: YETI 2018, M S U, Baroda, January 22 – 25, 2018.

- **Lolitika Mandal**

- Lolitika Mandal. EMBO Young Scientist networking Meeting 2017. Centre for Genomic Regulation, Barcelona Spain. April 24-25, 2017.
- Lolitika Mandal. 3rd Mini-Symposium on Cell Biology at National Center for Cell Science (NCCS). May 22-24, 2017.
- Lolitika Mandal. Indian Society of Developmental Biologist Biennial Meeting 2017. Indian Institute of Science Education and Research Pune (IISER PUNE). June 24-27, 2017.
- Lolitika Mandal. “Developmental insights into disease mechanisms” organized by The Biological Sciences and Bioengineering Department at IIT Kanpur. 15th and 16th December 2017.
- Lolitika Mandal. An Indo-Israel symposium on “Recent advances in molecular genetics with new biomedical insights” under the bilateral co-operation between INSA and the Israeli Academy of Sciences, INSA February 12-13, 2018

- **Sudip Mandal**

- 18th International Congress of Developmental Biology at National University of Singapore (NUS) Singapore. 18-22 June 2017.
- Metabolism and Mitochondria Network Meeting at IISER Pune. 10-11 November, 2017.
- **3rd Biennial Indian Drosophila Research Conference at IISER Bhopal. 6-9 December, 2017.**

- **Shravan Kumar Mishra**

- Shravan Kumar Mishra: Amar Klar Memorial Symposium, IMTECH Chandigarh, April, 26, 2017.
- Shravan Kumar Mishra: RNA2017 Annual Meeting of the RNA Society, Prague, Czech Republic, May 30 – June 03, 2017.
- Shravan Kumar Mishra: EMBO conference: Ubiquitin and SUMO: From Molecular mechanisms to system-wide responses, Cavtat-Dubrovnik, Croatia, Sept. 15-19, 2017.
- Shravan Kumar Mishra: Professor Stefan Jentsch Memorial Symposium, Max Planck Institute of Biochemistry, Martinsried/Munich, Oct. 17, 2017.
- Shravan Kumar Mishra: 9th RNA Group Meet, BHU, Varanasi, Oct. 26-29, 2017.

- Poulami Choudhuri: Amar Klar Memoriam Symposium, IMTECH Chandigarh, April, 26, 2017.
- Poulami Choudhuri: 28th International Conference on Yeast Genetics and Molecular Biology, Prague, Czech Republic, Aug. 27 – Sept. 01, 2017.
- Poulami Choudhuri: 9th RNA Group Meet, BHU, Varanasi, Oct. 26-29, 2017.
- Poonam: Amar Klar Memoriam Symposium, IMTECH Chandigarh, April, 26, 2017.
- Poonam: The EMBO Conference: Nuclear Structure & Dynamics, L'Isle sur la Sorgue, France, Oct. 04-08, 2017.
- Poonam: 9th RNA Group Meet, BHU, Varanasi, Oct. 26-29, 2017.
- K. Kiran Kumar: Amar Klar Memoriam Symposium, IMTECH Chandigarh, April, 26, 2017.
- K. Kiran Kumar: MaxQuant Summer School Course “Computational Mass Spectrometry-based Proteomics – Quantitative proteomics applied to sciences and systems biology”, Berlin, Germany, July 03-07, 2017.
- K. Kiran Kumar: Har Gobind Khorana Memorial Symposium: Genes, Genomes and Membrane Biology, NABI Mohali, Dec. 03-05, 2017.
- Rakesh P.: 9th RNA Group Meet, BHU, Varanasi, Oct. 26-29, 2017.
- Rakesh P.: International Congress of Cell Biology, CCMB, Hyderabad, Jan. 27-31, 2018.
- Prashant A. Pandit: EMBO conference: Ubiquitin and SUMO: From Molecular mechanisms to system-wide responses, Cavtat-Dubrovnik, Croatia, Sept. 15-19, 2017.
- **Arunika Mukhopadhyaya**
 - 7th Congress of European Microbiologists (FEMS 2017 Congress) held in Valencia, Spain, during July 9-13, 2017.
- **Samrat Mukhopadhyay**
 - 62nd Annual Meeting of Biophysical Society, San Francisco, USA (February 2018)
 - CRSI-ACS joint meeting at IICT Hyderabad (July 2017).
- **Sharvan Sehrawat**
 - 30th annual conference of Indian Association of Veterinary Microbiologist, Immunologists and specialists in infectious diseases. Held at Nagpur Veterinary college, Nagpur Maharashtra. February, 10-13, 2017
 - National Symposium on Recent trends in Regenerative Medicine. Held at Panjab University March 31, 2017.
 - Kaur M, Kumar D, Buti, V, Estaban, E, Fink G, Ploegh HL and Sehrawat S (2017) Galectin-3 regulates anti-gamma herpes virus specific CD8+ T cells. International conference on vaccine research and development, Held at ICEGB Delhi.
- **Mahak Sharma**
 - Shalini Rawat, International Congress of Cell Biology, Hyderabad (India), January 2018.
 - Devashish Dwivedi, International Congress of Cell Biology, Hyderabad (India), January 2018.

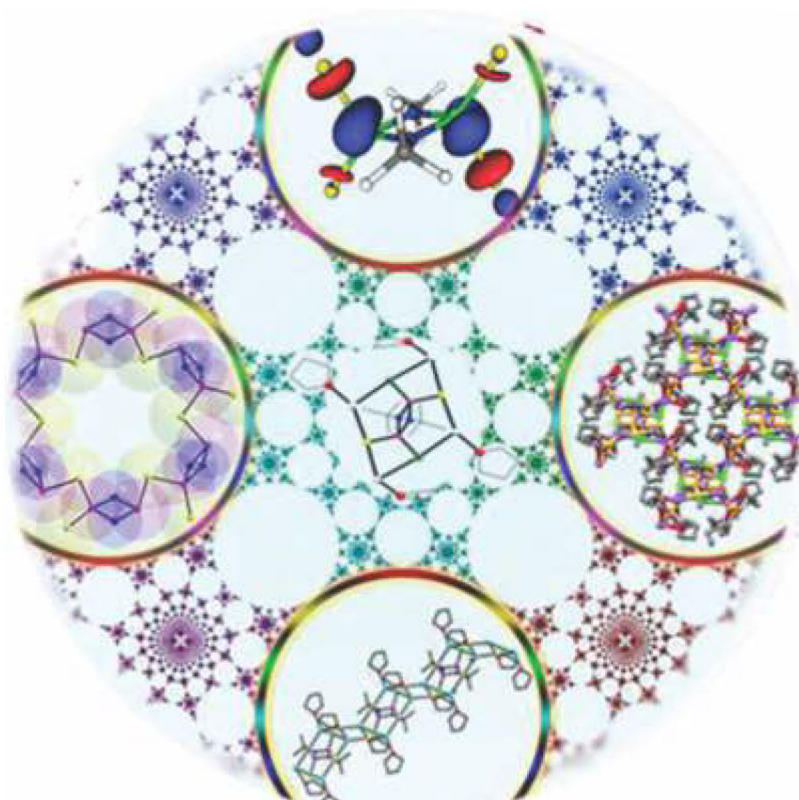
- Aastha Sindhvani, International Congress of Cell Biology, Hyderabad (India), January 2018.
- Devashish Dwivedi, Current Trends in Intracellular Transport and Molecular Motors, IIT (Mumbai)
- and TIFR (Mumbai) India, December 2017.
- Rituraj Marwaha, American Society for Cell Biology Meeting (USA), December 2017.
- Mahak Sharma, American Society for Cell Biology Meeting (USA), December 2017.
- Devashish Dwivedi, EMBO Conference- Centrosomes and Spindle Pole Bodies (Germany), September 2017.
- Aastha Sindhvani, EMBO Conference-Endocytic trafficking and signaling in health and disease (Poland), September 2017.
- Devashish Dwivedi, "Cell cycle inside out" (France), September 2017.
- **Ram Yadav**
 - 8th Ramalingaswami Conclave at NIPGR, New Delhi, 15th - 17th February, 2018.
 - International Conference on Plant Development Biology and 3rd National Meeting on Arabidopsis Research at NISER Bhubaneswar 12-16 December 2017.

8.1.5 Publications: Biological Sciences

- [1] Shruti Thapliyal, Amruta Vasudevan*, Yongming Dong*, Jihong Bai, Sandhya P. Koushika and **Kavita Babu**© (2018); The C-terminal of CASY-1/Calsyntenin regulates GABAergic synaptic transmission at the *Caenorhabditis elegans* neuromuscular junction. PLoS Genetics 2018 Mar; 14(3): e1007236. <http://journals.plos.org/plosgenetics/article?id=10.1371/journal.pgen.1007263> indicates equal contribution and © indicates corresponding author
- [2] **AK Bachhawat** and S Yadav. The glutathione cycle: Glutathione metabolism beyond the γ -glutamyl cycle. IUBMB Life. doi: 10.1002/iub.1756, 2018.
- [3] AA Deshpande, A. Shukla and **Bachhawat AK**. A Genetic Screen for Investigating the Human Lysosomal Cystine Transporter, Cystinosis. Sci Rep. 8(1):3442. doi: 10.1038/s41598-018-21483-x, 2018.
- [4] Choudhary P, Kumar S, **Bachhawat AK**, Pandit SB CSmetaPred: a consensus method for prediction of catalytic residues. BMC Bioinformatics. 18(1):583. doi: 10.1186/s12859-017-1987-z, 2017
- [5] Deshpande AA, Sharma M, **Bachhawat AK**. Insights into the molecular basis for substrate binding and specificity of the fungal cystine transporter CgCYN1. Biochim Biophys Acta., 1859(11):2259-2268, 2017.
- [6] Agrawal, S., # Jaswal, K., # Shiver, A. L., Balecha, H., Patra, T. and **Chaba, R.** (2017). "A genome-wide screen in *Escherichia coli* reveals that ubiquinone is a key antioxidant for metabolism of long-chain fatty acids" J. Biol. Chem. Vol. 292, no. 49, pp 20086-20099. # equal contribution
- [7] Aggarwal P, Gera J, Ghosh S, Mandal L, **Mandal S.** "Noncanonical Decapentaplegic Signaling Activates Matrix Metalloproteinase 1 To Restrict Hedgehog Activity and Limit Ectopic Eye Differentiation in *Drosophila*." Genetics. 2017 Sep; 207(1):197-213.

- [8] Thakran, P.* , Pandit, P.A.* , Datta, S., Kolathur, K.K., Pleiss, J.A., and **Mishra, S.K.****(2018). Sde2 is an intron-specific pre-mRNA splicing regulator activated by ubiquitin-like processing. The EMBO Journal 37: 89-101. DOI 10.15252/embj.201796751. (*Co-first authors, **Corresponding author)
- [9] **Mishra, S.K.**** and Thakran, P. (2018). Intron specificity in pre-mRNA splicing. Current Genetics. DOI: <https://doi.org/10.1007/s00294-017-0802-8>(**Corresponding author)
- [10] "Electrostatic lipid-protein interactions sequester the curli amyloid fold on the lipopolysaccharide membrane surface" H.M. Swasthi & **S. Mukhopadhyay*** J. Biol. Chem. 2017, 292, 19861-19872.
- [11] "Detergent-induced Aggregation of an Amyloidogenic Intrinsically Disordered Protein" S. Arya, P. Dogra, N. Jain & **S. Mukhopadhyay*** J. Chem. Sci. 2017, 129, 1817-1827.
- [12] "Site-Specific Fluorescence Depolarization Kinetics Distinguishes the Amyloid Folds Responsible for Distinct Yeast Prion Strains" D. Narang, H.M. Swasthi, S. Mahapatra & **S. Mukhopadhyay*** J. Phys. Chem. B. 2017, 121, 8447-8453.
- [13] P. Choudhary, S. Kumar, A. K. Bachhawat, **S. B. Pandit** "CSmetaPred: a consensus method for prediction of catalytic residues". BMC Bioinformatics. 18(1):583. doi: 10.1186/s12859-017-1987-z
- [14] Simran Kaur, Shivangi Gupta, Mansi Chaudhary, Mohammad Anwar Khursheed, Soumitra Mitra, Akshai Janardhana Kurup, **Rajesh Ramachandran**. "let-7 MicroRNA-Mediated Regulation of Shh Signaling and the Gene Regulatory Network Is Essential for Retina Regeneration" Cell Reports, vol. 23, no. 5, pp 1409-1423.
- [15] **Sehrawat S*** and Rouse BT (2017) Interplay of regulatory T cells and Th17 cells during infectious diseases of Humans and animals. Front. Immunol. 8: 341. (Impact factor 6.4)
- [16] **Sehrawat S*** and Rouse BT (2017) Immunity to Infections. In Encyclopedia of Life Sciences. John Wiley and Sons, Ltd: Chichester. DOI: 10.1002/9780470015902.a0000478.pub3
- [17] Aastha Sindhwani, Subhash B. Arya, Harmeet Kaur, Divya Jagga, Amit Tuli and **Mahak Sharma**. Salmonella exploits the host endolysosomal tethering factor HOPS complex to promote its intravacuolar replication. PLOS Pathogens, 13(10):e1006700. DOI: 10.1371/ journal.ppat.1006700 (2017).
- [18] The findings of this research were covered in various online news media websites including "The Hindu" News Link: <http://www.thehindubusinessline.com/news/science/scientists-decipher-how-salmonella-survives-in-human-cells/article9950974.ece>
- [19] "IndiaScience Wire (Vigyan Prasar)" NewsLink: http://vigyanprasar.gov.in/isw/salmonella_survives_story.html
- [20] "SciSOUP" News Link: <http://www.scisoup.com/2017/11/scientists-decipher-how-salmonella.html> "Wellcome Trust/DBT India Alliance" News Link: <http://www.wellcomedbt.org/news/185>
- [21] Rituraj Marwaha and **Mahak Sharma**. DQ-Red BSA trafficking assay in cultured cells to assess cargo delivery to lysosomes. Bio-protocol, 7(19): e2571. DOI: 10.21769/BioProtoc.2571 (2017).

- [22] **Mahak Sharma**. Cell scientist to watch. *Journal of Cell Science*, 130: 3423-3425; doi: 10.1242/jcs.209528 (2017).
- [23] Rituraj Marwaha, Subhash B. Arya, Divya Jagga, Harmeet Kaur, Amit Tuli, and **Mahak Sharma**. The Rab7 effector PLEKHM1 binds Arl8b to promote cargo traffic to lysosomes. co-corresponding author. *Journal of Cell Biology*, 216(4):1051-1070 (2017).
- [24] Kumari, A., Kishor, N., **Guptasarma, P.** (2018) Characterization of a mildly alkalophilic and thermostable recombinant *Thermus thermophilus* laccase with applications in decolourization of dyes. *Biotechnol Lett.* 40, 285-295.
- [25] Sharma, P., **Guptasarma, P.** (2017). Endoglucanase activity at a second site in *Pyrococcus furiosus* triosephosphate isomerase-Promiscuity or compensation for a metabolic handicap? *FEBS Open Bio.* 7, 1126-1143.



8.2 DEPARTMENT OF CHEMICAL SCIENCES

8.2.1 Summary of the research work

Bimalendu Adhikari: In the first project, we worked on biologically occurring G-quartet based self-assembly where guanosine (G) molecule forms self-healing hydrogels under suitable conjugation. In this context, we have functionalized guanosine to stimuli-responsive moieties for making responsive G-quartet which ultimately leads to the realization of smart and responsive soft materials. In the second project, we exploited the ferrocene moiety as a scaffold for supramolecular chemistry and tuning the peptide conformation. The concept is based on the fact that in ferrocene, the two cyclopentadienyl rings can rotate and the distance between them is 3.3 Å which is ideal for pi-pi stacking between the attached aromatic moieties and suitable the formation of intramolecular hydrogen bond between the attached peptide. It was found that the attachment of amino acids to ferrocene-diamine results in the formation of strong intramolecular interstrand H-bonds and nucleate beta-turn like conformation affording helically chiral peptides. In the third project, we aim to develop a general approach for the bio-functionalization of nanomaterials is expected to massively expand opportunities for nanomaterials in areas where they are to be interfaced with biological systems. The idea is based on a system displays a large number of peptides in a reaction system, called a dynamic peptide library. As the first step under this objective, we have synthesized several short peptides that are required for making dynamic library. Peptides are

synthesized using solution phase methodology rather than solid phase as to enable larger scale which is helpful to optimize the enzyme driven dynamic peptide library method. All peptides are purified using column chromatography and are fully characterized by mass spectrometry as well as NMR spectroscopy. Next, these peptides will be tested for the construction of dynamic peptide library assisted by some selected enzymes where the resulting product peptides will be purified using HPLC.

Debashis Adhikari: The group is involved in exploring redox innocence of several ligand backbones and use this property to develop base-metal catalysts for organic reactions. The newly synthesised complexes are potential surrogates for known catalysts comprising of toxic, expensive, less-abundant heavy metals such as Pd, Rh, Pt, Ir etc.

R. Vijaya Anand: Our research group recently developed an organocatalytic approach towards -arylated nitriles using N-heterocyclic carbene (NHC) as a catalyst. -Aryl nitriles have been emerged as one of the essential architectural motifs, often found in many pharmaceuticals and biologically active natural molecules. This protocol, which we developed, comprises an NHC catalyzed activation of $\text{Me}_3\text{Si-CN}$ followed by 1,6-conjugate addition of cyanide to para-quinone methides (p-QMs) and fuchsones leading to -diaryl- and -triaryl nitriles in good to excellent yields (Org. Lett. **2017**, 19, 1982). We have also developed another protocol by using bis(amino)cyclopropenylidene (BAC) as a non-covalent Bronsted base catalyst in the conjugate addition of carbon nucleophiles to p-quinone methides and enones. This protocol allowed us to access a wide range of unsymmetrical diaryl- and triarylmethane derivatives in good to excellent yields (Org. Biomol. Chem. **2018**, 16, 384). Very recently, we have explored bis(amino)cyclopropenylidene (BAC) as a nucleophilic organocatalyst in intermolecular Rauhut-Currier reaction between α,β -unsaturated carbonyl compounds and para-quinone methides. Through this method, we could effectively access vinyl diarylmethanes in good yields (J. Org. Chem. **2018**, 83, 4213). Apart from organocatalytic transformations, our group also developed a metal catalysed reduction of p-quinone methides and fuchsones to the corresponding diaryl- and triarylmethane derivatives using Hantzsch ester as a reducing agent (Org. Biomol. Chem. **2017**, 15, 8393). In line with this concept, another method was developed based on Cu-catalyzed domino cyclization of 2-(2-ethynyl)-pyridines to access indolizine containing diaryl- and triarylmethanes (Asian J. Org. Chem. **2017**, 6, 1857). Moreover, our group recently developed a TfOH catalysed 1,6-conjugate addition of thiols to p-quinone methides under continuous-flow conditions using microreaction technology (Eur. J. Org. Chem. **2017**, 3716).

Arulananda BabuSrinivasarao: The primary goals of the Dr. Babu lab's research are development of stereoselective C-H activation reactions and synthetic methods for synthesizing medicinally important synthetic building blocks and biologically active small molecules. Along this line, the group is actively involved in synthesizing various bio-active macromolecules and unnatural amino acid and peptide scaffolds. The group has published several papers, which include the synthesis of functionalized cyclopropane, cyclobutane, norlignan-type tetrahydrofuran and neolignan-type 1,4-benzodioxane, cinnamamide, allylamine and various aliphatic carboxamide scaffolds. Recently, the group reported the Pd (II)-catalyzed C-H activation route-based synthesis of arylheteroarylmethane and pyrrolidone ring annulated furan/thiophene scaffolds and Z-cinnamylamines (J. Org. Chem. **2017**, 82, 7123 and J. Org. Chem. **2017**, 82, 6550).

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 $1 \times 10^{14} \text{ W/cm}^2$, (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 a unique feature of this group for crystallization of materials having low (< 20°C), very low (< -20°C) and ultra-low (< -40°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: Ultrafast non-linear spectroscopy, fluorescence microscopy, optical trapping.

Ujjal K. Gautam: Gautam has been working on use of nanomaterials as heterogeneous catalysts. During this period, Pd, oxide and metal-free carbon based new catalysts have been developed and their photocatalytic activities have been studied. These investigations are running in parallel, with promising results and are expected to have some conclusions soon.

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, AFM 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) and Covalent Organic Frameworks (COFs) 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 has been involved with some current issues in the fields of (a) energy and environments focused on (i) selective gas adsorption studies for storage of hydrogen and methane (next generation fuels), (ii) carbon dioxide capture and chemical fixation (lowering greenhouse effect) and (iii) chormogenic and/or fluorogenic sensing of the cations, anions and neutral small molecules (specifically nitroaromatic explosives) at the ppm or ppb level, (b) heterogeneous catalysis in the C-C and C-N bond forming transformations, (c) molecular recognition namely, (i) fluorescence based decoding strategies for solvents and VOCs and (ii) nanoscale drug delivery at physiological conditions, (d) metal-oxide and metal-sulphide nanomaterials for their applications in luminescence, photocatalysis and quantum dots, and (e) crystal engineering for guest encapsulation and exploring rare hydrogen bonding synthons (amide-pseudo amide, for example).

Debrina Jana: Perovskite nanocrystals have been emerged as a promising candidate in optoelectronic processes due to their defect tolerant nature and they show high photoluminescence quantum yield, high charge-carrier mobility paving a way for efficient LED, solar cells and photovoltaics. Perovskite nanocrystals synthesized by wet chemical method are very much prone to be affected by air, moisture etc and are generally synthesized in inert atmosphere. So, stability of perovskite nanocrystals has been a major concern for real world applications in spite of their high quantum yield. Our main goal is to produce stable all inorganic and inorganic-organic mixed perovskite nanocrystals inside a mesoporous network keeping in view real world applications. So far, we have achieved improved stability of iodine rich perovskite nanocrystals of more than 4 months at room temperature in air. Band gap tunability over the visible spectral range has been achieved by the exchange of anion (halide counterpart) of the solid perovskite nanocrystal. Quantum confinement inside the mesoporous matrix, characterization of nanocrystals confined in mesoporous oxide host, photophysical study consisting of pore size dependent photoluminescence property, photoluminescence decay dynamics, quantum yield measurement and finally lab scale demonstration of luminescent perovskite nanocrystals incorporated mesoporous oxide film for solar cell and backlit display are being carried out.

In another work, we have showed that mesoporous template can act as breeding ground for the generation of anisotropic Pt nanocrystals. Systematic investigation has been carried out to understand the mechanism of formation of these anisotropic nanoparticles inside the porous network. Keeping in view the excellent catalytic capability of Pd nanoparticles, effort was given to prepare Pd nanoparticles of different shapes and morphologies, characterization, understanding the shape conversion mechanism and finally study their structure property relationship. Different capping agents as well as reducing agents

were explored to achieve tunability of the shape and morphology. Furthermore, shape-catalytic activity relation of Pd nanoparticles has been examined in Suzuki Miyaura coupling reaction.

Santanu K. Pal: Synthesis of room temperature discotic nematic liquid crystals for display applications: Disc shaped molecules showing nematic phase are rare but of utmost importance for the advancement of contemporary display devices. Dr. Pal and his group have engineered new discotic dyads showing the discotic nematic phase at room temperature explored by voltage- and temperature-dependent dielectric and birefringence studies for promising materials as display device materials and also point the way towards development of new anisotropic soft materials. For the 1st time, their group have designed and synthesized a room-temperature discotic nematic liquid crystal made of gold nanoparticles (Chem. Commun., 2017, 53, 3014; J. Mater. Chem. C, 2018, 6, 2303; Langmuir 2017, 33, 13849; Chem. Eur. J. 2017, 23, 10626).

- **New design of discotic materials for charge carrier mobility measurement and OLEDs device:** Fabrication of blue OLEDs based on discotic LCs are of immense importance. Dr. Pal and his group have developed columnar LC materials by utilizing oligo(phenylenevinylene) (OPV) and s-heptazine as a platform to yield a series of efficient deep-blue emitters. Fabricated OPV-based DLC emitters have achieved the best performance reported till date with external quantum efficiency (EQE) of 4.1% as OLED device (Chem. Eur. J. 2017, 23, 14718).
- **Modulated Bent-Core Liquid Crystals for electro-optic devices:** Bent-core LCs with modulated chemical architecture has been developed that are shown to exhibit different chiral phases along with antiferro-electric order of packing and thermochromic behaviour for electro-optic devices and temperature sensing applications (Chem. Commun., 2018, 54, 3452; New J. Chem., 2017, 41, 5403).
- **Covalent Organic Framework for catalysis and humidity sensing:** Truxene based novel covalent organic frameworks (COFs) with boronic ester linkage having a surface area of 1526 m² g⁻¹, have been developed. This COF based % RH sensor exhibits a change of 3 orders of magnitude in impedance in the 11–98% RH range, with response and recovery times of 37 s and 42 s, respectively. (J. Mater. Chem. A, 2017, 5, 21820; ACS Catalysis, 2018, ASAP).

Liquid Crystal based Sensing Technology towards biosensing and improvement of healthcare

- Novel design of poly-(lysine)-coated liquid crystal droplets that can sense cell and DNA through transition in topological defects and can be used in drug delivery application (J. Phys. Chem. B, 2017, 121, 4247; ACS Omega, 2017, 2, 7936).
- A novel design and fabrication of liquid crystal based sensing device using a smartphone which can affordably be used to detect toxins and biomarker and can improve health care services (Analyst, 2018, 143, 1046).
- Deposition of amyloids is implicated in many devastating neurodegenerative diseases like Alzheimer's, Parkinson's diseases and prion based encephalopathies. The commonly used biophysical techniques to study protein aggregation require high protein concentration which is generally far from physiological concentration. A liquid crystal based novel sensitive and inexpensive technique is designed and fabricated to better understand the oligomerization and aggregation of proteins in a low concentration regime (manuscript submitted).

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) surfacemodification 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.

Raj Kumar Roy: Our research group is multi-disciplinary in nature and situated at the interface of Organic, Physical and Material Chemistry. As a Polymer Chemistry research group, our motto is to design and synthesis of new functional polymers for targeted applications. We endeavour through development and adaptation of synthetic methodology along with extensive physical characterization to achieve our research objectives. Our major research activities are shown below.

(A) Fundamental investigation on polymerization mechanism and kinetics

In this very broad research area, our group will specifically focus on the development of new organo-catalyst to control the microstructure of the polymer such as tacticity, sequence (primary structure), molecular weight distribution etc, which will allow us to have a deep understanding on structure-property relationship to develop advanced functional material.

(B) Plastic multiferroic materials

Magnetism and ferroelectricity are two key components for various technological applications and which are generally mutually exclusive in nature. However, it has been suggested that intimating those two effects could lead to an interesting cross-coupling phenomenon. In this context, our approach will be to organize the electric and magnetic dipoles on a foldamer scaffold to achieve the multiferroic properties in a plastic material.

(C) Biomimetic cascade reactions within the compartment of Sequence-controlled polymer chain

Although the catalytic activity within the single-chain polymeric nanoparticles or asymmetric catalysis within the helical cavity of the foldamers have been reported. However, the catalytic activities are far away to meet enzymatic efficiency especially for the selectivity issue. The structural complexity in the artificial macromolecules are too low to be compared with the native structure of an enzyme. So, our objectives are two-fold such as (i) Design, synthesis and characterization of macromolecules, which folds into a higher order (tertiary and quaternary) structure (ii) A successful implementation of the former task will be utilized for the enzyme mimetic applications such as catalytic activities and cascade reactions.

Ramesh Ramachandran: Our research group here in Mohali is primarily focused on developing theoretical methods based on time-dependent quantum mechanics for both designing new SSNMR experiments and building models for quantifying NMR experimental data. To this end, an analytical theory has been developed (by Mr. Rajat Garg) for optimizing pulse NMR experiments in the solid state. In the forthcoming years, we plan to extend these ideas to the design of pulsed DNP experiments in the solid state.

Sripada S. V. Rama Sastry: The research group of Ramasastry was involved in the development of a simple and efficient approach for the synthesis of tetrasubstituted cyclopentadiene, and cyclopentannulated arenes and heteroarenes [Bankar, S. K.; Singh, B.; Tung, P.; Ramasastry, S. S. V. *Angew. Chem. Int. Ed.* **2018**, 57, 1678]. These structures are suitable for the preparation metallocenes, in addition to their application in natural products synthesis.

Till recently, hydroacylation of alkynes is known to be facilitated only by metals or N-heterocyclic carbenes (NHCs). Our group reported the first organophosphine catalysed intramolecular hydroacylation of

activated alkynes [Mondal, A.; Hazra, R.; Grover, J.; Raghu, M.; Ramasastry, S. S. V. *ACS Catal.* **2018**, 8, 2748].

Sanchita Sengupta: My research interest involves design, synthesis and characterization of p-conjugated organic small molecules, dyes and pigments for optoelectronic applications. Furthermore, their optical and electronic properties and applications are intended to be explored. The work involves extensive organic synthesis and structural characterization of new molecules followed by optical spectroscopy such as UV/Vis, fluorescence, emission lifetimes, fluorescence anisotropy, and internal quantum efficiency (IQE) measurements. Along these lines, research in my group has been aimed at developing new light harvesting systems based on p-conjugated molecules/dyes along the following themes:

- 1) Donor-acceptor (D-A) systems (in configurations such as D-A-D, A-D-A, D-A-A etc.) for efficient photoinduced electron transfer (PET). Major emphasis has been on the synthesis of new compounds.
- 2) Synthesis of covalently connected multichromophoric systems (based on squaraine, BODIPY dyes with complementary absorption) with the aim of achieving efficient Förster resonance energy transfer (FRET). Eventual aim is to achieve enhanced organic photovoltaic performances compared to conventional electron donor-acceptor blends.

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 closedshell 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.

Sanjay Singh: Our research activities focus on a few fundamental questions in the area of inorganic and organometallic chemistry. Special aspects of organometallic chemistry of group 13 and 14 elements and late transition elements (Co, Ni, Cu, Pd, Hg, Au, Zn and Hg) in the form of their N-heterocyclic carbene (NHC) and cyclic Alkyl Amino Carbene (cAAC) adducts, bicyclic Alkyl Amino Carbene (BICAAC) their reaction chemistry and applications in molecular transformations.

In addition to this, we have also successfully explored synthesis and properties of inorganic macrocycles and cryptands. These systems are based on phosph(III)azane units, boron-nitrogen (boraamidinate) linked pyridinophanes, aluminum/nitrogen (aluminum amide) linked calixarenes.

Chemistry of group 13 elements: 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. These cationic boron and aluminum complexes have respectively been used in cyanosilylation, hydrosilylation and hydroboration of carbonyls and are important addition in the area of electrophilic main group catalysis.

Inorganic macrocycles and cryptands: Synthesis of phosph (III)azane based macrocycles and cryptands and mixed valent P(III/V) sulfur bridged hexameric macrocycle, $[(S=P(\mu\text{-}t\text{Bu})_2P(\mu\text{-}Se))]_6$ 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. Conformationally rigid boraamidinate bridged pyridinophanes and the aluminum congeners are very novel molecules including the aluminum anchored calixarenes. More recently, we have developed a protocol to prepare boracalixarenes by exploiting the dearomative hydroboration route of pyridine moieties with different boron hydrides.

Sugumar Venkataramani: Photoswitchable Systems:

1. Design and development of multiple azobenzene-connected systems have been carried out. In this regard, the effectiveness and tunability of the photoswitchable units have been explored using heteroazoarenes. The photoswitching properties, their Z-isomer stability and the properties influencing the Z-isomer stability have been explored. Through substituent effects and solvent effects, along with the computational studies, the electronic, steric effects and the influences of hydrogen bonding have been demonstrated.
2. Design and development of solid state photoswitchable systems for rewritable image printing and erasing applications.

Heterocyclic Radicals:

3. Heterocyclic radicals are interesting in the fundamental point of view, due to their multicentric-multielectrons interactions. In this regard, various isomeric radicals of pyrimidine, pyridazine and pyrazine have been computationally investigated. All these results showed that the through space interaction between the lone pair and the radical electron is very important for the electronic structural and stability aspects in dehydrodiazine radicals.
4. Similarly computational studies on five-membered heterocycles with single heteroatom and their isomeric dehydro radicals have been carried out. Among the influences of various factors, we confirmed the existence of a competition between delocalization and the ring strain, and the interplay of both decides the overall stability order.

K. S. Viswanathan: The group has been studying the characteristics of non-covalent interactions using both experimental and computational methods. Matrix isolation infrared spectroscopy is used to experimentally characterize the weak complexes which are corroborated by electronic structure calculations. Hydrogen bonded interactions of various hues, such as $n\text{-}\sigma^*$ interactions, $O\text{-}H\cdots\pi$, $C\text{-}H\cdots\pi$ and $N\text{-}H\cdots\pi$ contacts have been studied. In recent work, we have also trapped and studied halogen bonded complexes which are today known to play a very important role in various supramolecular architectures. In addition to characterizing the weak complexes, we also attempt to answer fundamental

questions as to what decides the relative stability of these various contacts, when more than one can be present in an intermolecular system.

8.2.2 Visits of faculty members

- **Bimalendu Adhikari**
 - Visited Chiba University, Japan, during May13 – June 18, 2017
- **Debrina Jana**
 - Visited CSIR-Central Glass & Ceramic Research Institute (Kolkata) India, during December 5 – December 26, 2017
- **Angshuman Roy Choudhury**
 - Visited University of Ottawa, Canada, during June 8 – June 10, 2017.
- **Sripada S. V. Rama Sastry**
 - Visited Leeds, UK during 03-06 Oct, 2017.
 - Visited Yeungnam University, South Korea during 22-25 Nov 2017.
 - Visited IIT Roorkee during 22-24 Dec, 2017.
 - Visited Pt. Ravishankar Shkula University, Raipur during 02-05 Feb, 2018.
 - Visited National Institute of Technology (NIT) Warangal during 16-19 Feb, 2018.
 - Visited Panjab University, Chandigarh on 22nd Feb.
 - Visited Indian Institute of Chemical Technology (IICT) Hyderabad during 24-26 Feb, 2018.
- **Sanchita Sengupta.**
 - Visited *Indian Institute of Science (Bangalore) India*, during Nov 22, 2017 – Nov 24, 2017.

8.2.3 Talks delivered

1. R. Vijaya Anand: Chemical Frontiers. Organized by IITB and JNCASR at Goa during 17-20 August 2017.
2. R. Vijaya Anand: Prithwish Goswami. 13th Junior National Organic Symposium Trust (J-NOST). Organized at BHU, Varanasi during 9-12 November 2017.
3. Srinivasarao Arulananda Babu: Transition Metal-Catalyzed Remote δ -C-H Bond Activation: Construction of Phenanthridone Scaffolds via Intramolecular C-N Bond Formation. Indo-US Bilateral Workshop on Organometallic Chemistry: From Fundamentals to Applications, Lonavla. December 7-10, 2017.
4. Debrina Jana: Nanostructured materials for functional applications: catalysis, biosensing, plasmonics. Recent Advances in Nanostructured Powders, Films and Devices, organized by INST Mohali, Kasauli. September 15-16, 2017.
5. Sanjay K Mandal: delivered expert lectures on "X-ray Diffraction: Single Crystal and Powder", Faculty Development Program, Chandigarh University, Gharuan, Punjab, 7 July 2017.
6. Sanjay K Mandal: delivered a talk titled "Effect of Flexible Spacer Chain Length on the Structural

Diversification, Photophysical Properties and Sensing Applications of Luminescent Metal Organic Frameworks" 45th National Seminar on Crystallography (NSC45), BHU, Varanasi, 10 July 2017.

7. Sanjay K Mandal: delivered a talk titled "Multifunctional Materials for Sensing of Metal Ions and Small Molecules", 24th Congress and General Assembly of the International Union of Crystallography, Hyderabad International Convention Centre, Hyderabad, 27 August, 2017.
8. Sanjay K Mandal: delivered a talk titled "New Multifunctional Porous Materials for Carbon Capture, Sensing and Nanoscale Drug Delivery", 21st International Conference of International Academy of Physical Sciences (CONIAPS XXI, Guru Jambheshwar University of Science & Technology, Hisar, 28 October, 2017.
9. Sanjay K Mandal: delivered expert lectures on "X-ray Diffractometry", Faculty Development Program, Guru Jambheshwar University of Science & Technology, Hisar, 6 November, 2017.
10. Sanjay K Mandal: delivered a talk titled "New Multifunctional Porous Materials For Carbon Capture, Sensing And Nanoscale Drug Delivery", Inter IISER NISER Chemistry Meet, NISER Bhubaneswar, 22 December, 2017.
11. Sanjay K Mandal: delivered the keynote lecture titled "New Multifunctional Porous Materials For Carbon Capture, Sensing And Nanoscale Drug Delivery", 9th National Conference on Recent Advances in Chemical, Biological and Environmental Sciences (RACES-2018), Department of Chemistry, M. M. Modi College, Patiala, February 9, 2018.
12. Sanjay K Mandal: delivered a talk titled "New Multifunctional Porous Materials For Carbon Capture, Sensing And Nanoscale Drug Delivery", 10th National Conference on Chemical and Environmental Sciences: Innovations and Advances-2018 (CES: IA-2018), Department of Chemistry, Punjabi University, Patiala, 15 February, 2018.
13. Sanjay K Mandal: delivered a talk titled "MOFs and NPs@MOFs as Versatile, Efficient and Heterogeneous Catalysts for Organic Transformations", 7th National Symposium on Advances in Chemical Sciences, UGC Center of Advanced Study, Guru Nanak Dev University, Amritsar, 27 March, 2018.
14. Santanu Kumar Pal: Liquid Crystal in optoelectronic and biosensor applications. Raman Research Institute (RRI), Bangalore, India, May, 2017.
15. Santanu Kumar Pal: Liquid Crystal in optoelectronic and biosensor applications. Centre for Nano and Soft Matter Sciences (CeNS), Bangalore, India. May, 2017.
16. Sabyasachi Rakshit: Nisha Arora. Tracking Real-time Dynamics of an Enzymatic Reaction at the Single Molecule level, Inter IISER NISER Chemistry Meet (IINCM-2017) 22nd-24th December 2017, NISER Bhubaneswar.
17. Sripada S. V. Rama Sastry: Delivered an invited lecture on 26th Feb, 2018 during the one-day symposium held in honour of Dr. G.V.M. Sharma at Indian Institute of Chemical Technology (IICT) Hyderabad.
18. Sripada S. V. Rama Sastry: Gave an invited talk on 22nd Feb, 2018 during 'Professor Ram Chand Paul National Symposium on Triumphs of Sustainable Progress in Chemistry' held at the Department of Chemistry, Panjab University, Chandigarh.
19. Sripada S. V. Rama Sastry: Gave an invited lecture on 16th Feb, 2018 at the National Institute of Technology (NIT) Warangal.

20. Sripada S. V. Rama Sastry: Delivered CRSI Bronze medal lecture on 3rd Feb, 2018 during the 22nd CRSI-NSC held at Pt. Ravishankar Shukla University, Raipur.
21. Sripada S. V. Rama Sastry: Delivered an invited talk during the 'Contemporary Facets of Organic Synthesis 2017 (CFOS 2017)' held at IIT Roorkee between 22-24 Dec, 2017.
22. Sripada S. V. Rama Sastry: Gave an invited lecture on 24th Nov, 2017 during the '17th International Symposium on Clean Technology' held at The Institute of Clean Technology, Yeungnam University, South Korea.
23. Sripada S. V. Rama Sastry: Gave an invited talk on 14th Nov, 2017 during the RSC Roadshow at IISER Mohali.
24. Sripada S. V. Rama Sastry: Delivered an invited lecture at IISER Mohali on 10th Nov, 2017 during ChemWeek celebrations of the Curie Club [topic: 'Significance of catalysis in organic synthesis'].
25. Sripada S. V. Rama Sastry: Gave an invited poster presentation during the '1st RSC-NOST symposium on Organic & Biomolecular Chemistry' held during 03-06 October, 2017 at Leeds, UK.
26. Sugumar Venkataramani: Tuning and controlling cis-isomer stability in azoheteroarenes and multiple azoarenes connected systems. IINCM, NISER Bhubaneswar. December 22-23, 2017.
27. Angshuman Roy Choudhury. "Organic fluorine" in stabilizing crystal structures: Does it matter?. 24th Congress and General Assembly of the International Union of Crystallography. Hyderabad, India August 21-19, 2017.

8.2.4 Conferences attended by researchers

- **Bimalendu Adhikari**
 - National Conference on Liquid Crystals-2017 at IISER Mohali during October 11-13, 2017
- **Debashis Adhikari**
 - Debashis Adhikari, "Indo-US Organometallic Conference", 6-10 th December, 2017 in Lonavela, India
 - Debashis Adhikari, "Modern Trend in Inorganic Chemistry" in IISER Pune, 11-14 th December 2018.
- **R. Vijaya Anand**
 - R. Vijaya Anand. Chemical Frontiers. Organized by IITB and JNCASR at Goa during 17-20 August 2017.
 - Mr. Prithwish Goswami. 13th Junior National Organic Symposium Trust (J-NOST). Organized at BHU, Varanasi during 9-12 November 2017.
 - Dr. Priya Ghosh. 13th Junior National Organic Symposium Trust (J-NOST). Organized at BHU, Varanasi during 9-12 November 2017.
 - Mr. Prithwish Goswami. Contemporary Facets in Organic Synthesis. Organized at IIT Roorkee during 22-24 December 2017.
 - Mr. Abhijeet S. Jadhav. Contemporary Facets in Organic Synthesis (CFOS). Organized at IIT Roorkee during 22-24 December 2017.
 - Mr. Gurdeep Singh. Green Chemistry Conference. Organized at Delhi University during 3-4 October 2017.

- Mr. Yogesh A. Pankhade. Green Chemistry Conference. Organized at Delhi University during 3-4 October 2017.
- Mr. Yogesh A. Pankhade. Inter IISER & NISER Chemistry Meet. Held at NISER Bhubaneswar during 22-24 December 2017.
- **Arulananda Babu Srinivasarao.**
 - Srinivasarao Arulananda Babu. Indo-US Bilateral Workshop on Organometallic Chemistry: From Fundamentals to Applications: December 7-10, 2017. Rhythm Lonavla, Maharashtra. India.
 - R. Padmavathi J-NOST: November 9-12, 2017. Banaras Hindu University (BHU), Varanasi. India
- **Debrina Jana**
 - Debrina Jana. 24th National Conference on Liquid Crystals (NCLC 2017): October 11-13, 2017. IISER Mohali, Mohali, Punjab.
 - Debrina Jana. Recent Advances in Nanostructured Powders, Films and Devices: September 15-16, 2017. Kasauli.
- **Sanjay Mandal**
 - Sanjay K. Mandal, 24th Congress and General Assembly of the International Union of Crystallography. Hyderabad International Convention Centre, Hyderabad, India; 21st-28th August, 2017.
 - Gouri Chakraborty and Sanjay K. Mandal*, 24th Congress and General Assembly of the International Union of Crystallography. Hyderabad International Convention Centre, Hyderabad, India; 21st-28th August, 2017.
 - Prasenjit Das and Sanjay K. Mandal*, 24th Congress and General Assembly of the International Union of Crystallography. Hyderabad International Convention Centre, Hyderabad, India; 21st-28th August, 2017.
 - Vijay Gupta and Sanjay K. Mandal*, 24th Congress and General Assembly of the International Union of Crystallography. Hyderabad International Convention Centre, Hyderabad, India; 21st-28th August, 2017.
 - Datta Markad and Sanjay K. Mandal*, 24th Congress and General Assembly of the International Union of Crystallography. Hyderabad International Convention Centre, Hyderabad, India; 21st-28th August, 2017.
 - Datta Markad and Sanjay K. Mandal*, MTIC XVII Modern Trends in Inorganic Chemistry. IISER Pune and NCL Pune; 11th-14th December, 2017.
 - Sheeba Khan, Gouri Chakraborty and Sanjay K. Mandal*. MTIC XVII Modern Trends in Inorganic Chemistry. IISER Pune and NCL Pune; 11th-14th December, 2017.
 - Alisha Gogia and Sanjay K. Mandal*, MTIC XVII Modern Trends in Inorganic Chemistry. IISER Pune and NCL Pune; 11th-14th December, 2017.
- **Angshuman Roy Choudhury**
 - Angshuman Roy Choudhury, Prasanta Bhowmik (post-doc) and Mayank Joshi (PhD student), 24th

Congress and General Assembly of the International Union of Crystallography. Hyderabad, India August 21-19, 2017.

- Angshuman Roy Choudhury, Halogen Bonding in Supramolecular and Solid State Chemistry, Faraday Discussion University of Ottawa, Canada, during June 8 – June 10, 2017.

- **Santanu Kumar Pal**

- Liquid Crystal in optoelectronic and biosensor applications. Com-Flu 2017, December 18-20, 2017. IIT Madras, India.

- **Sabyasachi Rakshit**

- Jagadish Prasad Hazra. Deciphering the Mechanism of force dissemination through tip-links in hearing, American Chemical Society (ACS) on campus, February 9th, 2018. IISER Mohali
- Surbhi Garg. Tailored polyprotein using sequential staple and cut, American Chemical Society (ACS) on campus, February 9th, 2018. IISER Mohali
- Nisha Arora. Force dependent adhesion of staphylococcus aureus and single molecule printing, American Chemical Society (ACS) on campus, February 9th, 2018. IISER Mohali. And 3rd CRIKC Nanoscience Day on 29th August, 2017 in CSIR-CSIO, Chandigarh

- **Sripada S. V. Rama Sastry**

- Bishnupada Satpati and Mr. Siddeshwar gave oral presentations, Mr. Rajendra Shirke and Mr. Uttam K. Mishra gave poster presentation at the 'Emerging Trends in Drugs Development and Natural Products (ETDDNP 2018)' conference held at the University of Delhi during 12-14 Jan, 2018.
- Uttam gave an oral presentation at the 13th JNOST symposium held at BHU, Varanasi during 9-12 Nov, 2017.
- Bishnupada Satpathi and Mr. Siddheshwar Bankar gave poster presentation at the 'Thematic Conference in Chemical Sciences (TC2S-2017): Sustainable Chemistry' Conference held at IIT Ropar during May 15-16, 2017.

- **Sanchita Sengupta**

- 24th National Conference on Liquid Crystals, October 11-13, 2017, IISER Mohali.
- Royal Society of Chemistry on Campus, One-day Symposium, November 14, 2017, IISER Mohali.
- ACS on Campus One-day Symposium, Feb 09, 2018, IISER Mohali.

- **Sanjay Singh**

- M. Bhandari, B. Prashanth and S. Singh. * Cationic hydrido boranes and aluminum congeners: New main group catalysts for hydrosilylation and hydroboration reactions, Indo-US Bilateral Workshop on Organometallics: From Fundamentals to Applications held during December 7-10, 2017 in Lonavla, India.
- D. Bawari, S. Singh. * Novel pyridinophanes and calixarene-like assemblies built around boraamidinate (B/N) and aluminamidinate (Al/N) bridges, 12th International Symposium on macrocyclic and Supramolecular Chemistry, July 2-6, 2017 in Cambridge (UK).
- D. Bawari, C. Negi, S. Chakraborty and S. Singh. * Boraamidinate (N B N) and aluminium-amide (N Al N) bridged novel pyridinophanes and calixarene-like assemblies, Symposium on Modern

Trends in Inorganic Chemistry XVII, December 11-14, 2017 National Chemical Laboratory (NCL) and IISER Pune.

- M. Bhandari, S. Rawat, S. K. Thakur and S. Singh. * Three coordinated aluminum-hydride and -methyl cations as potent catalysts for hydrosilylation and hydroboration of carbonyls, Symposium on Modern Trends in Inorganic Chemistry XVII, December 11-14, 2017 National Chemical Laboratory (NCL) and IISER Pune.

- **Sugumar Venkataramani**

- Sugumar Venkataramani. Inter IISER NISER Chemistry Meet, NISER Bhubaneswar. December 22-23, 2017.
- Surbhi Grewal, 24th National Conference on Liquid Crystals, IISER Mohali, OCTOBER 11-13, 2017
- Anjali Srivastava, 24th National Conference on Liquid Crystals, IISER Mohali, OCTOBER 11-13, 2017
- Mayank Saraswat, Role of through bond and through space interactions in stability of dehydro-diazines: A case study of 3c-5e configuration radicals, International Symposium on Free Radicals, Hayama JAPAN, 27th Aug 2017 – 1st Sept 2017.
- Mayank Saraswat, Electronic structure, stability and reactivity aspects in dehydro-diazine radicals: Insights into 3c-5e interactions, 8th- Asia-Pacific Conference of Theoretical and Computational Chemistry (APCTCC 8), 15th – 17th December 2017, IIT Bombay.
- Ankit Somani, Computational Studies of Biaryl Biradicals, Inter IISER and NISER Chemistry Meet (IINCM-2017), NISER Bhubaneswar, 22nd – 24th December 2017

- **K. S. Viswanathan,**

- Propargyl Alcohol and its Rich Hydrogen Bonded Chemistry, Matrix Isolation Infrared and Ab Initio Studies" Jyoti Saini, K. S. Viswanathan, Inter-IISER Chemistry Meet (IICM), Jan. 2017, IISER Bhopal.
- Participated in Workshop on the Course on Vacuum Science Technology and Applications (CVSTA), conducted by Indian Vacuum Society, Nov. 2017, at Bhabha Atomic Research Centre, BARC, and Mumbai.
- Propargyl Alcohol and its Rich Hydrogen Bonded Chemistry, Matrix Isolation IR Spectroscopy and Computations" Jyoti Saini, K. S. Viswanathan, XXVII International Symposium on Molecular Beams (ISMB), June 2017, Radboud University, The Netherlands.
- Propargyl Alcohol and its Rich Hydrogen Bonded Chemistry, Matrix Isolation Infrared and Ab Initio Studies" Jyoti Saini, K. S. Viswanathan, Spectroscopy and Dynamics of Molecules and Clusters (SDMC), Feb. 2017, Pondicherry, India.

8.2.5 Publications: Chemical Sciences

- [1] **B. Adhikari**, X. Lin, M. Yamauchi, H. Ouchi, K. Aratsu, S. Yagai. "Hydrogen-bonded rosettes comprising-conjugated systems as building blocks for functional one-dimensional assemblies" **Chemical Communications**, 2017, vol. 53, pp 9663-9683.
- [2] M. Kovačević, I. Kodrin, S. Roca, K. Molčanov, Y. Shen, **B. Adhikari**, H.-B. Kraatz, L. Barišić. "Helically chiral peptides containing ferrocene-1,1'-diamine scaffold as a turn inducer" *Chemistry - A European Journal*, 2017, vol. 23, pp 10372-10395.

- [3] **B. Adhikari**, Y. Yamada, M. Yamauchi, K. Wakita, X. Lin, K. Aratsu, T. Ohba, T. Karatsu, M. Hollamby, N. Shimizu, H. Takagi, R. Haruki, S. Adachi, S. Yagai. "Light-Induced Unfolding and Refolding of Supramolecular Polymer Nanofibres" **Nature Communications** 2017, vol. 8, pp 15254.
- [4] Bhunia, M.; Vijaykumar, G.; **Adhikari, D.***; Mandal, S. K.* Highly Active Homoleptic Carbene Potassium Complexes for the Ring-Opening Polymerization of Cyclic Esters. *Inorg. Chem.*, 2017, 56, 14459–14466
- [5] Dhingra S.; Barman D.; Yadav H. R.; Eyyathiyil J.; Bhowmik P.; Kaur P.; **Adhikari, D.***; Choudhury A. R.* Structural and Computational Understanding of Weak Interactions in "Bridge-flipped" Isomeric Tetrafluoro-bis-benzylideneanilines. *Cryst. Engg. Comm.*, 2018, 20, 716
- [6] Vijaykumar, G.; Pariyar, A.; Ahmed, J.; Shaw, B. K.; **Adhikari, D.***; Mandal, S. K.* "Tuning the redox non innocence of a phenalenyl ligand toward efficient nickel-assisted catalytic hydrosilylation", *Chem. Sci.*, 2018, 9, 2817.
- [7] "Bis(amino)cyclopropenylidene catalyzed Rauhut-Currier reaction between α,β -unsaturated carbonyl compounds and para-quinone methides" Goswami, P.; Sharma, S.; Singh, G.; **Anand, R. V.** *J. Org. Chem.* 2018, 83, 4213.
- [8] "Exploring bis-(amino)cyclopropenylidene as a non-covalent Bronsted base catalyst in conjugate addition reactions" Singh, G.; Goswami, P.; **Anand, R. V.** *Org. Biomol. Chem.* 2018, 16, 384.
- [9] " $B(C_6F_5)_3$ catalysed reduction of para-quinone methides and fuchsones to access unsymmetrical diaryl- and triarylmethanes: Elaboration to Beclobrate" Mahesh, S.; **Anand, R. V.** *Org. Biomol. Chem.* 2017, 15, 8393.
- [10] "Synthesis of indolizine containing diaryl- and triarylmethanes through a Cu-catalyzed domino cyclization of 2-(2-enynyl)-pyridines" Mahesh, S.; Paluru, D. K.; Ahmad, F.; Patil, S.; Kant, G.; **Anand, R. V.** *Asian J. Org. Chem.* 2017, 6, 1857
- [11] "TfOH catalyzed 1,6-conjugate addition of thiols to para-quinone methides under continuous-flow conditions" Jadhav, A. S.; **Anand, R. V.** *Eur. J. Org. Chem.* 2017, 3716.
- [12] "N-Heterocyclic carbene catalyzed 1,6-conjugate addition of Me_3Si-CN to para-quinone methides and fuchsones: Access to α -arylated nitriles" Goswami, P.; Singh, G.; **Anand, R. V.** *Org. Lett.* 2017, 19, 1982.
- [13] R. Parella and **S. A. Babu**. "Pd(II)-Catalyzed Arylation and Intramolecular Amidation of $\gamma-C(sp^3)-H$ Bonds: En Route to Arylheteroarylmethane and Pyrrolidone Ring Annulated Furan/Thiophene Scaffolds" *The Journal of organic chemistry*, vol. 82, no. 14, pp 7123-7150.
- [14] R. Parella and **S. A. Babu**. "Pd (II)-Catalyzed, Picolinamide-Assisted, Z-Selective γ -Arylation of Allylamines To Construct Z-Cinnamylamines" *The Journal of organic chemistry*, vol. 82, no. 13, pp 6550-6567.
- [15] Salts of Amoxapine with Improved Solubility for Enhanced Pharmaceutical Applicability Joshi, M.; **Choudhury, A. R.** *ACS Omega*, 2018, 3, 2406-2416.
- [16] Tyrosinase and catecholase-like activities of a dinuclear Cu(II) complex Chatterjee, A.; Yadav, H. R.; Pasha, S. S.; **Choudhury, A. R.**; Ali, A.; Singh, Y.; Ghosh, R. *Polyhedron*, 2018, 141, 140-146.

- [17] Simple ratiometric push–pull with an 'aggregation induced enhanced emission' active pyrene derivative: a multifunctional and highly sensitive fluorescent sensor Kachwal, V.; Alam, P.; Yadav, H. R.; Pasha, S. S.; **Choudhury, A. R.**; Laskar, I. R. *New J. Chem*, 2018, 42, 1133-1140
- [18] Structural and computational understanding of weak interactions in "bridge-flipped" isomeric tetrafluoro-bis-benzylideneanilines Dhingra, S.; Barman, D. J.; Yadav, H. R.; Eyyathiyil, J.; Bhowmik, P.; Kaur, P.; Adhikari, D.; **Choudhury, A. R.**; *CrystEngComm*, 2018, 20, 716-727
- [19] Dual emission and multi-stimuli-response in iridium(III) complexes with aggregation-induced enhanced emission: applications for quantitative CO₂ detection Climent, C.; Alam, P.; Pasha, S. S.; Kaur, G.; **Choudhury, A. R.**; Laskar, I. R.; Alemany, P.; Casanova, D. J. *Met. Chem. C.*, 2017, 5, 7784-7798
- [20] Product Isomer Distribution in the Sequential Functionalization of Cyclic (P₂N₂)-N-III Frameworks Bawari, D.; Prasanth, B.; Jaisawal, K.; **Choudhury, A. R.**; Singh, S. *Eur. J. Inorg. Chem.*, 2017, 35, 4123-4130
- [21] Synthesis and phosphatase activity of a Cobalt(II) phenanthroline complex Garai, M.; Dey, D.; Yadav, H. R.; **Choudhury, A. R.**; Maji, M.; Biswas, B. *J. Chem. Sci.*, 2017, 129, 1513-1520
- [22] Catalytic Fate of Two Copper Complexes towards Phenoxazinone Synthase and Catechol Dioxygenase Activity Garai, M.; Dey, D.; Yadav, H. R.; **Choudhury, A. R.**; Maji, M.; Biswas, B. *Chemistry Select*, 2017, 2, 11040-11047
- [23] Synthesis of an aggregation-induced emission (AIE) active salicylaldehyde based Schiff base: study of mechanoluminescence and sensitive Zn(II) sensing Pasha, S. S.; Yadav, H. R.; **Choudhury, A. R.**; Laskar, I. R. *J. Met. Chem. C. J. Mater. Chem. C.*, 2017, 5, 9651-9658
- [24] Can C—H...F—C hydrogen bonds alter crystal packing features in the presence of N—H...O=C hydrogen bond? Yadav, H. R.; **Choudhury, A. R.** *J. Mol. Struct.*, 2017, 1150, 469-480
- [25] Catalytic aspects of a nickel(II)–bipyridine complex towards phosphatase and catechol dioxygenase activity Garai, M.; Day, D.; Yadav, H. R.; **Choudhury, A. R.**; Kole, N.; Biswas, B. *Polyhedron*, 2017, 129, 114-122
- [26] Synthesis and crystal structures of pyridine-2-carboxaldehyde thiosemicarbazone, its mononuclear and cytotoxic Cu(II) and polynuclear Pb(II) complexes: Effect of size of metal ion on nucleation of the complexes Ghosh, A. K.; Yadav, H. R.; **Choudhury, A. R.**; Duraipandian, N.; Kiran, M. S.; Ghosh, R. *Ind. J. Chem.*, 2017, 56A, 616-620
- [27] Aggregation induced emission' active iridium (III) complexes with applications in mitochondrial staining Alam, P.; Dash, S.; Climent, C.; Kaur, G.; **Choudhury, A. R.**; Casanova, D.; Alemany, P.; Chowdhury, R.; Laskar, I. R. *RSC Adv.*, 2017, 7, 5642-5648
- [28] Catalytic aspects of a nickel (II)–bipyridine complex towards phosphatase and catechol dioxygenase activity Garai, M.; Dey, D.; Yadav, H. R.; **Choudhury, A. R.**; Kole, N.; Biswas, B. *Polyhedron*, 2017, 129, 114-122
- [29] Quantitative Characterization of supramolecular synthons involving fluorine atoms in the crystal structures of di- and tetra fluorinated benzamides Mondal, P. K.; Yadav, H. R.; **Choudhury, A. R.**; Chopra, D. *Acta Cryst. B.*, 2017, 73, 805-819

- [30] Y. Cheng, L. Zhao, **U. K. Gautam**, D. Golberg and MS Wang, "Graphene Ingestion and Regrowth on "Carbon-Starved" Metal Electrodes" ACS nanovol. 11 no. 10, pp 10575-10582.
- [31] M. Rana, K. Subramani, M. Sathish and **U. K. Gautam**, "Soya derived heteroatom doped carbon as a promising platform for oxygen reduction, supercapacitor and CO₂ capture" Carbon, vol. 114, pp 679-689.
- [32] G. Singh, S. Girdhar, A. Singh, A. Saroa, J. S. Lakhi, S. Khullar, and **S. K. Mandal**. "Selective Mercury Ion Recognition Using Methyl Red (MR) Based Silatrane Sensor", New J. Chemistry, 2018, 42, 6315-6321.
- [33] N. Patel, M. Arfeen, R. Sood, S. Khullar, A. K. Chakraborti, **S. K. Mandal** and P. V. Bharatam. "Can Remote N-Heterocyclic Carbenes Coordinate with Main Group Elements? Synthesis, Structure and Quantum Chemical Analysis of N⁺ Centre Complexes", Chem. Eur. J., 2018, 24, 6418-6425.
- [34] P. Das and **S. K. Mandal**. "Understanding the effect of an amino group on the selective and ultrafast detection of TNP in water by fluorescent organic probes", J. Materials Chemistry C, 2018, 6, 3288-3297.
- [35] G. Chakraborty and **S. K. Mandal**, "Design and Development of Fluorescent Sensors with Mixed Aromatic Bicyclic Fused Rings and Pyridyl Groups: Solid Mediated Selective Detection of 2,4,6-Trinitrophenol in Water", ACS Omega, 2018, 3, 3248-3256.
- [36] J. Haneef, R. Chadha, V. Gupta and **S. K. Mandal**. "Novel polymorph of ambrisentan: Characterization and stability", J. Pharmaceutical and Biomedical Analysis, 2018, 153, 102-109.
- [37] F. Baig, S. Khullar, **S. K. Mandal** and M. Sarkar. "Coordination Polymers Comprised of an Exo Bifunctional Schiff Base Ligand and Succinate Dianion: Critical Analysis of Factors Affecting the Structures and Framework Dimensionality", ChemistrySelect, 2017, 2, 11677-11685.
- [38] G. Chakraborty and **S. K. Mandal**, "Neutral Luminescent Metal-Organic Frameworks: Structural Diversification, Photophysical Properties, and Sensing Applications", Inorg. Chem., 2017, 56, 14556-14566.
- [39] S. M. A. Shakoar, D. S. Agarwal, S. Khullar, **S. K. Mandal** and R. Sakhuja. "Solvent-Driven Iodine-Mediated Oxidative Strategies for the 1,2-Synthesis of Bis(imidazo[1,2-a]pyridin-3-yl)sulfanes and Disulfanes", Chem. Asian J. 2017, 12, 3061-3068.
- [40] D. Markad and **S. K. Mandal**, "An exploration into the amide-pseudo amide hydrogen bonding synthon between a new coformer with two primary amide groups and theophylline", CrystEngComm, 2017, 19, 7112-7124.
- [41] 10. Chadha, K.; Karan, M.; Bhalla, Y.; Chadha, R.; Khullar, S.; **Mandal, S.**, Vasisht, K. "Cocrystals of Hesperetin: Structural, Pharmacokinetic, and Pharmacodynamic Evaluation", Cryst. Growth and Des., 2017, 17, 2386-2405.
- [42] S. Patranabish, G. Mohiuddin, N. Begum, A. R. Laskar, **S. K. Pal**, N. V. S. Rao and A. Sinha. "Cybotactic nematic phase of achiral unsymmetrical bent-core liquid crystals-Quelling of polar ordering and the influence of terminal substituent moiety" J. Mol. Liq., 2018, 257, 144-154.
- [43] M. Gupta and **S. K. Pal**. "Structure-property relationships in lath-shaped triads based on multialkynylbenzene" Liq. Cryst., 2018, DOI: 10.1080/02678292.2018.1432084.

- [44] M. Gupta, V. Pal and **S. K. Pal**. "Photo-responsive liquid crystals derived from azobenzene centered cholesterol-based tetramers" *New J. Chem.*, 2018, 42, 8765-8772.
- [45] V. Punjani, G. Mohiuddin, S. Kaur, R. K. Khan, S. Ghosh and **S. K. Pal**. "Observation of polar order and thermochromic behaviour in a chiral bent-core system exhibiting exotic mesophases due to superstructural frustration" *Chem. Commun.*, 2018, 54, 3452-3455.
- [46] R. Nandi and **S. K. Pal**. "Liquid crystal based sensing device using a smartphone" *Analyst*, 2018, 143, 1046-1052.
- [47] B. Pradhan, R. K Gupta, S. K. Pathak, J. De, **S. K. Pal** and A. S. Achalkumar. "Columnar self-assembly of luminescent bent-shaped hexacatenars with a central pyridine core connected with substituted 1,3,4-oxadiazole and thiadiazoles" *New J. Chem.*, 2018, 42, 3781-3798.
- [48] M. Gupta, S. S. Mohapatra, S. Dhara and **S. K. Pal**. "Supramolecular self-assembly of thiol functionalized pentaalkynylbenzene-decorated gold nanoparticles exhibiting a room temperature discotic nematic liquid crystal phase" *J. Mater. Chem. C*, 2018, 6, 2303-2310.
- [49] R. K. Gupta, S. K. Pathak, J. De, **S. K. Pal** and A. S. Achal kumar. "Room temperature columnar liquid crystalline self-assembly of acidochromic, luminescent, star-shaped molecules with cyanovinylene chromophores" *J. Mater. Chem. C*, 2018, 6, 1844-1852.
- [50] G. Mohiuddin, N. Begum, N. V. S. Rao, S. Kaur, V. Punjani, R. K. Khan, S. Ghosh and **S. K. Pal**. "Observation of disordered mesomorphism in three-ring-based highly polar bent-core molecules: design, synthesis and characterisation" *Liq. Cryst.*, 2017, 44, 2247-2258
- [51] J. De, S. P. Gupta, I. Bala, S. Kumar and **S. K. Pal**. "Phase behavior of a new class of anthraquinone-based discotic liquid crystals" *Langmuir*, 2017, 33, 13849-13860.
- [52] I. Verma, S. Sidiq and **S. K. Pal**. "Poly (L-lysine)-Coated Liquid Crystal Droplets for Sensitive Detection of DNA and Their Applications in Controlled Release of Drug Molecules" *ACS Omega*, 2018 2, 7936-7945.
- [53] I. Bala, H. Singh, V. R. Battula, S. P. Gupta, J. De, S. Kumar, K. Kailasam and **S. K. Pal**. "Heptazine: an Electron-Deficient Fluorescent Core for Discotic Liquid Crystals" *Chem. Eur. J.*, 2017, 23, 14718-14722.
- [54] A. K Yadav, B. Pradhan, H. Ulla, S. Nath, J. De, **S. K. Pal**, M. N. Satyanarayan and A. S. Achal kumar. "Tuning the self-assembly and photophysical properties of bi-1, 3, 4-thiadiazole derivatives through electron donor-acceptor interactions and their application in OLEDs" *J. Mater. Chem. C*, 2017, 5, 9345-9358.
- [55] I. Bala, S. P. Gupta, J. De and **S. K. Pal**. "Room-Temperature Columnar Nematic and Soft Crystalline Columnar Assemblies of a New Series of Perylene-Centred Disc Tetramers" *Chem. Eur. J.*, 2017, 23, 12767-12778.
- [56] M. Gupta, S. P. Gupta and **S. K. Pal**. "TNF Induced Switching of Columnar Rectangular to Hexagonal Assemblies in a New Class of Triphenylene-Based Room Temperature Discotic Liquid Crystals" *J. Phys. Chem. B*, 2017, 121, 8593-8602.
- [57] M. Gupta, S. P. Gupta, S. S. Mohapatra, S. Dhara and **S. K. Pal**. "Room-Temperature Oligomeric Discotic Nematic Liquid Crystals over a Wide Temperature Range: Structure-Property Relationships" *Chem. Eur. J.*, 2017, 23, 10626-10631.

- [58] S. P. Gupta, M. Gupta and **S. K. Pal**. "Highly Resolved Morphology of Room-Temperature Columnar Liquid Crystals Derived from Triphenylene and Multialkynylbenzene Using Reconstructed Electron Density Maps" *Chemistry Select*, 2017, 2, 6070-6077.
- [59] D. Das and **S. K. Pal**. "Liquid Crystal Unveiled Interactions between Melittin and Phospholipids at Aqueous-Liquid Crystal Interface" *Chemistry Select*, 2017, 2, 4779-4786.
- [60] S. Kaur, V. Punjani, G. Mohiuddin and **S. K. Pal**. "Orthogonal smectic and nematic ordering in three-ring polar bent-core molecules with anti-parallel arrangement" *New J. Chem.*, 2017, 41, 5403-5411.
- [61] S. K. Pathak, S. Nath, J. De, **S. K. Pal** and A. S. Achal kumar. "The effect of regioisomerism on the mesomorphic and photophysical behavior of oxadiazole-based tris (N-salicylideneaniline) s: synthesis and characterization" *New J. Chem.*, 2017, 41, 9908-9917.
- [62] S. Nath, S. K. Pathak, J. De, **S. K. Pal** and A. S. Achal kumar. "Star-shaped π -gelators based on oxadiazole and thiadiazoles: a structure-property correlation" *Mol. Syst. Des. Eng.*, 2017, 2, 478-489.
- [63] H. Singh, V. K. Tomer, N. Jena, I. Bala, N. Sharma, D. Nepak, A. De Sarkar, K. Kailasam and **S. K. Pal**. "A porous, crystalline truxene-based covalent organic framework and its application in humidity sensing" *J. Mater. Chem. A*, 2017, 5, 21820-21827.
- [64] S. K. Pathak, S. Nath, J. De, **S. K. Pal** and A. S. Achal kumar. "Contrasting effects of heterocycle substitution and branched tails in the arms of star-shaped molecules" *New J. Chem.*, 2017, 41, 4680-4688.
- [65] Jagadish P. Hazra, Nisha Arora, Amin Sagar, Shwetha Srinivasan, Abhishek Chaudhuri, and **Sabyasachi Rakshit** "Force-activated catalytic pathway accelerates bacterial-adhesion against flow" (*Biochemical Journal*-under revision).
- [66] Surbhi Garg, Gayathri Sindhuri Singaraju, Sunanda Yengkhom, and **Sabyasachi Rakshit** "Tailored Polyproteins Using Sequential Staple and Cut" *Bioconjugate Chem.* 2018, 29, 1714-1719
- [67] Shwetha Srinivasan , Jagadish P. Hazra, Gayathri S. Singaraju , Debadutta Deb, **Sabyasachi Rakshit** "ESCORTing proteins directly from whole cell-lysate for single-molecule studies". *Analytical Biochemistry* 535 (2017), 35-42
- [68] Vinay Ganapathy, and **Ramesh Ramachandran**. "Effective Floquet Hamiltonian theory of multiple-quantum NMR in anisotropic solids involving quadrupolar spins: Challenges and Perspectives" *J. Chem. Phys.* 147, 144202 (2017).
- [69] Rajat Garg and **Ramesh Ramachandran**. "On the exactness of effective Floquet Hamiltonians employed in solid-state NMR spectroscopy" *J. Chem. Phys.* 146, 184201 (2017).
- [70] 'Organocatalytic Strategies for the Synthesis of Cyclopenta-Fused Arenes and Heteroarenes' Satpathi, B.; Mondal, A.; **Ramasastri, S. S. V.** *Chem. Asian. J.* 2018, 13, DOI: 10.1002/asia.201800389R1. ['Focus Review' article invited by the Editor]"
- [71] Organocatalyzed Intramolecular Hydroacylation of Activated Alkynes' Mondal, A.; Hazra, R.; Grover, J.; Raghu, M.; **Ramasastri, S. S. V.** *ACS Catal.* 2018, 8, 2748.
- [72] 'Palladium-Catalyzed Intramolecular Trost-Oppolzer-Type Alder-Ene Reaction of Dienyl Acetates to Cyclopentadienes' Bankar, S. K.; Singh, B.; Tung, P.; **Ramasastri, S. S. V.** *Angew. Chem. Int. Ed.* 2018, 57, 1678.'

- [73] Organocatalytic γ [C(sp³)-H] functionalization of ynones: An unusual approach for the cyclopentannulation of benzothiophenes' Grover, J.;† Raghu, M.;† Hazra, R.; Mondal, A.; **Ramasastry, S. S. V.** Synthesis 2018, DOI: 10.1055/s-0036-1591526. [†These authors contributed equally to this work]'
- [74] A computational investigation of the solvent-dependent enantioselective intramolecular Morita-Baylis-Hillman Reaction of enones' Singh, N. K.; Satpathi, B.; Balanarayan, P.; **Ramasastry, S. S. V.** Org. Biomol. Chem. 2017, 15, 10212. [Invited article towards the themed issue 'Mechanistic Aspects of Organic Synthesis']'
- [75] Acid-free and organocatalytic α -azidation of enones initiated by an electron-donor-acceptor complex' Shirke, R.; **Ramasastry, S. S. V.** Org. Lett. 2017, 19, 5482.'
- [76] Enantioselective Organocatalytic Intramolecular Morita-Baylis-Hillman (MBH) Reaction of Dienones, and a One-Pot Elaboration of the MBH Adducts to Fluorenones' Satpathi, B.; Wagulde, S. V.; **Ramasastry, S. S. V.** Chem. Comm. 2017, 53, 8042.'
- [77] One-Pot Multicatalytic Approaches: Diversity Oriented Synthesis of Cyclohepta[b]indoles, Indolotropones, and Tetrahydrocarbazoles' Mishra, U. K.; Yadav, S.; **Ramasastry, S. S. V.** J. Org. Chem. 2017, 82, 6729.
- [78] **Sanchita Sengupta***, Upendra Kumar Pandey "Dual Emissive BODIPY-Benzodithiophene-BODIPY TICT Triad with Remarkable Stokes Shift of 194 nm "Organic and Biomolecular Chemistry 2018, 16 (12), 2033-2038.
- [79] B. Prashanth, M. Bhandari, S. Ravi, K. R. Shamasundar and **S. Singh**. "Electronically Unsaturated Three Coordinated Aluminum Hydride and Organoaluminum Cations" Chem. Eur. J. 2018, vol 24, pp 4794-4799.
- [80] H.-C. Niu, A. J. Plajer, R. Garcia-Rodriguez, **S. Singh**, D. S. Wright. "Designing the Macrocyclic Dimension in Main Group Chemistry" Chem. Eur. J, 2018, vol. 24, pp 3073-3082.
- [81] D. Bawari, B. Prashanth, K. Jaiswal, A. R. Choudhury and **S. Singh**. "Product Isomer Distribution in the Sequential Functionalization of Cyclic-(PIII)₂N₂ Framework" Eur. J. Inorg. Chem. 2017, pp 4123-4130.
- [82] Rishu, B. Prashanth, D. Bawari, U. Mandal, A. Verma, A. R. Choudhury and **S. Singh**. "Hg(II) and Pd(II) Complexes with a New Selenoether Bridged Biscarbene Ligand: Efficient Mono- and Bis-arylation of Methyl Acrylate with a Pincer Biscarbene Pd(II) Precatalyst" Dalton Trans. 2017, vol 46, pp 6291-6302.
- [83] J. Plajer, R. Garcia-Rodriguez, C. G. M. Benson, P. D. Matthews, A. D. Bond, **S. Singh**, L. H. Gade and D. S. Wright. "A Modular Approach to Inorganic Phosphazane Macrocycles" Angew. Chem. Int. Ed. 2017, vol 56, pp 9087-9090.
- [84] Prashanth, D. Bawari, and **S. Singh**. "Heteroleptic Iminophosphonamidate(III) Complexes: Source of Mild Lewis Acid Indium Centers" ChemistrySelect 2017, vol 2, pp 2039-2043.
- [85] "Does Nitrogen Lone Pair Lead to Two Centered - Three Electrons (2c-3e) Interactions in Pyridyl Radical Isomers?" Chitraranjan Sah#, Lilit Jacob#, Mayank Saraswat#, Sugumar Venkataramani*, J. Phys. Chem. A 2017, 121, 19, 3781-3791. (#Equally contributing)

- [86] "Through bond and through space interactions in dehydro-diazine radicals: A case study of 3c-5e interactions" Mayank Saraswat, Sugumar Venkataramani* Phys. Chem. Chem. Phys. 2018, 20, 4386-4395
- [87] "Evaluation of Substituent Effect in Z-Isomer Stability of Arylazo-1H-3,5-dimethylpyrazoles – Interplay of Steric, Electronic Effects and Hydrogen Bonding" Sudha Devi, Mayank Saraswat, Surbhi Grewal, Sugumar Venkataramani* J. Org. Chem., 2018, 83, 8, 4307-4322..
- [88] Matrix Isolation Infrared and Ab Initio Study of the interaction of N-Heterocyclic Carbene with Water and Methanol: A case study of a strong hydrogen bond", Akshay Raut, Ginny Karir, **K. S. Viswanathan**, J. Phys. Chem A, 120, 9390 (2016).
- [89] Discerning Near-Isoergic Isomers - A Matrix Isolation Infrared and Ab Initio Study of the Propargyl Alcohol Dimers", Jyoti Saini, **K. S. Viswanathan** J. Phys. Chem. A, 121, 1448 (2017)
- [90] The Borazine Dimer: The Case of a Dihydrogen Bond Competing with a Classical Hydrogen Bond", Kanupriya Verma, **K. S. Viswanathan** Phys. Chem. Chem. Phys. 19, 19067 (2017)
- [91] H- π Landscape of the Phenylacetylene-HCl System: Does this Provide the Gateway to the Markovnikov Addition?" Ginny Karir, **K. S. Viswanathan**, J. Phys. Chem. A 121, 5797 (2017)
- [92] Conformational landscape of tri-n-butylphosphate: Matrix isolation infrared spectroscopy and systematic computational analysis", N. Ramanathan, K. Sundararajan, **K. S. Viswanathan**, J. Phys. Chem. A 121, 6108 (2017)
- [93] A Tale of Two Structures": The Stacks and Ts of Borazine and Benzene Hetero and Homo Dimers", Kanupriya Verma, **K. S. Viswanathan**, Chemistry Select, 3, 864 (2018)
- [94] Multiple Hydrogen Bond Tethers for the Grazing Formic Acid in its Complexes with Phenylacetylene", Ginny Karir, Gaurav Kumar, Bishnu Prasad Kar, **K. S. Viswanathan**, J. Phys. Chem. A, 122, 2046 (2018)



8.3 DEPARTMENT OF THE EARTH & ENVIRONMENTAL SCIENCES

8.3.1 Summary of the research work

Anoop Ambili: The major objective of my research work is to contribute for the understanding of the extreme changes in Indian monsoon dynamics using palaeolake sediments. Our investigation on contemporary limnological processes in Ashtamudiestuary, Southern India provides identification of environmentally sensitive climate proxies which could also be transferable for interpreting palaeodata in similar settings. A number of n-alkane indices have been calculated to illustrate the spatial variability by considering separately river dominated northern reaches and marine influenced southern part of the Ashtamudi estuary. The carbon preference index (CPI) and average chain length (ACL) provide evidence for recycled organic inputs in the tidal zone, whereas dominant biogenic contribution has been observed in the riverine zone. The P_{aq} and TAR indices demonstrate maximum aquatic productivity in the tidal dominated region of the Ashtamudi Estuary. The quantitative apportionment of organic matter sources in Ashtamudi sediments using compound-specific carbon isotope analysis (CSIA) of long-chain n-alkane shows dominance (53-83 %) of C_3 terrestrial plants derived OM. The biomarker (n-alkane) results clearly demonstrate the effectiveness of an integrated molecular and stable carbon isotope analysis for quantitatively assessing OM sources in estuarine environments. Additionally, the geochemical and sedimentological analyses of modern Ashtamudi surface sediments enabled us to decipher three dominant factors i.e. fluvial, marine and anthropogenic, in controlling the sediment distribution into the basin.

Baerbel Sinha: Tropospheric aerosols are ubiquitous in the natural environment and play an important role in the hydrological cycle of Earth, while also affecting human health, local and global climate, and air quality. In the past one year my group has focused on four major topics. The first concerns development of

source apportionment models for particulate matter that combine air mass trajectories and data from multiple monitoring sites, characterization and validation of low cost PM sensors that can be deployed at multiple sites and cost less than ten thousand rupees and the impact of ozone on wheat cultivars grown in north India through process based uptake studies involving stomatal leaf uptake of gases. Fourthly my research group has been compiling a new emission inventory constrained by emission factors for varied sources measured within India. Two new statistical source apportionment models, MuSAM and MuReSAM, were developed from scratch at IISER Mohali which can perform quantitative statistical source apportionment of PM10 using data from multiple receptor sites. The model was tested and validated using a case study in in South Hessen, Germany. While MuSAM uses multi-site back trajectory data to quantify the contribution of long-range transport, MuReSAM uses wind speed and direction as proxy for regional transport and quantifies the contribution of regional source areas.

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. The experimental studies are combined with relevant modeling tools (chemical box models and chemical transport models) to finally accurately assess air pollution and climate change effects on atmospheric chemistry for proposing mitigation strategies and policies. In the past year, several new results have been communicated. Some major highlights are our work on atmospheric chemistry impacts of agricultural biomass burning reactive emission in North West India and a study assessing the impact of the odd-even traffic rule intervention on Delhi's air quality.

Biomass fires are a significant emission source of reactive atmospheric carbon budget but the speciation and quantification of such emissions are poorly constrained. By applying direct OH reactivity and VOC speciation measurements in an ambient field experiment our research group identified and quantified new reactive compounds (e.g. amine and amides) currently missed in advanced atmospheric chemistry models. In a second study, our research group carried out chemical tracer VOC speciation measurements in Delhi. The study made use of traffic exhaust chemical tracer molecules and revealed the reasons behind the failure of the odd-even rule traffic intervention in reducing air pollution in Delhi. These findings were found to be of great relevance by policy makers during discussions proposing implementation of the odd even rule again in winter of 2017 in Delhi.

8.3.2 Visits of faculty members

- **Anoop Ambili**
 - Visited Indian Institute of Tropical Meteorology (IITM), Pune during Dec 2– Dec 3, 2017
- **Sunil A. Patil**
 - Visited Indian Institute of Technology Kharagpur, India during February 02-03, 2018
 - Visited International Centre for Genetic Engineering and Biotechnology, New Delhi during September 14, 2017
- **Baerbel Sinha**
 - Visited the Department of Materials, University of Oxford, UK on September 14, 2017.
 - Visited the Indian Institute of Technology Kanpur, India on May 14, 2017.

- **Vinayak Sinha**

- Visited Worcester College, University of Oxford during 11th - 14th September, 2017.
- Visited Indian Institute of Science Education and Research Pune on 25th October, 2017.
- Visited Department of Chemistry, Pt. Ravishankar Shukla University, Raipur, Chhattisgarh on 3rd February 2018.
- Visited Department of Earth and Environmental Sciences, Bhopal, on 12th March 2018

8.3.3 Talks delivered

1. Anoop Ambili: Ankit. Molecular distribution and carbon isotope of n-alkanes from Ashtamudi Estuary, South India: Assessment of organic matter sources and paleoclimatic implications. 2nd National Geo-Research Scholars Meet-2017, Wadia Institute of Himalayan Geology, Dehradun, India: May 2-5, 2017.
2. Anoop Ambili: Prem Kumar. Mid-late Holocene climate variability in the Indian monsoon: Evidence from continental shelf sediments adjacent to Rushikulya River, eastern India. 2nd National Geo-Research Scholars Meet-2017, Wadia Institute of Himalayan Geology, Dehradun, India: May 2-5, 2017.
3. Baerbel Sinha: Invited talk on "Aerosol and Gas Phase Chemistry", presented at the Indian Institute of Technology Kanpur, Kanpur, India, May 14th 2017.
4. Baerbel Sinha: Talk delivered on "Measuring and modelling ozone stomatal flux for irrigated winter wheat in the NW-Indo Gangetic Plain", at the 5th iLEAPS Science Conference, Oxford, UK held from 11th - 14th September, 2017.
5. Vinayak Sinha: Invited talk on "Clearing the air on agricultural biomass fire emissions and impacts" at The Max Planck Partner Group kick-off workshop, IISER Bhopal, on 12th March 2018.
6. Vinayak Sinha: Invited talk on "Reactive organic compounds emitted from agricultural waste burning in the North West Indo-Gangetic Plain" at 10th National Conference on Chemical and Environmental Sciences: Innovations and Advances-2018, Punjabi University, Patiala on 16th February 2018.
7. Vinayak Sinha: Invited talk on "Atmospheric Chemistry Research at the Climate and Air Quality Interface: Agricultural Waste Burning in the North-West Indo-Gangetic Plain" at the 12th CRSI-RSC Joint Symposium, Pt. Ravishankar Shukla University, Raipur, Chhattisgarh on 3rd February 2018.
8. Vinayak Sinha: Invited talk on "Atmospheric chemistry research at the climate and air quality interface: Agricultural waste burning in the North West Indo-Gangetic Plain" at Indian Institute of Science Education and Research, Pune on 25th October, 2017.
9. Vinayak Sinha: Invited talk on "Large unexplained suite of chemically reactive compounds present in ambient air due to biomass fires" at the 5th iLEAPS Science Conference, Oxford, UK, 11th - 14th September, 2017.
10. Vinayak Sinha: Talk on "Evidence for high biogenic isoprene emissions in the north IGP, oral presentation in The Third Workshop on Atmospheric Composition and the Asian Monsoon (ACAM) and Second ACAM Training School at Jinan University, Guangzhou, China, 2017 by Mr.

Abhishek Mishra held during 5-9 June, 2017.

11. Vinayak Sinha: Talk on Isoprene and acetaldehyde dominate VOC OH reactivities and Ozone production potentials in all seasons in the N. W. IGP, oral presentation in the 5th iLEAPS Science Conference, Oxford, UK, by Dr. Vinod Kumar held during 11th - 14th September, 2017.

8.3.4 Conferences attended by researchers

- **Anoop Ambili**

- Prem Kumar, Yadav Ankit, Praveen Kumar Mishra, Deepak Kumar Jha, Ambili Anoop. European Geoscience Union (EGU) Conference. April 23–28, 2017. Vienna, Austria.
- Yadav Ankit, Prem Kumar, Ambili Anoop, Praveen Kumar Mishra, Saju Varghese. European Geoscience Union (EGU) Conference. April 23–28, 2017. Vienna, Austria

- **Sunil A. Patil**

- Sunil Patil, INDO-EU workshop on "The recent developments in Microbial Fuel Cells and Membrane Bioreactor Technology: February 2-3, 2018. Indian Institute of Technology Kharagpur, West Bengal.

- **Baerbel Sinha**

- Baerbel Sinha attended the 5th iLEAPS Science Conference held at Oxford, UK during 11th - 14th September, 2017.
- Baerbel Sinha attended the DST's National Workshop on "Aerosols: Science and Application" as part of proposed National Network Programme on Climate Change and Aerosols from 11-12 May, 2017
- Baerbel Sinha attended workshop on "Technologies for Monitoring and Abatement of Air Pollution" on Feb 13, 2018 organized by Ministry of Environment, Forest and Climate Change, Gol.

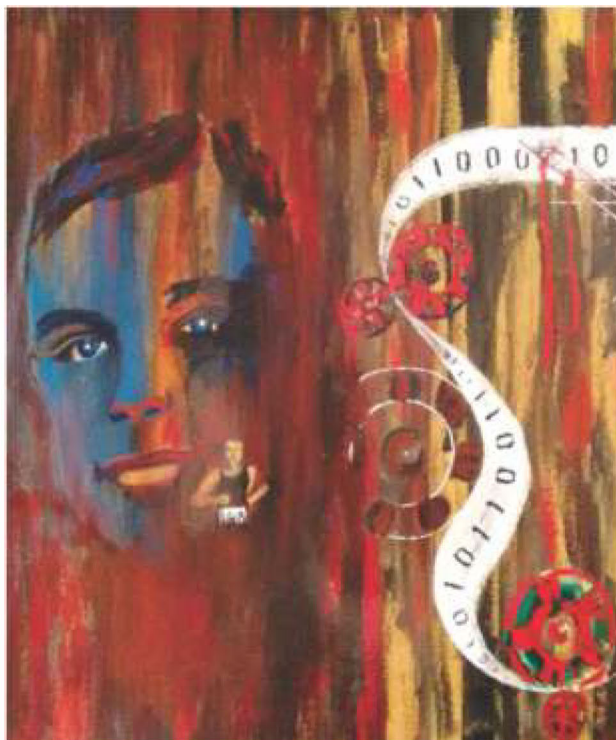
- **Vinayak Sinha**

- Vinayak Sinha attended the 5th iLEAPS Science Conference held at Oxford, UK during 11th - 14th September, 2017.
- Vinayak Sinha attended the 10th National Conference on Chemical and Environmental Sciences: Innovations and Advances-2018 (CES: IA-2018) February 15-16, 2018, Department of Chemistry, Punjabi University, Patiala
- Vinayak Sinha attended workshop on "Technologies for Monitoring and Abatement of Air Pollution" on Feb 13, 2018 organized by Ministry of Environment, Forest and Climate Change, Gol.
- Vinayak Sinha attended IISER Bhopal –Max Planck Institute, Jena workshop on Top Down Estimates of Regional GHG Sources and Sinks Constrained by Atmospheric Observations and Modeling and their Concurrent Evaluation over India held at IISER Bhopal on March 12, 2018.
- Vinayak Sinha attended the 12th Chemical Research Society of India –Royal Society of Chemistry Joint Symposium at Pt. Ravishankar Shukla University, Raipur, Chhattisgarh on 3rd February 2018

8.3.5 Publications: Earth and Environmental Sciences.

- [1] Ankit, Y., Mishra, Praveen K., Kumar, P., Jha, Deepak K., Kumar, Vivek V., Ambili, V., **Anoop, A.**, 2017. Molecular distribution and carbon isotope of n-alkanes from Ashtamudi Estuary, South India: Assessment of organic matter sources and paleoclimatic implications. *Marine Chemistry* 196, 62-70.
- [2] Mishra, Praveen K., Prasad, S., Marwan, N., **Anoop, A.**, Krishnan, R., Gaye, B., Basavaiah, N., Stebich, M., Menzel, P., Riedel, N., 2017 Contrasting pattern of hydrological changes during the past two millennia from central and northern India: regionality of climate change or anthropogenic signal? *Global and Planetary Change* 161, 97-107
- [3] Chauhan, P.R., Krishnan, K., Tiwari, N., Mukherjee, A., **Anoop, A.**, Sand, D.A. and Patnaik, R., 2018. At the forest edge: general observations on new microlithic occurrences in the central Narmada basin, Madhya Pradesh. In: *Rethinking the Past A Tribute to Professor V.N. Misra* (Eds S.G. Deo, A. Baptista, J. Joglekar), ISPQS Monograph No. 7, 65p.
- [4] Mishra, Praveen K., Prasad, S., Jehangir, A., **Anoop, A.**, Yousuf, A. R., Gaye, B., 2018. Abrupt lake level rises in the high-altitude Tso Moriri Lake (India) –investigating the role of meltwater versus precipitation seasonality in the regional hydrological budget. *Paleoclimatology Paleoecology Paleogeography* 493, 20-29.
- [5] S. Chen, **S. A. Patil** and U. Schröder. "A high-performance rotating graphite fiber brush air-cathode for microbial fuel cells" *Applied Energy*, 2018, vol. 211, pp 1089-1094.
- [6] J.M. Sonawane, **S. A. Patil**, P. C. Ghosh and S. B. Adeloju. "Low-cost stainless-steel wool anodes modified with polyaniline and polypyrrole for high-performance microbial fuel cells" *Journal of Power Sources*, 2018, vol. 389, pp 103–114.
- [7] N. Aryal, F. Ammam, **S. A. Patil** and D. Pant. "An overview of cathode materials for microbial electrosynthesis of chemicals from carbon dioxide" *Green Chemistry*, 2017, vol. 19, pp 5748-5760.
- [8] J. B. A. Arends, **S. A. Patil**, H. Roume and K. Rabaey. "Continuous long-term electricity-driven bioproduction of carboxylates and isopropanol from CO₂ with a mixed microbial community" *Journal of CO₂ utilization*, 2017, vol. 20, pp 141–149.
- [9] K. Guo, A. PrévotEAU, **S. A. Patil**, and K. Rabaey. "Materials and Their Surface Modification for Use as Anode in Microbial Bioelectrochemical Systems" In *Functional Electrodes for Enzymatic and Microbial Electrochemical Systems*, pp. 403-427.
- [10] Garg, S., **Sinha, B.**, Determining the contribution of long-range transport, regional and local source areas, to PM₁₀ mass loading in Hessen, Germany using a novel multi-receptor based statistical approach, *Atmospheric Environment*, 167, 566-575, 2017.
- [11] **Sinha, V.**, Chandra, B. P., Sinha, V., Hakkim, H., Kumar, A., Pawar, H., Mishra, A. K., Sharma, G., Pallavi, Garg, S., Ghude, S. D., Chate, D. M., Pithani, P., Kulkarni, R., Jenamani, R. K., and Rajeevan, M., Odd-even traffic rule implementation during winter 2016 in Delhi did not reduce traffic emissions of VOCs, carbon dioxide, methane and carbon monoxide, *Current Science*, 114, 6, 1318-1325.
- [12] Kumar, V., Chandra, B. P. , **Sinha, V.**, Large unexplained suite of chemically reactive compounds present in ambient air due to biomass fires, *Scientific Reports*, 8, 626, 2018.

- [13] Schultz, M. G., Schröder, S., Lyapina, O., Cooper, O. R., Galbally, I., Petropavlovskikh, I., Schneidemesser, E. R., Tanimoto, H., Elshorbany, Y., Naja, M., Seguel, R. J., Dauert, U., Eckhardt, P., Feigenspan, S., Fiebig, M., Hjellbrekke, A. G., Hong, Y. D., Kjeld, P. C., Koide, H., Lear, G., Tarasick, D., Ueno, M., Wallasch, M., Baumgardner, D., Chuang, M. D., Gillett, R., Lee, M., Molloy, S., Moolla, R., Wang, T., Sharps, K., Adame, J. A., Ancellet, G., Apadula, F., Artaxo, P., Barlasina, M. E., Bogucka, M., Bonasoni, P., Chang, L., Colomb, A., Cuevas-Agulló, A., Cupeiro, M., Degorska, A., Ding, A., Fröhlich, M., Frolov, M., Gadhavi, H., Gheusi, F., Gilge, S., Gonzalez, M. Y., Gros, V., Hamad, S. H., Helmig, D., Henriques, D., Hermansen, O., Holla, R., Hueber, J., Im, U., Jaffe, D. A., Komala, N., Kubistin, D., Lam, K. S., Laurila, T., Lee, H., Levy, I., Mazzoleni, C., Mazzoleni, L., McClure-Begley, A., Mohamad, M., Murovec, M., Navarro-Comas, M., Nicodim, F., Parrish, D., Read, K. A., Reid, N., Ries, L., Saxena, P., Schwab, J. J., Scorgie, V., Senik, I., Simmonds, P., **Sinha, V.**, Skorokhod, A. I., Spain, G., Spangl, W., Spoor, R., Springston, S. R., Steer, K., Steinbacher, M., Suharguniyawan, E., Torre, P., Trickl, T., Weili, L., Weller, R., Xiaobin, X., Xue, L. and Zhiqiang, M., Tropospheric Ozone Assessment Report: Database and Metrics Data of Global Surface Ozone Observations, *Elem Sci Anth.*, 5, 58, 2017.



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 postcolonial 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 Neoliberalism 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 Chauhan: Palaeoanthropological fieldwork was carried out along the western coast of the Red Sea (Sudan) in collaboration with Amanuel Beyin (University of Kentucky, USA) and Ahmad Nassr (University of Khartoum, Sudanese collaborator). This work involved a survey for Palaeolithic and palaeontological sites in relation to hominin dispersals out of eastern Africa and into western Asia. Numerous Acheulean and Middle Stone Age sites were discovered, documented and associated assemblages studied. This

evidence confirms the western Red Sea coast as a hominin/faunal dispersal corridor and demonstrates different environmental conditions than today. The region appears to have offered natural resources for hominin populations moving north and east from the east African zone, evidence for which was previously missing. This work was funded by a grant from the National Science Foundation (USA).

Experimental flintknapping and related research (e.g. heat treatment of Indian rock types and their XRF characterization) was carried out at the University of Exeter (UK) in collaboration with Prof. Bruce Bradley. Both Indian and British raw materials were broadly compared in terms of knapping quality and impact on stone tool form. The goal was to better understand patterns of raw material selection and associated cognitive abilities of early hominins through technological analysis of archaeological assemblages in comparison with assemblages produced from experiments. The technological aspect of this work has led to a strong functional aspect, where specific tool types will be tested through diverse actualistic studies for their efficiency, durability, versatility and preference for specific tasks (e.g. butchery, wood working, plant processing and so forth). This work was funded by a grant from the Royal society (UK).

Palaeolithic explorations were continued in the central Narmada Basin (in collaboration with the M.S. University of Baroda) and independently in the Siwalik Hills near Chandigarh. The former work involved rock art documentation in the Sehore District of Madhya Pradesh by Ms. Prabhsimrandeep Kaur for her 5th year project with the faculty. The work resulted in a more systematic documentation of the Bayan rockshelter complex and analysis of its paintings using D-Stretch software. The Siwalik Hills work involved surveys and geological trenching in post-Siwalik uplifted terrace deposits by Mr. Shubham Pal for his 5th year project with the faculty. The work resulted in a better contextual understanding of the Soanian Palaeolithic evidence found in the Siwalik Hills. In addition to the stratigraphic work, samples were also collected for OSL dating. This work was generously funded by IISER Mohali.

Select rockart sites in the Pachmarhi region (Madhya Pradesh) were visited with Dr. Martin Porr (University of Western Australia) to investigate the possibility of future collaboration. Some of the sites and associated paintings were documented as well as their sedimentary contexts and associated features such as geographic location, artifact records, research histories and so forth. The region appears to preserve styles of rock paintings slightly different from other parts of India and the dense patterning of the rock shelters may have led to a different and more diverse archaeological record from surrounding regions. This first preliminary visit will lead to formal collaboration through future grants and academic exchange.

Project JRF Vivek Singh and project postdoctoral researcher Tosabanta Padhan (Project UGC-16-0118) visited the University of Tel Aviv, Israel to see and study collections of original stone tools from the Levant, visit key paleoanthropological sites in the region, present their research and interact with Israeli collaborators. As a part of the same project, Prof. Ran Barkai visited IISER Mohali with his students and presented their work. The joint Indian-Israeli project is funded by an ISF-UGC grant (3rd cycle), the duration of which is from 2017-2020. The project essentially looks at select Acheulean records in Israel and India, respectively, to understand technological development, geographic dispersals and ecological adaptations. The Israeli part is more experiment oriented while the Indian part is more field oriented.

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.

V. Rajesh: I have been investigating the history of progressive literary movement in South India and the intellectual history of various strands of Left movement in Tamilnadu. A significant amount of resource material has been secured from various libraries in South India. I signed a contract with an Indian publisher to write a book on critical history of Tamil literature where I intend to experiment a chapter on the ideology of progressivism in twentieth century Tamil literature. Part of the ongoing research on progressive literary movement in South India also involves digitizing the primary source material. Many of literary magazines in vernacular languages that belong to this tradition from south India have been secured and digitized in the past one year.

Anu Sabhlok: May – June, 2017. Conducted fieldwork on the Hindustan Tibet Road to understand the relationship between national defence, infrastructural development and circular migration in India.

8.4.2 Visits of faculty members.

- **Parth Chauhan**
 - Visited Department of Archaeology, University of Exeter (UK) in May 2017.
 - Visited Department of Archaeology, Khartoum University (Sudan) June 2017.
 - Visited the National Museum of Ethiopia (Addis Ababa) in July 2017.
- **V. Rajesh**
 - Visited Institute of Economic Growth (IEG), New Delhi during May 4-5, 2017
 - Visited Sikkim University, Gangtok during October 27-29, 2017
- **Anu Sabhlok**
 - Visiting Associate Professor, Department of Geography, University of Colorado, Boulder

8.4.3 Talks delivered.

1. Parth Chauhan: A multidisciplinary perspective on the emergence and dispersal of prehistoric stone technology. Department of Anthropology, Panjab University, Chandigarh. February 6 to 9, 2018.
2. Parth Chauhan: Siwalik-age faunas from the Himalayan Foreland Basin of South Asia. Nanda, A.C. and P.R. Chauhan. Panjab University, Chandigarh. November 18-19, 2017.

3. Parth Chauhan: Theorizing about Late Pleistocene hominin biogeography in the Indian Subcontinent using multidisciplinary datasets. IISc, Bengaluru, September 26-28, 2017
4. Parth Chauhan: Explaining Regional Patterns of South Asian Symbolic Behaviour: Global Context. IGNCA, New Delhi. April 3-5, 2017
5. Parth Chauhan: A General Comparative Study of Rock Art from Central and Southern India. Prabhsimrandeep Kaur and P.R. Chauhan. University of Madras, Chapauk. March 22-23, 2018.
6. Parth Chauhan: Integrating faunal turnovers, mammalian biogeography and vertebrate taphonomy from Pleistocene South Asia. Parth R. Chauhan, Ramandeep Singh, Abhimanyu Bhardwaj. Benares Hindu University. November 4-6, 2017.
7. Parth Chauhan: Revisiting the Bayan Rockshelter Complex (Sehore Dt., M.P.). Prabhsimrandeep Kaur, Shubham Pal, Parth R. Chauhan. Benares Hindu University. November 4-6, 2017.
8. Parth Chauhan: Revisiting the Mahadevian: A Typo-technological Reanalysis of Lithic Assemblages from Mahadeo Piparia, central Narmada Basin, Madhya Pradesh. Srinivas, A., V. Singh and P.R. Chauhan. 2017. Benares Hindu University. November 4-6, 2017.
9. Parth Chauhan: Preliminary results of a Paleolithic Reconnaissance in the Red Sea Basin, Eastern Sudan. Chauhan, P.R., Amanuel Beyin, A. Nassr, M. Alhadi. National Museums of Ethiopia. Addis Ababa, Ethiopia. July 30-August 2, 2017.
10. Parth Chauhan: A report on lithic knapping: Experimental archaeological screening of Nubian like point technology dispersals into India. Ravindra Devra and A. Devara. School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand, Johannesburg, South Africa, March 20-22, 2018.
11. Parth Chauhan: Preliminary Observations from the Palaeolithic Investigations at Kibbanahalli, Southern Karnataka. Akash Srinivas. Indian Museum, Kolkata, India March 16-18, 2018.
12. Parth Chauhan: Archaeological Investigation around Kuldhara Village, Jaisalmer District, Rajasthan. Ravindra Devra. Department of History and Indian Culture, University of Rajasthan, Jaipur, January 19-20, 2018.
13. V. Rajesh. Intellectual Consciousness and Contending Narratives of Identity and Region in Tamilnadu. Institute of Economic Growth (IEG), Delhi: May 4, 2017.
14. V. Rajesh. Reading M.K. Gandhi's Hind Swaraj in Classroom: Challenges Confronting Pedagogy and Intellectual History. Department of History, Sikkim University, Gangtok: October 29, 2017.
15. V. Rajesh & Om Prakash. Contending Histories and Educating Citizens: NCERT History Textbook Controversy. Punjab University: Chandigarh, March 16, 2018.
16. Manleen Kaur. The Global Crisis and Financial Policy Trends in Late Colonial India. Institute for New Economic Thinking: Edinburgh, October 19, 2017.
17. Ajith. P. Ecology and Social Justice: A Critique of Kerala's Developmental Experience. Government Brennan College: Kannur, October 9, 2017.
18. Anu Sabhlok: Road Chronicles: Ethnographic notes on defense and development from the Indo-Tibetan border roads. Department of Geography Colloquium. University of Colorado, Boulder. Feb 16, 2018

19. Anu Sabhlok: Road Chronicles: A subaltern travelogue from the upper Himalayas. Department of Geography. University of Hawaii. March 7, 2018
20. Anu Sabhlok: Constructing the nation: a feminist reading of the modernist city of Chandigarh. Center for South Asian Studies. University of Hawaii. March 6, 201
21. Anu Sabhlok: Constructing the nation, modernity and gender: a feminist reading of Chandigarh. Association of American Geographers Annual Meeting. April 5, 2017. Boston

8.4.4 Conferences attended by researchers

- **Parth Chauhan**

- National Workshop on Perspectives in Palaeoanthropology & Human Evolution: Concepts, Methods, Issues. Organized by the Department of Anthropology, Panjab University, Chandigarh. February 6 to 9, 2018.
- Conference on The Emergence and Evolution of the Indian Foreland Basin. Panjab University, Chandigarh. November 18-19, 2017.
- International Biogeography Society meeting. Bengaluru, September 26-28, 2017
- National Seminar on Theoretical and Cognitive Aspects of Rock Art. IGNCA, New Delhi. April 3-5, 2017
- Annual Joint Conference of ISPQS, IAS & HSC. November 4-6, 2017.
- East African Association for Palaeoanthropology and Palaeontology conference. Addis Ababa, Ethiopia. July 30-August 2, 2017.
- Workshop on Geochronology. Nov 16-17, 2017 at IUAC, New Delhi

- **V. Rajesh**

- Language, Region, Knowledge: Colonial Disciplines to Indian Social Sciences, May 4-5, 2017: Institute of Economic Growth (IEG), Delhi
- One Hundred Years after Champaran and the Making of the Indian Nation, October 27-29, 2017: Department of History, Sikkim University, Gangtok
- Chandigarh Social Science Congress, March 15-16, 2018: Punjab University, Chandigarh

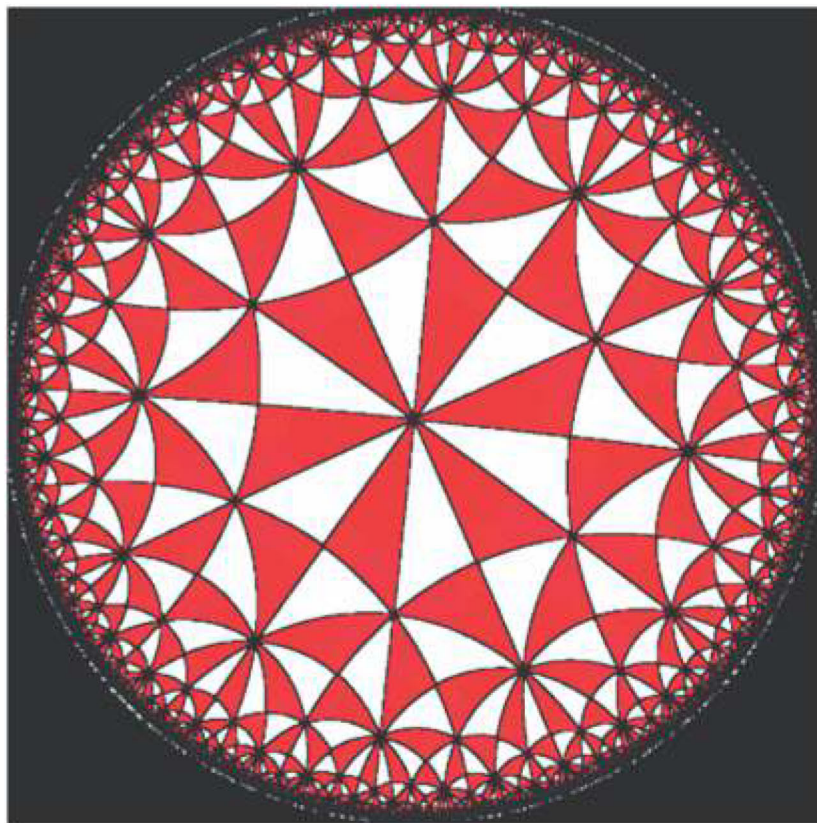
- **Anu Sabhlok**

- Association of American Geographers Annual Meeting. April 3-9, 2017. Boston

8.4.5 Publications: Humanities & Social Sciences

- [1] **Chauhan, P.R., Y. Sahle.** "Report on East African Association for Palaeoanthropology and Palaeontology conference". Addis Ababa. July 30-August 2, 2017. *Man and Environment* XLII(2): 115-116.
- [2] **Chauhan, P.R., K. Krishnan, N. Tiwari, A. Mukherjee, A. Anoop, D.A. Sant, R. Patnaik.** 2017. "At the forest edge: General observations on new microlithic occurrences in the central Narmada Basin, Madhya Pradesh." In *Rethinking the Past: A Tribute to Prof. V.N. Misra*. ISPQS Monograph 7. E-format. Pp.65-80.

- [3] **Chauhan, P.R.**, David R. Bridgland, Marie-Hélène Moncel, Pierre Antoine, Jean-Jacques Bahain, Rebecca Briant, Pedro P. Cunha, Jackie Despriée, Nicole Limondin-Lozoue, Jean-Luc Loch, Antonio A. Martins, Danielle C. Schreve, Andrew D. Shaw, Pierre Voinchet, Rob Westaway, Mark J. White, Tom S. White. 2017. "Fluvial deposits as an archive of early human activity: Progress during the 20 years of the Fluvial Archives Group". *Quaternary Science Reviews* 166: 114-149.
- [4] **Adrene Freeda Dcruz:** H. S. Pawar and A. F. Dcruz. "Introducing a third culture: Carl Djerassi and Roald Hoffmann in theatre" *Current Science*, vol. 114, no. 2, pp 275 – 279. (25 January 2018)
- [5] **V. Rajesh** 'Towards Creating an Archive of Marxist Writings in Tamil Language', *Puthiya Araichi*, Issue 8, July-December 2017, pp. 56-58.
- [6] **V. Rajesh** 'Obituary: Satish Chandra: Historian, Author, Institution Builder', *Puthiya Puthagam Pesuthu*, November 2017, pp. 68-70.
- [7] **Sabhlok, Anu.** "'Main Bhi to Hindostaan Hoon': gender and nation-state in India's Border Roads Organisation." *Gender, Place & Culture* (2017): 1-18.
- [8] Dahake, S. 2018. Epidemic of Urban Floods: Politics, Development and Ecology. *Economic and Political Weekly*, 53:7, pp 23-26. http://www.epw.in/journal/2018/7/commentary/epidemic-urban-floods.html?0=ip_login_no_cache%3Dbfa0834c6d94b7d1de277843bc43be77



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.

Chetan Balwe: My research has been focused on studying A^1 homotopy invariants of algebraic varieties. The universal motivic quotient of a birationally ruled surface was computed (collaboration with Anand

Sawant) and one of the questions I am currently studying is whether it is equal to the sheaf of A^1 -connected components of this surface. I am also trying to relate the A^1 -homotopy invariants of a given variety with those of (an appropriate version of) the space of rational curves on such a variety. Another project involves constructing a A^1 -homotopic analogue of the Milnor fiber.

Krishnendu Gongopadhyay:

- With Sean Lawton, we have obtained a set of trace parameters on the $SU(3,1)$ character variety of two generator free groups that classify any polystable representation in the deformation space. This is the best possible set of such trace parameters known so far.
- With Soumya Dey, we investigated commutator subgroup of a generalized braid group, known as welded braid groups, loop braid groups, or symmetric automorphisms of free groups. We prove that the commutator subgroup is finitely generated and every surjective self-homomorphism of the commutator subgroup is an isomorphism. We also prove that the commutator subgroup is equal to its own commutator subgroup.
- With Abhishek Mukherjee, we have obtained Jorgensen type inequalities for two-generator subgroups of $SL(2, H)$ which acts by the orientation-preserving isometries of the real hyperbolic 5-space, here H is the division ring of Hamilton's quaternions. We further investigated extremality of such inequalities.
- With Sudip Mazumder, we investigated the following problem: When does a linear map over a field with involution admit an invariant hermitian form. Assuming that the characteristic of the underlying field is different from two, we have answered this question in this work.
- With Valeriya Bardakov and Oleg Bryukhanov, we proved that a nilpotent product of a set of groups $G_1 = \langle X_1 \rangle, \dots, G_m = \langle X_m \rangle$ has finite palindromic width with respect to the generating set X if and only if each G_i has finite palindromic width with respect to X_i , where X is the union of the sets X_i , $i=1, \dots, m$. We also investigated palindromic widths in wreath products.

Sudesh Kaur Khanduja: During this period, I published three papers on algebraic number theory and valued fields jointly with my research students: Anuj Jakhar and Neeraj. Paper I characterizes those primes which divide the discriminant of an irreducible trinomial of the type $F(X) = X^n + aX^m + b$ belonging to $\mathbb{Z}[X]$ but do not divide the index $1 [A_K \mathbb{Z}[\alpha]]$, where A_K is the ring of algebraic integers of $K = \mathbb{Q}(\alpha)$, α a root of $F(X)$. Keeping in mind that a prime p satisfies the above properties if and only if the ring $\mathbb{Z}(p)[\alpha]$ is integrally closed, $\mathbb{Z}(p)$ being the localization of \mathbb{Z} at $p\mathbb{Z}$. Paper II extends the main result of Paper I replacing $\mathbb{Z}(p)$ by the valuation ring by any Krull valuation. The results of Paper II give the converse of a well-known theorem of Algebraic Number Theory regarding discriminant of compositum of two algebraic number fields which are linearly disjoint over the field of rationals. Paper III gives an explicit formula for the discriminant of Kummer extensions of rationals having square-free degree using an innovative method.

Tanusree Khandai: Toroidal Lie algebras are a generalization of the affine Kac-Moody Lie algebras. The class of integrable representations of toroidal Lie algebras has been a subject of interest for the past few years. It is well known that the category of integrable representations of the toroidal Lie algebra having finite-dimensional weight space is not be semisimple. I have been studying the structure of this category. In the case when the finite type Lie algebra associated with the toroidal Lie algebra is of type A_n, D_n, E_7, E_8, F_4 , I have obtained a block decomposition of the subcategory of finite-length objects of the category of positive level integrable representations of toroidal Lie algebras.

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 exploring power maps and word maps over linear groups. Together with Anupam Singh, I have obtained bounds on the proportion of various powers in special linear groups. In a collaboration with Varadharaj Srinivasan I am also working on Differential Central Simple Algebras with an intention to explore field extensions which split Differential Crossed Product Algebras.

Chanchal Kumar: I have been interested in investigating combinatorial problems using tools from commutative algebra. We have obtained interpretations of many well-known integer sequences in terms of enumeration of standard monomials of quotient of polynomial rings. In future, I am planning to apply tools from discrete Morsetheory to construct minimal free resolutions of some classes of monomial ideals. Am also interested in problems on combinatorics of hyperplane arrangements.

Shobha Madan: I am working on aspects of Fuglede's Conjecture in one dimension, and we have proved that a spectral set, its spectrum must be periodic, and rational.

Alok Maharana: Complex affine surfaces with logarithmic Kodaira dimension zero, canonical divisor zero and logarithmic irregularity zero were investigated.

Soma Maity: It is a classical problem in Riemannian Geometry to study critical metrics of Riemannian functionals defined by taking L^2 -norm of Riemannian curvature tensor, Ricci curvature, scalar curvature, Weyl curvature denoted by R_2 , Ric_2 , S_2 and W_2 . Gursky and Viaclovsky gave criterion for stability of Einstein metrics as critical metrics of the linear combinations of Ric_2 and S_2 . There are many examples of Einstein manifolds whose product manifolds are not Einstein but they are critical points of L^2 -norm of Ricci tensor (Ric_2) and R_2 . Product of spheres and compact hyperbolic manifolds are such a examples. We have studied stability of Riemannian functionals mentioned above at these types of metrics. We have also studied stability of the conformally invariant Riemannian functional defined by $L^{n/2}$ -norm of Weyl curvature at product of spheres and hyperbolic manifolds. This is a joint work with Dr. Atreyee Bhattacharya and the manuscript is under preparation.

Shane D'Mello: I have mainly studied the topology of real algebraic curves including real algebraic knots. Most recently, I studied an application of braid groups in the construction of real algebraic knots, which led me to consider classical knots in more detail. I am collaborating with Prof. Rama Mishra of IISER Pune to understand certain aspects of knots related to quandles.

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: In collaborative work with M. V. Nori, we have isolated a particular case of the Hodge conjecture for K3 surfaces with complex multiplication. In this case, the conjecture can be proven by us for a family of codimension one. This also leads to a resolution of a particular case of the generalised Hodge conjecture as formulated by Grothendieck.

Inder Bir Singh Passi: A study of the upper central series of the unit groups of integral group rings was carried out. In collaboration with Sugandha Maheshwary (IISER Mohali), a survey on this topic was completed. This survey will appear in Indian Statistical Institute Series - Springer.

Ongoing work, in collaboration with Mahender Singh (IISER Mohali) and Manoj Kumar Yadav (HRI Allahabad), on a monograph entitled Automorphisms of Finite Groups, was completed. This monograph has been accepted for publication by Springer.

A study of quandle rings, in collaboration with Valery G. Berdakov (Novosibirsk) and Mahender Singh (IISER Mohali) was initiated and continued.

Investigation of integral group rings with all central units trivial, taken up in collaboration with Gurmeet K. Bakshi (PU Chandigarh) and Sugandha Maheshwary (IISER Mohali) [Journal of Pure and Applied Algebra, Volume 221, Issue 8, August 2017, Pages 1955-1965], was continued to explore infinite groups with this property.

Neeraja Sahasrabudhe: The work on problem of finding optimal strategy for influencing opinions of a system with fixed population, in collaboration with Dr. Sharayu Moharir and Bhumes Kumar, was concluded for the proposed model. The results obtained were put together in the paper titled "On Influencing Opinion Dynamics over Finite Time Horizons", which has been accepted for presentation at MTNS 2018 (23rd International Symposium on Mathematical Theory of Networks and Systems). This is an ongoing work and we are currently working on some extensions of the opinion model considered in this paper. The paper titled "Sparse Regression using Compressive Sensing with Input Shaping" with Prof. V. S. Borkar and V. R. Dwarlacherla has also been accepted at MTNS 2018.

The results obtained for the ongoing work on "Random Walk in i.i.d. environment on regular trees", in collaboration with Antar Bandyopadhyay, Siva Athreya, Amites Dasgupta, were presented at 'ISI-Networks conference in Probability' held in December 2017, by co-author Antar Bandyopadhyay. This manuscript is currently in preparation.

Some results on concentration of asynchronous multiple timescale stochastic approximations were obtained. This manuscript, a collaborative work with Prof. V. S. Borkar, is currently in preparation. Some preliminary results were obtained for a new research project on "Consensus via interacting urns on networks" with Gursharan Kaur (PhD student at ISI, Delhi).

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 II₁- 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.

Pranab Sardar: Suppose a hyperbolic group admits a decomposition into a graph of hyperbolic groups with quasi-isometrically embedded conditions. Then we prove a limit set intersection of the vertex groups reminiscent of the same type of results obtained by J. Anderson for Kleinian groups.

An exact analog of this for a graph of relatively hyperbolic groups has been obtained by a PhD student mentored by me in IISER Mohali recently.

We prove the existence of Cannon-Thurston maps (jointly with M. Kapovich) for a subgraph of groups of a graph of hyperbolic groups generalizing a similar result of Mahan Mitra for the vertex groups of a graph of hyperbolic groups. This is a work under progress.

Jointly with Shubhabrata Das, Pritam Ghosh, and Abhijit Pal we introduce a weak form of Cannon-Thurston maps for groups with nontrivial Morse boundary and prove the existence of such maps for graphs of hyperbolic groups with quasi-isometric embedding conditions when the ambient groups is not hyperbolic. This is a work under progress.

Mahender Singh: We completed our joint research monograph [Automorphisms of Finite Groups, Springer, 2018] with I.B.S. Passi and M.K Yadav. The monograph investigates numerical and structural aspects of automorphism groups of finite groups, and is broadly divided into three parts. The first being an exposition of an exact sequence relating automorphisms, derivations and cohomology of groups. The second part is an exposition of various developments on a functional bound on orders of finite groups with sufficiently large automorphism groups. The final part presents the works on the well-known Divisibility Property of finite p -groups culminating in the existence of groups without this property. The monograph is aimed at researchers working in group theory, particularly, graduate students in algebra will find it useful.

We obtained some results on the lifting and extension problem for automorphisms of some well-known exact sequences arising from Artin braid groups, and prove that that answers are negative in most cases. We also investigated equivariant maps between representation spheres of some compact Lie groups.

Varadharaj R. Srinivasan: I am presently working on the following problems: a. Understand the structure of central simple algebras endowed with a derivation map (joint work with Kulshrestha, Soman) b. Determine the existence of closed form solutions of nonlinear differential equations over the field of rational functions in one variable.

8.5.2 Visits of faculty members

- **Chetan Balwe**
 - visited Institute of Mathematics and Applications, Bhubaneswar in June 2017
 - visited IISER Pune, December 2017
 - visited Institute of Mathematics and Applications, Bhubaneswar in December 2017
 - visited Homi Bhabha Center for Science Education, Mumbai in January 2017
 - visited IISER Pune in February 2017
 - visited Indian Statistical Institute, Delhi in March 2017
- **Krishnendu Gongopadhyay**
 - University of New South Wales (UNSW), Sydney, New South Wales, Australia.
 - University of Sydney, Sydney, Australia.
 - International Center for Theoretical Sciences (ICTS) Bangalore, India.
 - Harish-Chandra Research Institute, Allahabad, India.
- **Sudesh Kaur Khanduja**
 - Visited Department of Mathematics IIT Patna, during November 22- 23, 2017.
 - Visited Department of Mathematics SGGS Institute of Engineering and Technology Nanded, during December 6 - 8, 2017.

- **Tanusree Khandai**
 - Visited Indian Institute of Science (Bangalore) India, during June 30 – July 02, 2017
 - Visited Mathematical Institute and Zoology Department, Oxford University (UK), during August 27-30, 2017
- **Amit Kulshrestha**
 - Indian Institute of Science Education and Research Pune during May 11-13, 2017.
 - Sobolev Institute of Mathematics, Novosibirsk, Russia during October 15-27, 2017.
 - Indian Institute of Science Education and Research Pune during December 9-15, 2017.
- **Inder Bir Singh Passi**
 - Ashoka University, Sonipat, 2 April – 13 May, 2017, 14 August – 15 December 2017, 22 January – 11 May, 2018.
- **Neeraja Sahasrabudhe.**
 - Visited Indian Institute of Technology Bombay, India, during 7-15 October, 2017
- **Pranab Sardar**
 - Visited ICTS Bangalore from November 08 to 19, 2017 for the international workshop on Groups, Geometry and Dynamics 2017.
- **Mahender Singh.**
 - Visited Institute of Mathematics of the Polish Academy of Sciences, Bedlewo, Poland, 25 June–01 July 2017.
 - Visited Sobolev Institute of Mathematics, Novosibirsk, Russia, during 17-28 July 2017.
 - Visited Doon University, Dehradun, Uttarakhand, 09-14 October 2017.

8.5.3 Talks delivered

1. Chetan Balwe: A^1 -connected components of reductive groups: CAAG, IISER Pune: December 5, 2017
2. Sudesh Kaur Khanduja: Delivered a Plenary lecture in International Conference on Class Groups of Number Fields and Related Topics (ICCGNFRT) held at Harish-Chandra Research Institute, Allahabad, India, during September 4 - 7, 2017.
3. Sudesh Kaur Khanduja: Delivered two lectures in Science Academy's Lecture Workshop on Topics in Algebra and Number Theory held at Ranchi College, Ranchi during September 22 - 24, 2017. 50.
4. Sudesh Kaur Khanduja: Delivered a lecture in the International Conference on Algebra, Discrete Mathematics and Applications at Babasaheb Ambedkar Marathwada University, Aurangabad during December 9 - 11, 2017.
5. Sudesh Kaur Khanduja: Delivered a lecture in the conference on Number Theory: Arithmetic, Diophantine and Transcendence held at IIT Ropar during December 22- 25, 2017.
6. Sudesh Kaur Khanduja: Delivered the opening lecture in the 61st Refresher Course in Mathematical Science organised by UGC- Human Resource Development Centre, Punjabi University, Patiala on June 22, 2017.

7. Sudesh Kaur Khanduja:Delivered a lecture in Mathematics Workshop for Undergraduate Students Sponsored by Chandigarh Chapter of NASI at DAV College Ambala City on October 28, 2017.
8. Sudesh Kaur Khanduja:Delivered a colloquium talk in the Department of Mathematics IIT Patna on November 22, 2017.
9. Sudesh Kaur Khanduja:Delivered a public lecture in the Department of Mathematics SGGS Institute of Engineering and Technology Nanded on December 8, 2017.
10. Tanusree Khandai: Aastha Sindhwani. Cell Biology of Infection. National Centre for Biological Sciences, Bangalore. October 13-14, 2017.
11. Tanusree Khandai: Anand K. Bachhawat. Bose Institute, Kolkata, October 2017
12. Tanusree Khandai: Kavita Babu. Role of cell adhesion molecules at the C. elegans NMJ : IBRO / APRC School at Panjab University, India : Dec 19, 2017.
13. Amit Kulshrestha:Witt equivalence of fields and quaternion algebras, Indian Institute of Science Education and Research Pune, May 11 2017.
14. Amit Kulshrestha: Quaternions and abstraction, HRD Centre, Punjabi University Patiala, June 28 2017.
15. Amit Kulshrestha: Groups around us, Academies' Workshop, Ranchi College, Ranchi, September 22-23 2017.
16. Amit Kulshrestha: Matrices and quadratic forms, DAV University Jalandhar, September 09 2017.
17. Chancha Kumar: Delivered an invited talk on "Finding Area by counting points" at DAV University, Jalandhar on April 22, 2017.
18. Chancha Kumar: Gave a series of six lectures in an Instructional School for Teachers (IST) on "Quadratic number fields and Linear algebra" held at University of Shimla during June 12-17, 2017.
19. Chancha Kumar: Delivered two lectures on "Group Actions and their applications" in INSA Lecture workshop on Algebra and Number Theory held at DAV University, Jalandhar on September 8, 2017.
20. Shane D'Mello:Real algebraic knots, 7th East Asian Conference on Algebraic Topology, IISER Mohali, December 5, 2018
21. Inder Bir Singh Passi: Automorphisms of Groups, Indian Institute of Science Education and Research, Mohali, 24 January, 31 January, 21 February, 7 March 2018.
22. Inder Bir Singh Passi: Automorphisms of Groups, DAV College, Jalandhar, 23 February 2018.
23. Pranab Sardar:I gave lectures in international workshop on Groups, Geometry and Dynamics 2017 at ICTS Bangalore on Symmetric Spaces.
24. Mahender Singh: Quandles, Automorphisms and Cohomology. Sobolev Institute of Mathematics, Novosibirsk, Russia. 20 July 2017.
25. Mahender Singh:Equivariant maps between representation spheres of compact Lie groups. Applied Topology in Bedlewo, Poland. 27 June 2017.
26. Mahender Singh: Mini course on algebraic topology. Doon University, Dehradun, Uttarakhand. 09-14 October 2017.
27. Varadharaj R. Srinivasan: Inter IISER Mathematics Meet (IIMM), May 11-12, 2017.
28. Krishnendu Gongopadhyay: Quaternionic hyperbolic Fenchel-Nielsen coordinates, Sydney University, August 2017.

29. Krishnendu Gongopadhyay: Conjugation orbits of loxodromic pairs in $SU(n,1)$, UNSW, Sydney Australia.
30. Krishnendu Gongopadhyay: Soumya Dey: Commutators of Welded Braid Groups (Sobolev Institute of Mathematics, Russia, July 20, 2017)
31. Krishnendu Gongopadhyay: Soumya Dey: Welded Braids and their Commutators (IISER Mohali, August 11, 2017)
32. Krishnendu Gongopadhyay: Swathi Krishna gave a talk "Hyperbolic groups" at IISER Mohali student seminar.

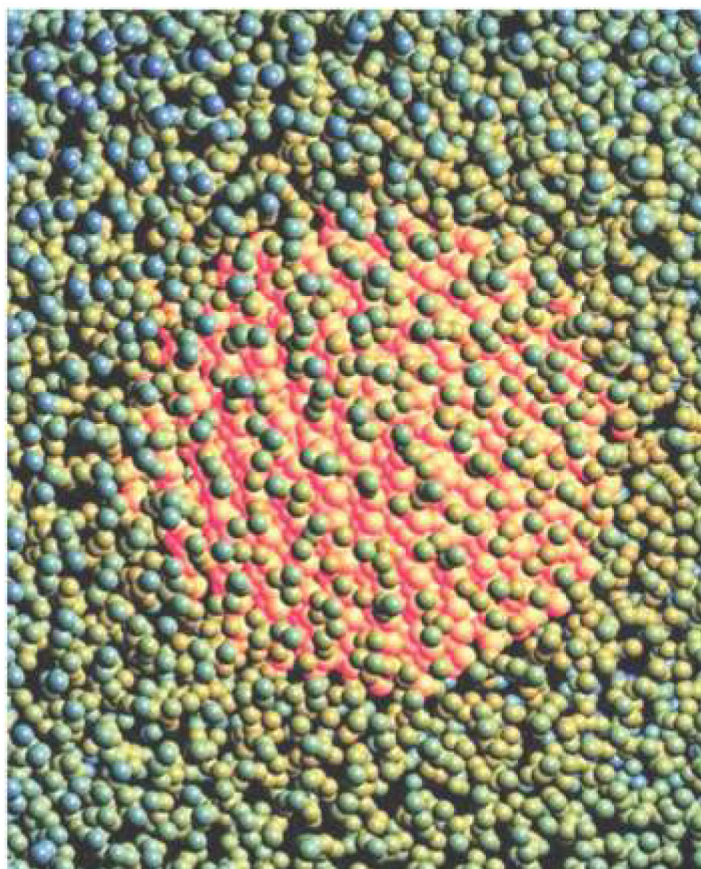
8.5.4 Conferences attended by researchers

- **Chetan Balwe**
 - Commutative Algebra and Algebraic Geometry: December 5-8, 2017: IISER Pune.
- **Sudesh Kaur Khanduja**
 - Anuj Jakhar, Sudesh Kaur Khanduja and Neeraj. International Conference on Class Groups of Number Fields and Related Topics (ICCGNFRT): September 4 - 7, 2017, Harish-Chandra Research Institute, Allahabad, India.
 - Sudesh Kaur Khanduja. Science Academy's Lecture Workshop on Topics in Algebra and Number: September 22 - 24, 2017, Ranchi College, Ranchi.
 - Sudesh Kaur Khanduja. International Conference on Algebra, Discrete Mathematics and Applications: December 9 - 11, 2017, Babasaheb Ambedkar Marathwada University, Aurangabad.
 - Sudesh Kaur Khanduja. Conference on Number Theory: Arithmetic, Diophantine and Transcendence: December 22- 25, 2017, IIT Ropar.
- **Tanusree Khandai**
 - Richa Singh, Lata Kalra, Soniya Yambem. Young Ecologists Talk and Interact (YETI): January 4-7, 2018. Tezpur University, Tezpur, Assam.
 - Rachna Chaba, EMBO conference on Bacterial Morphogenesis. November 27 to December 1, 2017. Trivandrum, India.
- **Shane D'Mello**
 - 7th East Asian Conference on Algebraic Topology. December 1 - 6, 2018. IISER Mohali.
- **Inder Bir Singh Passi**
 - Anniversary General Meeting, Indian National Science Academy, IISER, Pune, 27 – 29 December 2017.
- **Mahender Singh**
 - Attended Applied Topology in Bedlewo, Institute of Mathematics of the Polish Academy of Sciences, Bedlewo, Poland, 25 June–01 July 2017.
 - Attended Knots, Braid Groups and 3-Manifolds, Sobolev Institute of Mathematics, Novosibirsk, Russia, 20 July 2017.
 - Attended TEW on Group Theory, Analysis and Topology, Doon University, Uttarakhand 09-14 October 2017.
 - Attended 7th East Asian Conference on Algebraic Topology (EACAT), IISER Mohali, 01-06 December 2017.

- Attended Groups and Related Structures, IISER Mohali, 07-08 December 2017.
- **Varadharaj R. Srinivasan**
 - IIMM: I relived a talk and my PhD student, Ms. Yashpreet Kaur put up a poster on her PhD thesis work.

8.5.5 Publications: Mathematical Sciences

- [1] **Krishnendu Gongopadhyay** and Sean Lawton, Invariants of pairs in $SL(4, \mathbb{C})$ and $SU(3,1)$. *Proc. Amer. Math. Soc.* 145 (2017), no.11, 4703--4715.
- [2] **Krishnendu Gongopadhyay** and Soumya Dey, Commutator subgroups of welded braid groups. *Topology and its Applications*. Volume 237, 2018, 7--20.
- [3] **Krishnendu Gongopadhyay** and Abhishek Mukherjee, Extremality of quaternionic Jorgensen inequality. *Hiroshima Math. J.* 47 (2017), 113--137.
- [4] **Krishnendu Gongopadhyay** and Sudip Mazumder, Existence of an invariant form under a linear map. *Indian J. Pure Appl. Math.* 48 (2017), no.2, 211--220.
- [5] Valeriy G. Bardakov, **Krishnendu Gongopadhyay** and Oleg V. Bryukhanov) On palindromic widths of some wreath products and nilpotent products. *Proc. Indian Acad. Sci. Math. Sci.*, Volume 127, No. 1 (2017), 99--108.
- [6] Jakhar, **S. K. Khanduja**, N. Sangwan, Characterization of primes dividing the index of an algebraic integer, *Int. J. Number Theory* Vol. 13 No. 10 (2017), pp 2505--2514.
- [7] Jakhar, **S. K. Khanduja**, N. Sangwan, On integrally closed simple extensions of valuation rings, *J. Pure Appl. Algebra*, Vol. 222 (2018), pp 889-899.
- [8] Jakhar, **S. K. Khanduja**, N. Sangwan, Discriminant of pure square free degree number fields, *Acta Arith.* Vol. 181 (2017), pp 287-296.
- [9] Ajay Kumar and **Chanchal Kumar**, An integer sequence and standard monomials, *Journal of Algebra and Its applications*, vol 17, No 2 (2018)
- [10] Ajay Kumar and **Chanchal Kumar**, Some Integer sequences and standard monomials, *GANITA*, Vol. 67(1), 2017, pp. 33-40.
- [11] **S. D'Mello** and R. Mishra. "Constructing real rational knots by gluing". *Topology and its Applications*, vol. 237, pp. 67 - 81, 2018
- [12] **Inder Bir Singh Passi**, (with Alfred W. Hales) Group rings and Jordan decomposition, *Contemporary Mathematics*, Vol. 688, Groups, Rings, Group Rings and Hopf Algebras, dedicated to Don Passman, pp 103--112, *Amer. Math. Soc.* Providence, Rhode Island, 2017.
- [13] **Inder Bir Singh Passi** (with Gurmeet K. Bakshi and Sugandha Maheshwary) Integral group rings with all central units trivial, *J. Pure Appl. Algebra*, 221, Issue 8, August 2017, pp. 1955--1965.
- [14] **P. Sardar** Graphs of hyperbolic groups and a limit set intersection theorem, *PROCEEDINGS OF THE AMERICAN MATHEMATICAL SOCIETY*, Volume 146, Number 5, May 2018, Pages 1859--1871.
- [15] **I.B.S Passi, Mahender Singh** and M.K. Yadav, Automorphisms of Finite Groups, Springer Monographs in Mathematics Springer, (2018), ISBN 978-981-13-2894-7, ISSN 1439-7382, XXIII + 215 pp."
- [16] V.G. Bardakov, M.V. Neshchadim and **Mahender Singh**, Automorphisms of pure braid groups, *Monatshefte für Mathematik* (2017), DOI 10.1007/s00605-017-1073-7.
- [17] Z. Blaszczyk, W. Marzantowicz and **Mahender Singh**, Equivariant maps between representation spheres, *Bulletin of the Belgian Mathematical Society* 24 (2017), 621--630.



8.6 DEPARTMENT OF PHYSICAL SCIENCES

8.6.1 Summary of the research work

Arvind: My research in this year includes entanglement in quantum optical systems, quantum measurement problem including weak quantum measurements, quantum cryptography and quantum contextuality, orbital angular momentum in light beams and NMR quantum information processing. A key result that we recently got where we have shown that contextuality monogamy plays a role in providing security to certain cryptography protocol has many ramifications and we are currently exploring these directions

Charanjit Singh Aulakh: Together with Dr. Ram Lal Awasthi National post-doctoral Fellow I have been struggling to develop a complete renormalization and matching scheme for the full off diagonal Minimal Supersymmetric Standard Model to the Standard Model to complete the low scale end of the Supersymmetric $SO(10)$ Grand Unified - experimental data fitting program so that we can search for viable and broadly predictive minimal Susy $SO(10)$ GUT parameter values. This has involved an extensive learning program regarding the gritty issues of renormalization of spontaneously broken supersymmetric gauge theories and specifically of the matching of the Cabbibo Kobayashi Masakawa Matrix and lightest Higgs mass calculations: which are two of the most challenging aspects of defining the effective MSSM obtained from the Susy $SO(10)$ GUT and run down to low scale via the Renormalization Group equations.

We have now resolved all the conceptual issues that puzzled us and are at the stage of coding our results into our numerical parameter search programs. This work is done under my ongoing DST Project on the "Phenomenology and Cosmology of the New Minimal Supersymmetric SO(10) GUT"

Jasjeet Singh Bagla: Focus of my research has been on aspects of galaxy formation and gravitational clustering.

Manvendra Pratap and I have studied evolution of density perturbations in realistic models of dark energy in the regime where perturbations in dark matter are highly non-linear and dark matter halos have collapsed. We find that the perturbations in dark energy remain small and have no discernable impact on clustering of dark matter. However, perturbations in dark energy grow at a rate that is higher than expected at these scales in linear perturbation theory. The most intriguing outcome of our study is that the equation of state parameter for dark energy develops spatial variation. This may provide an avenue for an observational test of dynamical dark energy.

Jayanta Dutta, Sharanya Sur, Athena Stacy and I have been studying the possibility of survival of the first generation of stars, the so called Population III stars, up to the present day. Our study indicates that stars that escape from the gas cloud where these are born may survive to the present day, all other stars accrete adequate mass such that their expected life time becomes much shorter than the time since their formation.

Sandeep Rana and I have studied clustering of point sources as observed in the low frequency radio window at 150 MHz. We used observations made as a part of the GMRT sky survey (TGSS). We find that the angular correlation of these sources varies as a power law in angle, the index of the correlation function is insensitive to the flux limit whereas the amplitude varies strongly with the flux limit: brighter sources cluster strongly. We derive a relation between the flux limit and the amplitude of angular clustering. This is useful as the clustering of point sources is an important foreground contamination for studies of the epoch of reionization.

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 softcondensed matter systems that are driven out of equilibrium. We use both analytical approaches (Equilibrium and Non-equilibrium Statistical Mechanics, Hydrodynamics) and computational methods

(Molecular Dynamics, Brownian Dynamics, Monte Carlo) to investigate the dynamics of systems ranging from the cell membrane and the cell cytoskeleton to polymers and colloids in confinement.

The cell is an active dynamical medium, constantly generating and dissipating energy to sustain the various life processes. It is subject to active stresses arising from a meshwork of filaments (cell cytoskeleton), which is driven out of equilibrium. We use an active hydrodynamics approach for the coupled dynamics of these filaments and the motor proteins to determine the organization of molecules on the cell surface. We study the consequences of such organization on signalling platforms and the uptake of material by the cell.

In a recent work (Phys. Rev. E 2016) we have studied the effect of catch bonding on unidirectional transport properties of cellular cargo carried by multiple dynein motors. This work was motivated by experiments which demonstrated that dynein motors exhibit catch bonding behaviour, in which the unbinding rate of a single dynein decreases with increasing force, for a certain range of force. We find catch bonding can result in dramatic changes in the transport properties, which are in sharp contrast to kinesin driven unidirectional transport, where catch bonding is absent. These results can have important consequences in understanding the role of motor driven transport inside the cell.

Sanjib Dey: During the given time period I have worked on several projects. The main aim of all of these projects was to find a deformed quantum mechanical framework that is consistent with quantum gravity theories. Therefore, my works are based on the combination of the subjects of quantum gravity and quantum information theory. In one of the works, we have explored a possibility of detecting the deformation parameter of noncommutative theories by using a simple opto-mechanical device, which can detect the deformation with high-precision. The other works are mostly based on theoretical framework, where we have studied deformation of several physical models and observe the physical consequences of the given framework. The main conclusion of the works is that the deformed quantum mechanical framework that is compatible with quantum gravity theories does not violate any basic laws of original quantum mechanics. But, it gives rise to the idea of nonlinearity in the context which may be imposed to understand the quantum gravity theories.

Dr. Kavita Dorai: Research on NMR Metabolomics from my group focused on developing fast 2D-based metabolite fingerprinting schemes to speedup metabolomics experiments and on exploring the differences in basal metabolism of a control and an immunity-enhanced drosophila population. We used a fast 2D NMR experiment namely the 2D ASAP-HSQC sequence and the entire metabolomics study, including metabolite identification and preparing input data for multivariate statistical analysis, was performed using the 2D NMR dataset. We used NMR-based metabolomics to test two hypotheses—(i) there will be evolved differences in the metabolome of selected and control populations even under uninfected conditions and (ii) post infection, the metabolomes of the selected and control populations will respond differently.

Research on NMR Quantum Computing from my group focused on using dynamical decoupling sequences to preserve quantum correlations and three-qubit entanglement, wherein sophisticated quantum control techniques were used to experimentally preserve the lifetime of fragile quantum states for remarkable times. We also implemented an experimental NMR scheme for selective and efficient quantum process tomography without the need for an ancilla. We also experimentally demonstrated the efficacy of a three-layer nested Uhrig dynamical decoupling (NUDD) sequence to preserve arbitrary quantum states in a two-dimensional subspace of the four-dimensional two-qubit Hilbert space. We experimentally constructed a positive map to witness nonclassicality of two qubits in an NMR system. The

map can be decomposed in terms of measurable spin magnetizations so that a single run of an experiment on an ensemble of spins suffices to detect the nonclassicality in the state, if present. We also studied the Majorana geometrical representation of a qutrit, where a pair of points on a unit sphere represents its quantum states. A canonical form for qutrit states was presented, where every state can be obtained from a one-parameter family of states via $SO(3)$ action. We designed efficient quantum circuits for the three-qubit Toffoli (controlled-controlled-NOT) and the Fredkin (controlled-SWAP) gate, optimized via genetic programming methods and implemented them on a three-qubit NMR quantum information processor.

Sandeep Goyal: My primary focus is on the quantum memories, more specifically, atomic frequency comb (AFC) based quantum memory. We have estimated multipartite entanglement between the multiple teeth of an AFC. A single photon is absorbed collectively over all the teeth of the AFC. This results in a multipartite entangled state, where the teeth of the comb are the participating systems. We have developed an experimental friendly method to witness this entanglement which relies upon the signal to noise ratio of the output signal. In collaboration with an experimental group at the University of Calgary, we demonstrated this witness experimentally. In collaboration with Prof. David Feder and Prof. Barry Sanders I have also devised methods to detect topological phase transition in two-dimensional quantum Hamiltonians by just looking at the evolution of a single particle and to simulate topologically protected bound states using quantum walks.

Harvinder Kaur Jassal: A large amount of data is now available and it is therefore possible to constrain cosmological parameters to unprecedented precision. We use different observations to set constraints on models of the Universe, especially constraints on dark energy. In the context of dark energy as a fluid, we consider cosmologies with constant and varying equation of state. We constrain dark energy models using a compendium of observations at low redshifts. We consider the dark energy as a barotropic fluid, with the equation of state a constant as well the case where dark energy equation of state is a function of redshift. The different observations used are the supernovae data, the baryonic acoustic oscillations (BAO) data and the direct measurements of Hubble parameter data. We compare constraints obtained from these data and also do a combined analysis. The combined observational constraints put very strong limits on variation of dark energy density with redshift. For varying dark energy models, the range of parameters preferred by the supernova type Ia data is in tension with the other low redshift distance measurements.

Dark energy equation of state can be effectively described by that of a barotropic fluid. The fluid model describes the background evolution and the functional form of the equation of state parameter can be constrained by using diverse observations. Equally viable explanations of dark energy are via scalar field models, these scalar field models being low energy descriptions of an underlying high energy theory. We attempt to reconcile the two approaches to dark energy by way of reconstructing the evolution of the scalar field potential. For this analysis, we have considered canonical quintessence scalar field and the phantom field for this reconstruction. We obtain the analytical or semi-analytical forms of scalar field potentials corresponding to typical parameterisations of dark energy.

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 unzipping of a double stranded DNA subjected to a time-dependent periodic pulling force, oscillating with some frequency, at one of its ends keeping the other end fixed. The distance between the strands, where the force is applied, also varies but with a lag which depends on the frequency of the pulling force. As a result, a hysteresis loop is observed whose area gives the energy deposited in the system. We study the effect of temperature on the area of the hysteresis loop. 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 of the polymer for different type of pores and found that the sequence of an unknown heteropolymer made up of alternating flexible and stiff segment can be detected by passing it through multiple pores of different types. We also study the translocation of a polymer through a conical pore.

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.

Kinjalk Lochan: During the specified period, Dr. Lochan primarily worked on the aspects of black holes and quantum gravity, QFT on curved space, properties of Quenched quantum systems. A brief summary is produced below.

1. Black Holes and Quantum Gravity: Black holes, over time, have really started to test our confidence in everything else in the theoretical physics. The most serious charge on the black holes is that they eat up information, never to release and subsequently erase it. This goes absolutely against the sacred principles of all other branches of fundamental sciences. Dr. Lochan has been analyzing the problem of information loss from black holes in the framework of semiclassical and quantum gravity. In some of his recent works, it has been demonstrated that this issue can be addressed through analysis of quantum correlations in black hole background (see list of publications). He also analyzed the emission pattern of a (fundamentally quantum) black hole in Kerr-Newman family in a model insensitive fashion, demonstrating that, irrespective of the fundamental quantum theory, a macroscopic black hole always has non-continuously separated mass states, therefore they descend down in discrete manner. This may have large implications for information content in the radiation.

2. Properties of Quenched quantum systems: Dr. Lochan also investigated equilibration and generalized thermalization of the quantum Harmonic chain under local quantum quench. This study verifies the validity of the Generalized Gibbs Ensemble description for this infinite dimensional Hilbert space system and also identifies equilibration between the subsystems as in classical systems. Using

Bogoliubov transformations, it was shown that the eigenstates of the system prior to the quench evolve towards the Gibbs Generalized Ensemble description. Eigenstates that are more delocalized (in the sense of inverse participation ratio) prior to the quench, tend to equilibrate more rapidly. Further, through the phase space properties of a Generalized Gibbs Ensemble and the strength of stimulated emission, one can identify the necessary criterion on the initial states for such relaxation at late times and also find out the states which would potentially not be described by the Gibbs Generalized Ensemble description.

Smriti Mahajan: I have been working on understanding star formation in nearby galaxies. By bringing together multi-wavelength data (radio to ultraviolet) we are trying to understand the relation between the rates of star formation measured at individual wavelengths. With my student Devika Shobhana, I have also created a catalogue of galaxies with optical and ultraviolet data for the nearby rich Supercluster called Coma.

Ketan M. Patel: A new mechanism to address the fermion mass hierarchy problem was proposed. The mechanism is based on the recent idea of "Clockwork Theory" in which very small or large values of fundamental couplings can naturally be obtained. The proposed mechanism is shown to give results similar to the ones obtained from the gauge theories in higher spacetime dimensions. We also provided symmetry realization for low scale seesaw mechanism and have explored the phenomenological consequences of compact supersymmetry.

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 created 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: Dr. Mandip Singh is doing conceptually novel experiments with laser cooled atoms, quantum entangled photons and ultra cold matter to realise counter intuitive principles of quantum mechanics and to understand more deeply the quantum to classical transition. He has proposed new experiments on macroscopic entanglement as a sole author which could be feasible with advancement in technology. One of the main research activities this year is an experimental realisation of three dimensional tomographic imaging of a pattern localised in phase space. Phase space patterns cannot be visualised with a human eye or with a camera by conventional methods. This is a novel concept of imaging in phase space introduced and experimentally verified by him. In addition, we have performed experiments on quantum ghost interference, diffraction from moving objects. We have also devised new experiments for physics education in linear as well as in nonlinear regime of optics. One of our recent experiments is published in American Journal of Physics and it has appeared on the cover page of the journal.

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 Bi₂Te₃: Pd intercalated Bi₂Te₃ single crystals were grown. This material has a superconducting critical temperature $T_c = 5.4\text{K}$. 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: OsB₂ and RuB₂ were synthesised by arc-melting and their normal state and superconducting properties were studied down to 0.3 K. We find superconductivity at $T_c = 2.1\text{ K}$ and 1.5 K , for OsB₂ and RuB₂, 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 Na₄-xIr₃O₈: The hyper-kagome material Na₄-xIr₃O₈ 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 hyperkagome material Na₄-xIr₃O₈ ($x \approx 0, 0.1, 0.3, 0.7$). Materials with $x \leq 0.3$ are found to be Mott (local-moment) insulators with strong antiferromagnetic interactions. No magnetic ordering down to $T = 2\text{K}$ 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 (Na₁-xLi_x)₂IrO₃: Na₂IrO₃ is a candidate material to show Kitaev spin-liquid behavior. Inelastic light scattering studies on single crystals of (Na₁-xLi_x)₂IrO₃ ($x = 0, 0.05$ and 0.15) show a polarization independent broad band at $\approx 2750\text{cm}^{-1}$ with a large band-width $\approx 1800\text{cm}^{-1}$. For Na₂IrO₃ the broad band is seen for temperatures $\leq 200\text{ K}$ and persists inside the magnetically ordered state. For Li samples, the intensity of this mode increases, shifts to lower wavenumbers, 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 T_N . 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 $JK \approx 57\text{ meV}$. Direct Evidence for Dominant Bond-directional Interactions in a Honeycomb Lattice Iridate Na₂IrO₃: 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 Na₂IrO₃ and show that they lead to strong magnetic frustration.

Sudeshna Sinha: We focused on the dynamics and pattern formation in complex systems. In particular, we investigated nonlinear systems and time-varying networks. We explored phenomena ranging from amplitude death and synchronization, to chimera states and spatiotemporal chaos. We studied these systems from the point of view of local stability using linear stability analysis, as well as global stability using concepts of multi-node basin stability.

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 nonlinear 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-initio 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 Indian Institute of Technology Bhubhaneshwar India, during April 30 – May 02, 2017.
 - Visited Indian Indian Institute of Science Bangalore, During July 2 – July 4, 2017.
 - Visited Indian Institute of Technology Bhubhaneshwar India, during April 30 – May 02, 2017
 - Visited Sambalpur University Orrisa India, during Aug03 – Aug05, 2017
 - Visited Kovempu University, Karnataka India, during Sept 22 – Sept 24, 2017
 - Visited HRI Allahabad India, during October 09 – Oct 10, 2017
 - Visited Indian Institute of Technology Guwahati India, during December 10 – Dec 14, 2017
 - Visited Ramkrishna Mission Vivekananda University, Belur India, during Dec 18 – Dec 21, 2017.
- **CHARANJIT S. AULAKH**
 - Visited International Centre for Theoretical physics, Trieste between June 5 and July 28, 2017 in my capacity as a senior Associate of ICTP.
- **Jasjeet Singh Bagla**
 - Visited HBCSE-TIFR (Mumbai) during April 30 – May 2, 2017
 - Visited NCRA-TIFR (Pune) during June 9-28, 2017
 - Visited Guru Nank Dev University (Amritsar) during August 3, 2017
 - Visited IUCAA (Pune) during August 11-13, 2017
 - Visited NISER (Bhubaneswar) during March 24-27, 2018.
- **Sandeep Kumar Goyal**
 - Visited University of KwaZulu-Natal, Durban South Africa, during Jan12 – 20, 2018
- **Harvinder Kaur Jassal**
 - Visited National Centre for Radio Astrophysics, 9-28 June, 2017

- **Sanjeev Kumar**
 - IFW Dresden (Germany): July 01 – July 15, 2017.
- **Kinjalk Lochan**
 - Visited Indian Institute of Technology (Guwahati) India, during May 18 – May 20, 2017
 - Visited Guru Nanak Dev University, Amritsar (India), on August 12, 2017
- **Ketan M. Patel**
 - Visited Instituto de Física Corpuscular (IFIC, Valencia), Spain, during May 28 – June 10, 2017
 - Visited Deutsches Elektronen-Synchrotron (DESY, Hamburg), Germany, during June 11 – July 1, 2017
- **Sudeshna Sinha**
 - Visited University of Maryland (USA), during May 14-20, 2017
 - Visited NCSU (USA), during May 21-27, 2017
 - Visited Potsdam Institute of Climate Impact Research (Germany), during June 8-18, 2017

8.6.3 Talks delivered

1. Arvind:Colloquium, IIT Bhubhaneshwar. May 2, 2017.
2. Arvind:International Convergence on Quantum Foundations, PATNA. December 04-09, 2017. (Invited Talk)
3. Arvind:SERB School on Quantum Optics, IIT Guwahati. December 10-14, 2017. (Set of 4 lectures).
4. Arvind:Ramkrishna Mission Vivekananda University, Belur India, Dec 18 – Dec 21, 2017. (Set of lectures)
5. Arvind:DST Inspire Camp, Ramjas College New Delhi India, July 7, 2017. (Lecture)
6. Arvind: DST Inspire Camp, Panjab University Chandigarh India, Nov 21, 2017. (Lecture)
7. Arvind: DST Inspire Camp, Panjab University Chandigarh India, March 27, 2018. (Lecture)
8. Arvind: DST Inspire Camp, ISF College, Moga Punjab India, October 13, 2017. (Lecture)
9. Arvind: DST Inspire Camp, HMV Jalandhar, Jan 15, 2018. (Lecture)
10. Arvind: DST Inspire Camp, Asian College Patiala India, Nov 22, 2017. (Lecture)
11. Arvind: Rethinking Social Contract of Science, JNU India, October 28, 2017. (Invited Lecture)
12. Arvind: Indo-German workshop on Science Communication, NIPER Mohali India, Nov 8, 2017. (Invited Lecture)
13. Jasjeet Singh Bagla:Expanding Universe. GNDU, Amritsar, Aug.12, 2017.
14. Jasjeet Singh Bagla:RAM pressure stripping during mergers and quenching of star formation.

IUCAA, Pune, Aug.30, 2017.

15. Jasjeet Singh Bagla:Nobel Prize in Physics 2017: Gravitational Waves. AKSIPS School, Sector 41, Chandigarh, Nov.7, 2017.
16. Jasjeet Singh Bagla:Nobel Prize in Physics 2017: Gravitational Waves. National Student Symposium on Physics, Panjab University, Chandigarh, Nov.10, 2017.
17. Jasjeet Singh Bagla:Nobel Prize in Physics 2017: Gravitational Waves. DST-INSPIRE camp, SSM College, Dinanagar, Nov.11, 2017.
18. Jasjeet Singh Bagla:Nobel Prize in Physics 2017: Gravitational Waves. DAV College, Sector 10, Chandigarh, Nov.14, 2017.
19. Jasjeet Singh Bagla:Gravity Wave detection of GW 20170817 and inferences from gravity wave observations. IISER Mohali, Dec.1, 2017.
20. Jasjeet Singh Bagla:Nobel Prize in Physics 2017: Gravitational Waves. Model Govt. School, Sector 25, Chandigarh, Dec.5, 2017.
21. Jasjeet Singh Bagla:Nobel Prize in Physics 2017: Gravitational Waves. Guru Gobind Singh College for Women, Sector 26, Chandigarh, Feb.23, 2018.
22. Jasjeet Singh Bagla:Dark Energy Clustering in the non-linear regime. NISER, Bhubaneswar, March 26, 2018.
23. Ankit Singh:RAM pressure stripping: A semi-analytical model, Franco-Indian Astronomy School: From Reionization to Large Scale Structure- A multi-wavelength Approach, IUCAA, Pune, 11-17 February, 2018.
24. Sandeep Rana:How well gaussian approximation works in 21cm foreground Simulations, Young Astronomers meet 2017 IUCAA: Sep 09, 2017.
25. Sandeep Rana:Non-Gaussianity of diffuse galactic foregrounds at low frequencies, Franco-Indian Astronomy school from Re-ionization to Large scale structure: IUCAA, Pune, Feb 11-17, 2018.
26. Sandeep Rana:Statistical nature of Galactic and Extragalactic foregrounds, Introductory School on Galaxy Formation: NISER, Bhubaneswar, March 13-16, 2018.
27. Manvendra Pratap Rajvanshi:Nonlinear Spherical Perturbations in Quintessence Cosmology. 29th meeting of the Indian Association for General Relativity and Gravitation (IAGRG). Indian Institute of Technology Guwahati, Assam, India. May 18-20, 2017
28. Sanjib Dey: Indian Institute of Technology Kharagpur, Kharagpur, India. April 07, 2017.
29. Sanjib Dey: Indian Statistical Institute Kolkata, Kolkata, India. April 21, 2017.
30. Sanjib Dey: Physics Center of the German Physical Society at the international conference, "PHHQ XVII: Non-Hermitian Hamiltonians in Physics: Theory and Experiment", Bad Honnef, Germany. May 17, 2017.
31. Sanjib Dey: Indian Institute of Science Education and Research Mohali, India. March 05, 2018.
32. Kavita Dorai:Invited lecture in 42nd Annual Meeting of the Indian Biophysical Society IBS-2018, IISER Pune, March 9-11 2018.
33. Kavita Dorai:Invited lecture on "Structure Elucidation by NMR Spectroscopy", Chandigarh

University Gharuan, January 19, 2018.

34. Kavita Dorai: Invited Keynote lecture in the Australian and New Zealand Society of Magnetic Resonance Conference ANZMAG-2017, organized by University of Western Sydney, Kingscliff NSW Australia, December 3-6 2017.
35. Kavita Dorai: Invited lecture in the Adriatic NMR Conference, organized by Department of Chemistry University of Zagreb, Mali Ston Croatia, June 16-18 2017.
36. Kavita Dorai: "24th Conference of the National Magnetic Resonance Society of India NMRS-2018", IISER Mohali, February 16-19, 2018.
37. Sandeep K. Goyal: Quantum key distribution and the future of secure communication. Punjab University, Chandigarh, Punjab. Nov 11, 2017.
38. Sandeep K. Goyal: An almost convincing scheme for discriminating the preparation basis of quantum ensemble and why it will not work. Bose Institute, Kolkata. Feb 2, 2018.
39. H.K. Jassal: Archana Sangwan, Ankan Mukherjee, H.K. Jassal (IISER, Mohali). Dec 14, 2017. 17 pp. Published in JCAP 1801 (2018) no.01, 018 DOI: 10.1088/1475-7516/2018/01/018 e-Print: arXiv: 1712.05143.
40. Dark energy equation of state parameter and its evolution at low redshift Ashutosh Tripathi, Archana Sangwan, H.K. Jassal. Nov 7, 2016. 7 pp. Published in JCAP 1706 (2017) no.06, 012 DOI: 10.1088/1475-7516/2017/06/012 e-Print: arXiv: 1611.01899.
41. Rajeev Kapri: HBN University Srinagar Garhwal, January 27, 2018.
42. Rajeev Kapri: Suman Kalyan ISI Kolkata, February 26-28, 2018.
43. Rajeev Kapri: Suman Kalyan Presidency College, Chennai: April 4-6, 2018.
44. Sanjeev Kumar: "Spin Hall Conductivity in Rashba-Kondo Model" IFW Dresden, Dresden (Germany) - July 2017 "Spin Hall Conductivity of Rashba Electrons Coupled to Magnetic Lattice"
45. Sanjeev Kumar: S N Bose Institute, Kolkata (India) - October 2017.
46. Kinjalk Lochan: Information retrieval from black holes: Quantum correlations in non-vacuum distortions; 29th IAGRG, 18-20 May 2017, IIT Guwahati
47. Kinjalk Lochan: Quantum Correlations: Interplay in curved spacetime; 29th IAGRG, 18-20 May 2017, IIT Guwahati
48. Kinjalk Lochan: Black Holes: Illuminating the bright side! 12-08-2017, GNDU, Amritsar Quantum Tryst with Gravity; 10-11-2017, IISER Mohali
49. Kinjalk Lochan: GW170817: Test of Equivalence Principle & Modified Gravity Theories, 01-12-2017, IISER Mohali
50. Smriti Mahajan: Gave a talk at the "Astronomical Society of India annual meeting" held at the Osmania University, Hyderabad from February 5-9, 2018
51. Smriti Mahajan: Gave a seminar at a one-day Astronomy workshop organised at the Guru Nanak Dev University, Amritsar on August 12, 2017
52. Ketan M. Patel: The Flavour Puzzle and Grand Unification, Instituto de Física Corpuscular (IFIC, Valencia), Spain; June 5, 2017.

53. Ketan M. Patel: Degenerate Supersymmetry, Instituto de Física Corpuscular (IFIC, Valencia), Spain; June 6, 2017.
54. Ketan M. Patel: Fermion mass pattern from a five-dimensional SO(10) GUT, Deutsches Elektronen-Synchrotron (DESY, Hamburg), Germany; June 26, 2017.
55. Ketan M. Patel: Non-detection of neutrinos from GW-GRB event. Expectations and possible constraints from such events, IISER Mohali, India; December 1, 2017.
56. Mandip Singh: invited lecture series delivered in SERB school on frontiers in quantum optics at Indian Institute of Technology (IIT) Guwahati, Dec 1-19, 2017.

8.6.4 Conferences attended by researchers

- **Arvind**

- Arvind: International Conference on Quantum Foundations, Patna, Dec 4-9, 2018.
- Arvind: Rethinking Social contract of science, JNU October 28, 2017.
- Arvind. SERB School in Quantum Optics, IIT Guwahati December 9-14, 2017
- Jaskaran Singh: Contextuality and its applications, Perimeter Institute Canada, July 24-28, 2017.
- Chandan Sharma: SERB School on Quantum Optics, IIT Guwahati Nov. 16-Dec 15, 2017

- **Jasjeet Singh Bagla**

- Jasjeet Singh Bagla: Plasma Universe and its Structure Formation, IUCAA, Pune, Aug. 29-31, 2017.
- Sandeep Rana: Young Astronomers Meet, IUCAA, Pune, Sep. 8-10, 2017.
- Juhi Tiwari: Chandra/CIAO Workshop on X-ray data analysis. NCRA-TIFR, Pune, October 23-27, 2017.
- Manvendra Pratap and Ashish Meena, 29th meeting of the Indian Association for General Relativity and Gravitation (IAGRG). Indian Institute of Technology Guwahati, Assam, India. May 18-20, 2017.
- Manvendra Pratap, Ankit Singh and Ashish Meena, XXXVI Meeting of Astronomical Society of India, Osmania University, Hyderabad, 5-9 February, 2018.
- Sandeep Rana and Ankit Singh, Franco-Indian Astronomy school from Re-ionization to Large scale structure: IUCAA, Pune Feb 11-17, 2018.
- Sandeep Rana: Introductory School on Galaxy Formation: NISER, Bhubaneswar, March 13-16, 2018.

- **Sanjib Dey**

- Sanjib Dey: Black holes, Quantum information, Entanglement and all that: May 29 to June 01, 2017. Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France.
- Sanjib Dey: PHHQP XVII: Non-Hermitian Hamiltonians in Physics: Theory and Experiment. May 15-19, 2017. Bad Honnef, Germany.

- **Kavita Dorai**
 - Kavita Dorai: 42nd Annual Meeting of the Indian Biophysical Society IBS-2018, IISER Pune, March 9-11 2018.
 - Kavita Dorai: 24th Conference of the National Magnetic Resonance Society of India NMRS-2018, IISER Mohali, February 16-19, 2018.
 - Kavita Dorai: Australian and New Zealand Society of Magnetic Resonance Conference ANZMAG-2017, University of Western Sydney, Kingscliff NSW Australia, December 3-6 2017.
 - Kavita Dorai: Adriatic NMR Conference, organized by Department of Chemistry University of Zagreb, Mali Ston Croatia, June 16-18 2017.
 - Harpreet Singh: Amandeep Singh, Rakesh Sharma, Amit Devra, Akanksha Gautam, Dileep Singh, Sumit Mishra, Jyotsna Ojha, Akshay Gaikwad, Aditya Mishra, Ankit, Agrim Gupta. 24th Conference of the National Magnetic Resonance Society of India NMRS-2018, IISER Mohali, February 16-19, 2018.
 - Akshay Gaikwad, Amit Devra, Akanksha Gautam. 3rd International Conference on Quantum Foundations, National Institute of Technology, Patna, India, December 4-9, 2017.
 - Jyotsna Ojha. The largest european congress on magnetic resonance EUROMAR2017, Warsaw, Poland, 2-6 July 2017.
 - Jyotsna Ojha: AMPERE NMR School, Zakopane, Poland, June 25th-July 1st 2017.
- **Sandeep K. Goyal**
 - Sandeep K. Goyal: Workshop on optical realisations of quantum algorithms: Jan 14-18, 2018. Durban South Africa.
 - Sandeep K. Goyal: International Symposium on New Frontiers of Quantum Correlations: Jan 29 - Feb 02, 2018. Bose Institute, Kolkata, India.
 - Sandeep K. Goyal: 24th meeting of the National Magnetic Resonance Society of India (NMRS-2018): Feb 16-19, 2018. IISER-Mohali, Mohali, India.
- **Rajeev Kapri**
 - Suman Kalyan. Frontiers of Statistical Physics, ISI Kolkata, February 26-28, 2018.
 - Suman Kalyan. International Conference on Computer Simulations in Natural Sciences, Presidency College Chennai, April 4-6, 2018.
- **Kinjalk Lochan**
 - Kinjalk Lochan, 29th IAGRG Meet, 18-20th May 2017, IIT Guwahati, Assam.
 - Kinjalk Lochan, Workshop @ GNDU, 12-08-2017, Amritsar, Punjab

- **Smriti Mahajan**
 - Attended the "Galaxies in absorption" conference at IUCAA, Pune December 12-14 2017
 - Attended the "Science with the Ultra violet Imaging telescope" meeting at IIA, Bengaluru from July 6-7 2017
- **Kamal P Singh**
 - S. Dahiya, M. S. Sidhu, A Tyagi and Kamal P. Singh (2018) Generation, characterization and optimization of high harmonics in Ar gas. PALM International School 2018 Attosecond Science: from ultrafast sources to applications. 29th May – 1st June 2018. Centre Benoit Frachon, 12 Rue Fernand Léger Gif-sur-yvette 91190 (Poster)
 - B. Panda, M.S. Sidhu, P. Munjal and Kamal P. Singh, A versatile nano Newton force spectroscopy setup for biological samples. Indian Biophysical Society Conference at IISER Pune, 42nd Annual Meeting of the Indian Biophysical Society IISER Pune, 9-11 March 2018
 - M. S. Sidhu and Kamal P. Singh (2017) Ablation of Silicon and Spider silk by single femtosecond pulse. International Conference on Laser Ablation – 2017, Marseille (France) from 3 to 8 september 2017
 - M. S. Sidhu and Kamal P. Singh (2017) Femtosecond laser induced homogeneous and large area surface patterning of solids and ultrathin fibers. International Conference on Laser Ablation – 2017, Marseille (France) from 3 to 8 september 2017

8.6.5 Publications: Physical Sciences

- [1] Shruti Dogra, Kavita Dorai and **Arvind** "Majorana representation, qutrit Hilbert space and NMR implementation of qutrit gates", J. Phys. B: At. Mol. Opt. Phys. 51, 045505 (2018).
- [2] Harpreet Singh, Arvind and **Kavita Dorai**. " Evolution of tripartite entangled states in decohering environment and their experimental protection using dynamical decoupling" Phys. Rev. A, 97, 022302 (2018).
- [3] Akshay Gaikwad, Diksha Rehal, Amandeep Singh, Arvind and **Kavita Dorai** "Experimental demonstration of selective quantum process tomography on an NMR quantum information processor" Phys. Rev. A, 97, 022311 (2018)
- [4] Harpreet Singh, Arvind and **Kavita Dorai** "Experimentally freezing quantum discord in a dissipative environment using dynamical decoupling" EPL, 118, 50001 (2017).
- [5] Harpreet Singh, Arvind and **Kavita Dorai** "Experimental protection of arbitrary states in a two-qubit subspace by nested Uhrig dynamical decoupling" Phys. Rev. A, 95, 052337 (2017).
- [6] Debmalya Das, Ritabrata Sengupta, and **Arvind** "Measurement-based local quantum filters and their ability to transform quantum entanglement" Pramana, 88, 82 (2017).
- [7] Amandeep Singh, Arvind and **Kavita Dorai** "Witnessing nonclassical correlations via a single-shot experiment on an ensemble of spins using nuclear magnetic resonance" Phys. Rev. A, 95, 062318 (2017).

- [8] Arvind, S. Chaturvedi, and **N. Mukunda** "Global aspects of polarization optics and coset space geometry" *Physics Letters A*, 381(35):3005 – 3009 (2017).
- [9] Amit Devra, Prithviraj Prabhu, Harpreet Singh, Arvind and **Kavita Dorai**. "Efficient experimental design of high-fidelity three-qubit quantum gates via genetic programming", *Quantum Information Processing*, 17, 67 (2018).
- [10] Navdeep Gogna, Rakesh Sharma, Vanika Gupta, Kavita Dorai and **N. G. Prasad**. "Evolution of the metabolome in response to selection for increased Immunity in populations of *Drosophila melanogaster*", *PLOS ONE*, 12(11), e0188089 (2017).
- [11] Rakesh Sharma, Navdeep Gogna, Harpreet Singh and **Kavita Dorai**. "Fast profiling of metabolite mixtures using chemometric analysis of a speeded-up 2D heteronuclear correlation NMR experiment", *RSC Advances*, 7, 29860 (2017).
- [12] Bernard Ancien, **Kavita Dorai** and Fabien Ferrage. "Cross-Relaxation and Cross-Correlation Parameters in NMR", Editor: Daniel Canet, Royal Society of Chemistry (November 2017). ISBN: 978-1-84973-913-9; ISSN: 2044-253X.
- [13] Wei-Wei Zhang, **Sandeep K. Goyal**, Christoph Simon, Barry C. Sanders, "Decomposition of split-step quantum walks for simulating Majorana modes and edge states" *Phys. Rev. A* 95, 052351 (2017).
- [14] P. Zarkeshian, C. Deshmukh, N. Sinclair, **Sandeep K. Goyal**, G.H. Aguilar, P. Lefebvre, M. Grimau Puigibert, V.B. Verma, F. Marsili, M.D. Shaw, S.W. Nam, K. Heshami, D. Oblak, W. Tittel, C. Simon, "Entanglement between more than two hundred macroscopic atomic ensembles in a solid" *Nature Communications* 8, 906 (2017)
- [15] Wei-Wei Zhang, Barry C. Sanders, Simon Apers, **Sandeep K. Goyal**, David L. Feder, "Detecting topological transitions in two dimensions by Hamiltonian evolution" *Phys. Rev. Lett.* 119, 197401 (2017)
- [16] S. Chakraborty and **K. Lochan**. "Black Holes: "Eliminating Information or Illuminating New Physics?" *Universe*, vol 3, pp 55 (2017).
- [17] S. Muralidharan, K. Lochan and **S. Shankaranarayanan**: "Generalized thermalization for integrable system under quantum quench" *Phys. Rev. E*, Vol 97, pp 012142 (2018)
- [18] Manoj Aravind, K. Murali, **Sudeshna Sinha**. "Coupling induced Logical Stochastic Resonance" *Physics Letters A*, vol. 382, pp 1581-1585.
- [19] M. Yadav, A. Sharma, M.D. Shrimali, **Sudeshna Sinha**. "Revival of oscillations via common environment" *Nonlinear Dynamics*, vol. 91, pp 2219-2225.
- [20] S. Rakshit, S. Majhi, B.K. Bera, **Sudeshna Sinha**, D. Ghosh. "Time varying multiplex network: inter-layer and intra-layer synchronization" *Physical Review E*, vol. 96, 062308
- [21] Choudhary, C. Mitra, V. Kohar, **Sudeshna Sinha**, J. Kurths. "Small-world networks exhibit pronounced intermittent synchronization" **Chaos** (Featured Article) vol. 27, 111101
- [22] Meena, S. Kumari, A. Sharma, **Sudeshna Sinha**. "Effect of Heterogeneity in Models of El-Nino Southern Oscillations" *Chaos, Solitons and Fractals*, vol. 104, pp 668-679.

- [23] Meena, P.D. Rungta, **Sudeshna Sinha** "Threshold-activated transport stabilizes chaotic populations to steady states" PLoS ONE, vol.12, e0183251
- [24] P.D. Rungta, A. Choudhary, C. Meena and **Sudeshna Sinha**. "Are network properties consistent indicators of synchronization?" Europhysics Letters, vol. 117, 20003.
- [25] Mitra, A. Choudhary, **Sudeshna Sinha**, J. Kurths, R.V. Donner. "Multi-node basin stability in complex dynamical networks" Physical Review E, vol. 95, 032317.
- [26] V. Agrawal, P. Moitra and **Sudeshna Sinha**. "Emergence of Persistent Infection due to Heterogeneity" Scientific Reports (Nature), vol. 7, 41582.
- [27] S.S. Chaurasia and **Sudeshna Sinha**. "Suppression of chaos through coupling to an external chaotic system Nonlinear Dynamics, vol. 87, pp 159-167.
- [28] Chowdhury, **K. M. Patel**, X. Tata and S. K. Vempati, "Indirect Searches of the Degenerate MSSM", Phys. Rev. D95 (2017) 075025.
- [29] P. Chattopadhyay and **K. M. Patel**, "Discrete symmetries for electroweak natural type-I seesaw mechanism", Nucl. Phys. B921 (2017) 487–506.
- [30] **K. M. Patel**, "Clockwork Mechanism for Flavour Hierarchies", Phys. Rev. D96 (2017) 115013.
- [31] "Exotic superconducting states in the extended attractive Hubbard model" S Nayak and **S Kumar**, J. Phys. Cond. Mat. 30, 135601 (2018).
- [32] "Carrier-driven coupling in ferromagnetic oxide heterostructures" CH Chang, A Huang, S Das, HT Jeng, **S Kumar** and R Ganesh, Phys. Rev. B 96, 184408 (2017).
- [33] "Galaxy and Mass Assembly (GAMA): blue spheroids within 87 Mpc", Mahajan, Smriti; Drinkwater, Michael J.; Driver, S.; Hopkins, A. M.; Graham, Alister W.; Brough, S.; Brown, Michael J. I.; Holwerda, B. W.; Owers, Matt S.; Pimbblet, Kevin A., 2018, MNRAS, 475, 788
- [34] "The SAMI Galaxy Survey: the cluster redshift survey, target selection and cluster properties", Owers M. et al., 2017, MNRAS, 468, 1824
- [35] "Galaxy and Mass Assembly (GAMA): formation and growth of elliptical galaxies in the group environment", Deeley S. et al., 2017, MNRAS, 467, 3934
- [36] Bhat, **S. Dey**, M. Faizal, C. Hou and Q. Zhao, "Modification of Schrodinger-Newton equation due to braneworld models with minimal length" Physics Letters B, vol. 770, pp 325-330 (2017).
- [37] **S. Dey** and A. M. Grundland, "Properties of soliton surfaces associated with integrable CP^{N-1} sigma models" Journal of Physics A: Mathematical and Theoretical, vol. 50, no. 33, pp 335201 (2017).
- [38] M. P. Jayakrishnan, **S. Dey**, M. Faizal and C. Sudheesh, "q-deformed quadrature operator and optical tomogram" Annals of Physics, vol. 385, pp 584-590 (2017).
- [39] **S. Dey**, "On completeness of coherent states in non commutative spaces with generalised uncertainty principle" In: Duarte S., Gazeau JP., Faci S., Micklitz T., Scherer R., Toppan F. (eds), Physical and Mathematical Aspects of Symmetries, Springer: Cham, pp 145-152 (2017).
- [40] **S. Dey**, A. Bhat, D. Momeni, M. Faizal, A. F. Ali, T. K. Dey and A. Rehman, "Probing non commutative theories with quantum optical experiments" **Nuclear Physics B**, vol. 924, pp 578-587 (2017).

- [41] M. Khodadi, K. Nozari, **S. Dey**, A. Bhat and M. Faizal. "A new bound on polymer quantization via an opto-mechanical setup" Scientific Reports, vol. 8, no. 1659 (2018).
- [42] **S. Dey**, A. Fring and V. Hussin, "A squeezed review on coherent states and nonclassicality for non-Hermitian systems with minimal length" To appear in **Springer Proceedings in Physics**, arXiv: 1801.01139.
- [43] **Mandip Singh**, Quantum Stern-Gerlach experiment and path entanglement of a Bose-Einstein condensate, Phys. Rev. A. 95, 043620 (2017).
- [44] Samridhi Gambhir and **Mandip Singh**, Diffraction effects in mechanically chopped laser pulses, Am. J. Phys. 86, 406, June-2018. Featured on the cover page of June issue of the journal.
- [45] Samridhi Gambhir, Arvind and **Mandip Singh**, Intrinsic nonlinearity of a PN-junction diode and higher order harmonic generation, IAPT Physics Education, Apr - Jun 2018.

9 Patents

- **Kamal P Singh**
 - Kamal P Singh and Mehra S. Sidhu. Nanoprocessing and heterostructuring of silk. PCT / IB2017 / 051252 2015 / 092777A2 (International Patent)
 - Mehra S Sidhu, B. Kumar and Kamal P. Singh, The processing and heterostructuring of silk with light. Nature Materials 16(9)(2017) DOI: 10.1038/nmat4942
 - Mehra S. Sidhu, P. Munjal and Kamal P. Singh, High-fidelity large area nano-patterning of silicon with femtosecond light sheet. Appl. Phy A, Applied Physics A 124(1), (2018) DOI: 10.1007/s00339-017-1459-3

10 Awards and Honours

10.1 Awards won by the faculty

1. **Anu Sabhlok:** Fulbright Nehru Academic and Professional Excellence Fellowship. 2017-2018
2. **Mahak Sharma:** Featured by the Life of Science organization "Women in Science" (Link: <https://thelifeofscience.com/2018/03/08/mahak-polices-traffic-cell-city/>)
3. **Mahak Sharma:** Member, Indian National Young Academy of Science (INAYAS): 2018.
4. **Mahak Sharma:** Featured in "Cell Scientist to Watch" column by **Journal of Cell Science**: 2017 (Link: <http://jcs.biologists.org/content/130/20/3423>)
5. **Mahak Sharma:** SERB-Women Excellence Award: 2017.
6. **Lolitika Mandal:** WellcomeTrust/DBT Indian Alliance Senior Fellowship
7. **Samrat Mukhopadhyay:** has been invited as the Guest Editor of **BBA (Biochimica et Biophysica Acta) Proteins and Proteomics**.
8. **Samrat Mukhopadhyay:** Early Career Award from SERB, ECR/2017/001764
9. **Sripada S. V. Rama Sastry:** Thieme Chemistry Journals Award: 2017.
10. **Sripada S. V. Rama Sastry:** Chemical Research Society of India (CRSI) Bronze Medal: 2018.
11. **Sripada S. V. Rama Sastry:** Editorial Advisory Board member of the RSC journal of **Organic & Biomolecular Chemistry: Since Dec 2017**
12. **Mahender Singh:** Awarded SERB MATRICS grant for 2017-2020.
13. **Sanjib Dey:** DST-INSPIRE Faculty award with research grant of INR 35 lakhs: 2017.
14. **Sudeshna Sinha:** was elected **Fellow** of the **World Academy of Sciences (TWAS)**
15. **Sudeshna Sinha:** Is an Editor of **Chaos (AIP)**
16. **Ketan M. Patel:** Early Career Research Award, SERB, Govt. of India: 2018–2020
17. **Vinayak Sinha:** Elected Co-Chair of the Scientific Steering Committee of the Integrated Land Ecosystem Atmosphere Process Studies (iLEAPS; www.ileaps.org), a Global Research Project of Future Earth (under ICSU) since Sep, 2017.

18. **Vinayak Sinha:** Best Teacher Award 2017 given by Indian Institute of Science Education and Research Mohali
19. **Vinayak Sinha:** Editor (Subject: Atmospheric Chemistry and Physics) for Earth System Science Data, an international peer reviewed open access journal (I.F: 6.7 in 2018) published by Copernicus Publications, Gottingen, Europe
20. **Sunil Patil:** Editorial board member, Bioresource Technology Reports: since 2017
21. **Sunil Patil:** Applied Energy – Highly cited review paper award (2016) and hot paper recognition (2017) for the paper entitled “Recent advances in the use of different substrates in microbial fuel cells toward wastewater treatment and simultaneous energy recovery.
22. **Manjari Jain:** Editorial Board, 'Resonance' A Journal of Science Education: 2018 – 2021: Member
23. **Debashis Adhikari:** Early Career Award from SERB, ECR/2017/001764
24. **Krishnendu Gongopadhyay:** I received INSA Indo-Australia EMCR fellowship to visit UNSW Sydney for 6 months.

10.2 Awards won by the students

1. **Abhishek Mishra:** Travel Grant: From ICIMOD, Nepal to present a talk in The Third Workshop on Atmospheric Composition and the Asian Monsoon (ACAM) and Second ACAM Training School at Jinan University, Guangzhou, China in June 2017.
2. **Amit Devra:** Best Poster Award at NMRS-2018, February 16-19, 2018 IISER Mohali
3. **Ankit Somani:** Best Poster Award, Inter IISER NISER Chemistry Meet, NISER Bhubaneswar. December 22-23, 2017.
4. **Anuj Jakhar:** Travel Grant: Department of Science and Technology: to present a paper at the conference “Diophantine Problems” held at University of Manchester, UK during September 11-15 2017.
5. **Bishnupada Satpati:** received Best oral presentation award during the 'Emerging Trends in Drugs Development and Natural Products (ETDDNP 2018)' conference held at the University of Delhi during 12-14 Jan, 2018.
6. **Bishnupada Satpati:** received Best poster award from the organisers of the 'Thematic Conference in Chemical Sciences (TC2S-2017): Sustainable Chemistry' held at IIT Ropar during May 15-16, 2017.
7. **Biswajit Panda:** Best poster Award at 42nd Annual Meeting of the Indian Biophysical Society IISER Pune, 9-11 March 2018 for the Work presented by Project Student, Biswajit Panda.
8. **Chandrakala Meena:** SERB Travel Award, 2017 : for giving a talk at the conference on Perspectives in Nonlinear Dynamics 2017 (PNLD 2017) held in Potsdam, Germany, during July 24-29, 2017.
9. **Deependra Bawari,** Chandrakala Negi, Soumyadeep Chakraborty and Sanjay Singh: Best poster award, 2017: for the poster “Boraamidinate and aluminium-amide bridged novel pyridinophanes and calixarene-like assemblies” at the Symposium on Modern Trends in Inorganic Chemistry XVII, held at National Chemical Laboratory (NCL) and IISER Pune during December 11-14, 2017.

10. **Devashish Dwivedi:** EMBO Travel Award: Travel award to present research work at the EMBO Conference-Centrosomes and Spindle Pole Bodies (Germany), September 2017
11. **Golam Mohiuddin's:** liquid crystal picture has been selected as the featured artwork of February 2017 in International Liquid Crystal Society (ILCS) website.
12. **Harleen Kaur:** poster prize in "Chemistry Conference for Young Scientists" held in Blankenberge, Belgium.
13. **Ipsita Pani:** won the best poster award at ACS Roadshow held at IISER Mohali on 9th February, 2018.



14. **Jagadish Prasad Hazra:** Best Poster Award.: Deciphering the Mechanism of force dissemination through tip-links in hearing, American Chemical Society (ACS) on campus, February 9th, 2018. IISER Mohali.
15. **Jaskaran Singh:** Travel Grant: Confernece on Contextuality and its applications, Perimeter Institute Canada, July 24-28, 2017.
16. **Jaskaran Singh:** Travel Grant: Confernece on Contextuality and its applications, Perimeter Institute Canada, July 24-28, 2017.
17. **Jaskaran Singh:** Travel Grant: Visited CQT, NSU Singapore with full financial suport from them to discuss about his recent work, during Aug 1-15, 2017.
18. **Jaskaran Singh:** Travel Gran: Visited CQT, NSU Singapore with full financial suport from them to discuss about his recent work , during Aug 1-15, 2017
19. **Jayashree Mazumder:** CSIR Travel grant 2017 to present a poster at the Primatological Society of Great Britain conference in London, November 27-29, 2017.
20. **Neeraj:** Travel Grant plus boarding and lodging: Heidelberg Laureate Forum foundation for participating in 5th Heidelberg Laureate Forum held at University of Heidelberg, Germany, during September 24 - 29, 2017.
21. **Nidhi Kundu:** received award for best oral presentation under session 3Rs and Biophysics for Medical Advances without Animals (MAWA) within the 19th IUPAB Congress and 11th EBSA Congress, 16-20 July, 2017, held in Edinburgh, Scotland.

22. **Nidhi Kundu:** received the Student Research Achievement Award for the best poster in the 62nd Annual Biophysical Society Meeting, USA, held during February 2018.
23. **Pallavi Sharma:** Received a best poster award at the 2nd C. elegans meeting at NII Delhi (Feb 2018).
24. **Poonam:** EMBO Travel Award to attend the EMBO conference: Nuclear Structure & Dynamics, L'Isle sur la Sorgue, France, Oct. 04-08, 2017.
25. **Prashant A. Pandit:** EMBO Travel Award to attend the EMBO conference: Ubiquitin and SUMO: From Molecular mechanisms to system-wide responses, Cavtat-Dubrovnik, Croatia, Sept. 15-19, 2017.
26. **Prithwish Goswami:** Received best poster award in Contemporary Facets in Organic Synthesis (CFOS) conference organized at IIT Roorkee during 22-24 December 2017.
27. **Prithwish Goswami:** Received best poster award in Contemporary Facets in Organic Synthesis (CFOS) conference organized at IIT Roorkee during 22-24 December 2017.
28. **Priyanka Dogra:** Biophysical Society travel award to attend 62nd Annual Meeting of Biophysical Society, San Francisco, USA (February 2018).
29. **Priyanka Dogra:** SERB international travel award to attend 62nd Annual Meeting of Biophysical Society, San Francisco, USA (February 2018).
30. **Rajendra Shirke:** received Best poster presentation award during the 'Emerging Trends in Drugs Development and Natural Products (ETDDNP 2018)' conference held at the University of Delhi during 12-14 Jan, 2018.
31. **Ravinder Gulia:** IBRO-SFN travel award to attend the Society for Neuroscience meeting in USA.
31. **Reema Kathuria:** received best poster award (Biophysical Society Poster Prize) in IDP2017 held at IISER Mohali, during 9-12 December, 2017.
33. **Richa Singh:** Best Paper Presentation Award for her talk presented at the 41st meeting of Ethological Society of India, Gujrat Institute of Desert Ecology, Bhuj, November 24th, 2017.
34. **Rituraj Marwaha:** ASCB Travel Grant: Travel award to present research work at the American Society for Cell Biology Conference (Philadelphia, USA): December (2017).
35. **Rituraj Marwaha:** Norton B. Gilula Travel Award (Journal of Cell Biology): Travel award to present research work at the American Society for Cell Biology Conference (Philadelphia, USA): December (2017).
36. **Rohan Sharma:** "Best poster award" in IBRO/APRC Neuroscience meeting that was held in Panjab University, India on October 12, 2017
37. **Shalini Yadav:** was awarded best oral presentation in the International Conference on Plant Development Biology and 3rd National Meeting on Arabidopsis Research at NISER Bhubaneswar 12-16 December 2017.
38. **Shruti Thapliyal:** Received funding from DBT to attend the Society for Neuroscience Meeting at Washington DC (Nov 2017).
39. **Shruti Thapliyal:** Was selected to give a talk at the 2nd C. elegans meeting at NII Delhi (Feb 2018).

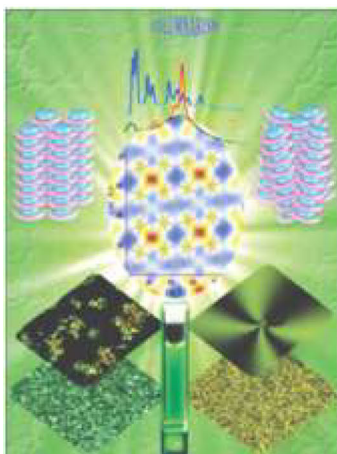
40. **Soumya Dey and Sagar Kalane:** received LMS-CMI travel and subsistence grants to present posters during Warwick-EPSRC symposiums at Warwick University, UK.
41. **Vina Tikiyani:** Received funding from DBT to attend the Society for Neuroscience Meeting at Washington DC (Nov 2017).
42. **Vinod Kumar:** Travel grant: from DST, India to present a talk at iLEAPS Open Science Conference in Oxford, UK in Sep 2017.
43. **Vivek Singh:** Research grant from the Andrew Sherratt Fund for Old World Prehistory. To visit Italy for training in microwear analysis.
44. **Yogesh Dahiya:** Was invited to give a talk at the CRISPR Cas9 workshop at IISER, Pune (Jun 2017)
45. **Yogesh Dahiya:** Was selected to give a talk at the the NGN Meeting at IISER, Pune (Oct 2017)
46. Cover image is accepted for the article entitled as "A new strategy towards the synthesis of a room-temperature discotic nematic liquid crystal employing triphenylene and pentaalkynylbenzene units".



47. Cover image is accepted for the article entitled as "Poly(L lysine)-Coated Liquid Crystal Droplets for Cell-Based Sensing Applications".



48. Cover image is accepted for the article entitled as “Room-Temperature Columnar Nematic and Soft Crystalline Columnar Assemblies of a New Series of Perylene-Centred Disc Tetramers”.



49. Cover image is accepted for the article entitled as “Observation of disordered mesomorphism in three-ring-based highly polar bent-core molecules: design, synthesis and characterisation”.



11 Major Facilities Procured

S. Arulananda Babu: Transmission Electron Microscope.

Ujjal K. Gautam: Transmission Electron Microscope (TEM).

- The high-resolution field emission gun TEM equipped with elemental analysis was purchased, equipment site has been made ready and currently it has been undergoing installation.

12 Current projects and fellowships

Sr. No.	Project No.	Name of project	Principal Investigator	Funding Agency	Duration	Total Sanctioned Cost
1	INSPIRE-12-0034	INSPIRE FACULTY AWARD	DR. MAHENDER SINGH	DST	2012-2017	₹ 35,00,000.00
2	JCB-12-0036	JCB FELLOWSHIP	DR. ANAND K. BACCHAWAT	DST	2012-2017	₹ 68,00,000.00
3	DBT-12-0040	Identification of Transcriptional Gene Networks Using Genomic Approaches	Ram Kishore Yadav	DBT	2012-2017	₹ 74,50,000
4	DBT-12-0042	Towards Understanding The Mechanism of Antigenicity.	Kavita Babu	DBT ALL	2012-2017	₹ 343,26,491
5	DBT-12-0043	Role of Small GTP – Binding Proteins In Regulating Lysosomal Trafficking and Microbial Killing	Mahak Sharma	DBT ALL	2012-2018	₹ 327,11,140
6	DAE-12-0044	Passive Sensor Materials Based on Crystals	Santanu Kumar Pal	DAE	2012-2015	₹ 16,50,000
7	DST-12-0045	Logical Approaches To The Enantioselective Synthesis O Biologically Active Compounds	S.V. Ramasastry	DST	2012-2015	₹ 25,25,000
8	DBT-12-0046	An Investigation On the Role of Transcription Factors Ascl1a, Foxn4, Zic2b And Tumor Suppressor Pten In Retina Regeneration And Funtional Analysis of Pluripotency Factors In The Retinal Stem Cells.	Rajesh Ramachandran	DBT ALL	2012-2017	₹ 323,95,132
9	DST-12-0047	Fabrication of Mesoscopic Electromechanical Systems For Ultra Low Temperature Studies	Ananth Venkatesan	DST	2012-2015	₹ 250,11,200
10	DST-13-0049	Regulation On Rna Splicing	Shravan K. Mishra	DST	2013-2016	₹ 40,50,000

Sr. No.	Project No.	Name of project	Principal Investigator	Funding Agency	Duration	Total Sanctioned Cost
11	DST-13-0050	Invariants and Group Actions On Manifolds	Mahender Singh	DST	2013-2016	₹ 2,16,000
12	DST-13-0053	Comological Parameters: Observational Aspects And Theoretical Issues	Harvinder K Jassal	DST	2013-2016	₹ 16,44,000
13	DST-13-0054	National Network For Mathematical And Computational Biology	Somdatta Sinha	DST	2013-2016	₹ 49,37,000
14	DST-13-0055	Magnetifc Moments of The N* An Low Laying Negative Parity Baryons	Neetika	DST	2013-2016	₹ 18,12,000
15	DST-13-0056	Knot, Braids And Automorphism Groups	K. Gongopadhyay	DST	2013-2016	₹ 30,02,450
16	DAE-13-0057	Complex Hyperbolic Quasi-Fuchsian Group	K. Gongopadhyay	DAE	2013-2016	₹ 6,86,900
17	DST-13-0058	Evolution of Galaxies And The Large-Scale Envrionments	Samriti Mahajan	DST	2013-2016	₹ 18,72,000
18	DBT-14-0059	Long Term Associateive Memory In Caenorhabditis Elegans : Role Of Creb-1 Dependent Genes	Yogesh Dahiya	DBT	2014-2018	₹ 26,37,600
19	DST-14-0060	Search For Spin Liquid And Other Novel Ground States Arising From An Interplay Between Electronic Correlations, Spin-Orbit Coupling And Geometric Magnetic Frustration	Yogesh Singh	DST	2014-2017	₹ 26,37,600
20	CRFS-14-0061	Genetic And Biochemical Investigations On The Cystinocin Trasporter Using A Novel Genetic Screen	Anand K. Bacchawat	CRFS	2014-2016	\$ 82500
21	INSPIRE-14-0062	Inspire Faculty Award	Sudhanshu Shekhar	DST	2014-2019	₹ 19,00,000

Sr. No.	Project No.	Name of project	Principal Investigator	Funding Agency	Duration	Total Sanctioned Cost
22	DST-14-0063	Nanoscale Biophysics of Protein Amyloids Creating Nanoparticle Based Bsuperstructures	Milly Bhattacharya	DST	2014-2017	₹ 24,80,000
23	MHRD-14-0064	Establishment of Centres of excellence for training and research in frontier areas of Science And Technology (Fast)	Purnananda Guptasarma	MHRD	2014-2018	₹ 400,00,000
24	DST-14-0065	Investigating The Links Between Glutathione Depletion And Calcium Homeostasis In Yeast Apoptosis Using The Cha C1 Proteins	Anand K. Bacchawat	DST	2014-2017	₹ 52,82,000
25	DST-14-0066	Spectroscopy And Imaging Down To Subnanometer Length Scales On Novel Electronic Systems And Their Nanostructured Devices	Goutam Sheet	DST	2014-2017	₹ 456,33,200
26	DBT-14-0067	Dop-2 Modulates Acetylcholine And Gaba Singaling In Caenorhabditis Elegans	Pratima Pandey	DBT	2014-2017	₹ 38,70,000
27	DST-14-0068	India-Japan Research Project Knot Invariants And Geometric Manifolds	Krishnendu Gongopadhyay	DST	2014-2016	₹ 4,52,000
28	CSIR-14-0069	Investigating 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	₹ 22,00,000
29	DST-14-0070	Self-Propulsive Mechanisms of Autonomous Microswimmers	Dipanjan Chakraborty	DST	2014-2017	₹ 36,10,000
30	INSPIRE-14-0071	Inspire Faculty Award	Anandam Banarjee	DST	2014-2019	₹ 19,00,000

Sr. No.	Project No.	Name of project	Principal Investigator	Funding Agency	Duration	Total Sanctioned Cost
31	DBT-14-0073	Structural And Molecular Insights Into Initiation, Propagation And Regulation of A Yeast Prion Determinant	S. Mukhopadhyay	DBT	2014-2017	₹ 85,57,200
32	INSPIRE-15-0075	Inspire Faculty Award	Monkia Sharma	DST	2015-2020	₹ 19,00,000
33	DST-15-0076	Investigation of Protein-Dna G-Quadruplex Spin Relaxation And Novel Numerically Optimised Piles	Kavita Dorai	DST	2015-2018	₹ 7,82,250
34	ICHR-15-0077	Sanskrit And The British Empire	Rajesh Kochhar	ICHR	2015-2017	₹ 1,50,000
35	DST-15-0079	"Exploring The Quantum Measurement Problem In The Context of Weak Quantum Measurements"	Arvind	DST	2015-2018	₹ 24,73,600
36	CSIR-15-0080	Stereoselective C-H Functionalization 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	₹ 30,80,000
37	DST-15-0081	Phenomenology Cosmology of The New Minimal Supersymmetric So(10) Gut	C S Aulakh	DST	2015-2018	₹ 28,57,920
38	RSCSC-15-0082	The Impact of Rock Variability On Hominin Technological Adaptations In India	Parth R Chauhan	RSCSC	2015-2018	3000 Pound
39	DST-15-0083	Chemical Reactions In High Frequency, Strong Oscillating Fields	P Balanarayan	DST	2015-2018	₹ 15,00,000
40	DST-15-0084	Collective Dynamics of Activ Polymers Implication For Sytoskeletal Structure And Dynamics	Abhishek Chaudhuri	DST	2015-2018	₹ 10,00,000

Sr. No.	Project No.	Name of project	Principal Investigator	Funding Agency	Duration	Total Sanctioned Cost
41	DST-15-0085	Photoswitchable Reversible Molecular Transport Developing Model Systems	Sugumar Venkataramani	DST	2015-2018	₹ 14,00,000
42	DBT-15-0086	Deciphering The Mechano-Responsive Behavior of Cadherins In Hearing	Sabyasachi Rakshit	DBT ALL	2015-2020	₹ 327,32,260
43	INSPIRE-15-0087	Inspire Faculty Award	Anoop Aambili	DST	2015-2020	₹ 35,00,000
44	INSPIRE-15-0088	Inspire Faculty Award	Ketankumar Patel	DST	2015-2020	₹ 35,00,000
45	DWF-15-0089	Delhiwinterfog	Vinayak Sinha	IITM Pune	2015-2016	₹ 2,15,000
46	DST-15-0090	Chiral Bis (Amino) Cyclopropenylidenes And Bis (Amino) Cyclopropenimines Catalysed Enantioselective Organ Catalytic Transformations)	R Vijaya Anand	DST	2015-2018	₹ 49,23,000
47	JCB-15-0091	J C Bose Fellowship	Sudeshna Sinha	DST	2015-2020	₹ 68,00,000
48	DST-15-0092	Enhancement of Immune Memory By Transient Treatment With Puromycin	Sharvan Sehrawat	DST	2016-2019	₹ 50,15,890
49	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	₹ 65,84,600
50	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	₹ 71,29,600
51	INSPIRE-15-0095	Inspire Faculty Award	Vishal Bhardwaj	DST	2016-2021	₹ 83,00,000

Sr. No.	Project No.	Name of project	Principal Investigator	Funding Agency	Duration	Total Sanctioned Cost
52	DBT-15-0096	Structure – Function Studies On Vibrio Cholerae Cystoisin, A Membrane Damaging Poreforming Toxin	Kaushik Chattopadhyay	DBT	2016-2019	₹ 68,15,600
53	INSPIRE-15-0097	Inspire Faculty Award	Satyajit Gurin	DST	2016-2021	₹ 83,00,000
54	ICHR-15-0098	Learning From The Utopian City: An International Network On Alternative Histories of India's Urban Futures	Anu Sabhlok	ICHR	2015-2016	₹ 2,25,000
55	INSPIRE-15-0099	Inspire Faculty Award	Divya Srivastava	DST	2016-2021	₹ 83,00,000
56	DST-15-0100	L-Functions And Iwasawa Theory	Chandrakant Sharma Aribam	DST	2016-2019	₹ 3,84,000
57	NACP-15-0101	national carbonaceous aerosols programme	Baerbel Sinha	NACP	2015-2021	₹ 106,08,000
58	INSPIRE-16-0102	Inspire Faculty Award	Smriti Mahajan	DST	2016-2021	₹ 83,00,000
59	DST-16-0103	Optical Spectroscopy of Trapped (And Patterned) Nano-Particles And (Macro) Molecules In Solution	Arijit Kumar De	DST	2016-2019	₹ 46,44,000
60	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. Bacchawat	DBT	2016-2019	₹ 62,28,200

Sr. No.	Project No.	Name of project	Principal Investigator	Funding Agency	Duration	Total Sanctioned Cost
61	DST-16-0105	Experimental Investigation of Quantum Decoherence On An Nmr Quantum Information Processor	Kavita Dorai	DST	2016-2019	₹ 18,70,000
62	DST-16-0106	Functional And Trans- Regulatory Constraints of Long- Rang Spatial Cross – Talk Among Genes	Kuljeet Singh Sandhu	DST	2016-2019	₹ 25,03,000
63	DST-16-0107	Complex Vocal Communication In A Social Passerine Jungle Babbler(Turdoides Striata),In Relation To Its Social And Physical Environment	Manjari Jain	DST (YSS)	2016-2019	₹ 22,82,000
64	MAX-16-0108	Investigating Sub-Fs Electronic Process With Shaped Xuv And Ir Pulses	Kamal P Singh	MAX PLANC/D ST	2016-2021	20000 Euro
65	INSPIRE-16-0109	Inspire Faculty Award	Debrina Jana	DST	2016-2021	₹ 95,00,000
66	DST-16-0110	High Fied Magneto-Transport & Spectroscopic Studies On Topologically Non-Trivial Systems At Kelvin Temperatures	Goutam Sheet	DST-SERB	2016-2019	₹ 435,64,573
67	DST-16-0111	Modern Problem In Low Dimensional Topology In Crossroad With Geometry And Algebra	Mahender Singh	DST	2016-2019	₹ 40,88,040
68	DBT-16-0112	Exploring An Evolutionarily Conserved Form of Cell-Killing Mechanism Employed By The Pore-Forming Toxins: Implications For The Host-Pathogen Interaction Process And Immunity	Kaushik Chattopadhyay	DBT	2016-2019	₹ 15,00,000

Sr. No.	Project No.	Name of project	Principal Investigator	Funding Agency	Duration	Total Sanctioned Cost
69	WFE-16-0113	Winter Fog Experiments	Vinayak Sinha	IITM Pune	2016-14	₹ 6,50,000
70	INSPIRE-16-0114	Inspire Faculty Award	Bimalendu Adhikari	DST	2016-2020	₹ 83,00,000
71	DST-16-0115	Central Simple Algebras With Derivations	Varadharaj R Srinivasan & Amit Kulahrestha	DST	2016-2019	₹ 7,59,000
72	DST-16-0116	Molecular Structure And Supramolecular Packing of Misfolded Proteins Within The Amyloid Nanostructures	S. Mukhopadhyay	DST	2016-2019	₹ 95,86,790
73	DBT-16-0117	Investigating The Role of Local Auxin Biosynthesis In Stem Cell Differentiation	Ram Kishore Yadav	DBT	2016-2019	₹ 60,23,200
74	UGC-16-0118	The First Global Culture Lower Paleolithic Archeulean Adaptations At The Two Ends of Asia	Parth R Chauhan	UGC	2016-2019	₹ 208,95,700
75	DST-16-0119	Development of Ab Initio Electronic Structure Methods For Non-Adiabatic Excited-State Dynamics Of Molecules	Shamasundar R K	DST	2016-2019	₹ 36,96,000
76	DSTCC-16-0120	The Atmospheric Chemistry Of Climate Change	Vinayak Sinha & Baerbel Sinha	DST	2016-2019	₹ 150,13,724
77	MEFC-16-0121	National Carbonaceous Aerosols Programme (Ncap) Working Group-iii Project	Baerbel Sinha	MOEF-CC	2016-2020	₹ 106,00,000
78	INSPIRE-16-0122	Inspire Faculty Award	Kinjalk Lochan	DST	2016-2020	₹ 83,00,000

Sr. No.	Project No.	Name of project	Principal Investigator	Funding Agency	Duration	Total Sanctioned Cost
79	ICAR-17-0123	Understanding The Molecular Basis of Pestes-Petits Ruminants Virus (Pprv) Mediated Host Immune Modulation For The Development Of Next Generation Vaccine	Sharvan Sehrawat	ICAR	2017-2020	₹ 210,55,280
80	DST-17-0124	Understanding The Role of Arf-Like Small Gtpase 8 In Regulating Lysosome Motility And Trafficking	Mahak Sharma	DST-SERB	2017-2020	₹ 18,00,000
81	DST-17-0125	Elucidation of Synthetic Methods, Structural Aspects And Reaction Chemistry Of Novel Inorganic Macrocycles And Cryptands	Sanjay Singh	DST	2017-2020	₹ 52,43,575
82	DST-17-0126	Understanding The Mechanistic Basis of Mitochondrial Dysfunction Leading To Congenital Heart Disease (Chd) In Drosophila	Lolitika Mandal & Sudip Mandal	DST	2017-2020	₹ 78,00,528
83	DST-17-0127	Modular Weights And Serre Weights of Certain Mod P Galois Representations	Abhik Ganguli	DST-SERB	2017-2020	₹ 2,42,000
84	DBT-17-0128	Understanding The Evolution Of Immune Response: An Experimental Evolution Approach	N. G. Prasad	DBT	2017-2020	₹ 60,68,200
85	ICHR-17-0129	Documentation Study And Scientific Analysis of Rock Art In Paisen District Madhya Pradesh	Parth R chauhan	ICHR	2017-2019	₹ 5,00,000
86	ICMR-17-0130	Light Based Ultrasound Array Detector Development For Diagnosing Rbc Under Various Diswise Model In Infant	Samir Kumar Biswas & Kamal P Singh	ICMR	2017-2020	₹ 143,00,000

Sr. No.	Project No.	Name of project	Principal Investigator	Funding Agency	Duration	Total Sanctioned Cost
87	DBT-17-0131	International Genetically Engineered Machines Contest(IGEM)	Anand K. Bacchawat	DBT	2017-2018	₹ 10,00,000
88	DST-17-0132	Novel Quantum Ground States In Nonstrutured Devices(Swarnajayanti)	Goutam Sheet	DST	2017-2021	₹ 356,79,600
89	INSPIRE-17-0133	Inspire Faculty Award	Anirban Bose	DST	2017-2021	₹ 83,00,000
90	DBT-17-0134	Developing A Platform For Generating Diagnostic And Therapeutic Single Domain Antibodies For Viral Infections Employing Phage Display Technology	Saharvan Sehrawat	DBT	2017-2020	₹ 64,52,200
91	INSPIRE-17-0135	Inspire Faculty Award	Sanjib Dey	DST	2017-2021	₹ 83,00,000
92	DBT-17-0136	Epigenetics Of Gens Regulation In Muller Glia Dedifferentiation And Stem Cells Induction During Retina Regeneration In Zebrafish	Rajesh Ramachandran/ K S Sandhu	DBT	2017-2020	₹ 64,59,600
93	CSIR-17-0137	Synthesis And Characterization of Nanographenes Based Hexabenzocoronene Discotics For Photovoltaics Applications	Santanu Kumar Pal	CSIR	2017-2020	₹ 13,00,000
94	DST-17-0138	Multichromophoric Light Harvesting Antenna System Based On Squaraine And Bodipy Dyes	Sanchitasen Gupta	DST	2015-2018	₹ 36,62,670
95	INSPIRE-17-0139	Inspire Faculty Award	Sanchitasen Gupta	DST	2013-2018	₹ 35,00,000
96	INSPIRE-17-0140	Inspire Faculty Award	Pranab Sardar	DST	2015-2020	₹ 35,00,000
97	DBT-17-0141	Dbt Alliance	Lolitika Mandal	DBT ALL	2017-2022	₹ 441,32,492

Sr. No.	Project No.	Name of project	Principal Investigator	Funding Agency	Duration	Total Sanctioned Cost
98	DBT-17-0142	Ddevelopment Of 3d Genome Browser	Kuljeet Singh Sandhu/ Shashi B Pandit	DBT	2017-2020	₹ 13,40,000
99	INSPIRE-17-0143	Inspire Faculty Award	Sugandha Maheshwary	DST	2017-2022	₹ 83,00,000
100	INSPIRE-17-0144	Inspire Faculty Award	Neeraja Sahasrabudhe	DST	2017-2022	₹ 35,00,000
101	DST-17-0145	Investigation of The Role of Tamalin In Group Imglur Trafficking And Mglur-Dependent Ampa Receptor Endocytosis	Samarjit Bhattacharya	DST- SERB	2017-2020	₹ 45,23,200
102	DBT-17-0146	International Genetically Engineered Machines Contest(IGEM)	Anand K. Bacchawat	DBT	2018-2019	₹ 10,00,000
103	FIST-17-0147	Fist Program-2017	Anand K. Bacchawat	DST	2018-	₹ 460,00,000

13 Institute Library

Situated in the Informatics Centre, IISER Mohali library epitomizes the spirit of the institute, i.e., the pursuit of knowledge. The library houses rich collection of electronic and print versions of books (general, text, and reference books) for UG & PG, Print and e-journals, Online databases from various fields of study, namely, Mathematics, Physics, Chemistry, Biology, Computer Science, Earth/Environmental Sciences and Humanities and Social Sciences etc.,

The library provides unfailing access to essential and specialized library resources which aid teaching, learning, and research activities. In tune with the recent advancement in the field 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 not only for its aesthetic ambience but also for its astonishing infrastructure. 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 to the aforesaid central theme.

MISSION: The library's mission is to provide access to rich, relevant and high quality resources in all available formats to the IISER community. In doing so, the library aligns itself to teaching, learning, and research missions of the institute which is committed to excellence and innovation.

Library Timings: Library works all 365 days except 3 National holidays and 4 Gazetted holidays

Monday - Saturday:

Reference: 9.00 am - 6.00 am

Circulation (Check-In and Check-Out): 9.00 am - 8.00 pm (Opens during LUNCH & DINNER)

Sunday:

Reference: 10.00 am - 6.00 pm (No Circulation – Only Reference). Closes during LUNCH i.e 1.00 pm – 2.00 pm

Library Services: The house keeping activities of Library like cataloguing, circulation, Patron Information etc, is being operated through Open Source Library Management Software ' **Koha** ' and the library creates and maintains the Repository of thesis, Dissertations, Institute articles, Institute Publications, Institute event images, News clipping and films published by IISER Mohali as well as published on IISER Mohali is Open source Software ' **Dspace** '.

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

Library subscribed the following e-resources (Journals Packages) through various Consortia with maximum discounted prices. 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 title 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.,.

Highlights During the Period:

1. Library of IISER Mohali received "Aspiring **Young Academic Library Award**" by Wiley on 20th December 2017 at Delhi.
2. Library has organised "**Sixth International Library and Information Professionals Summit (I-LIPS 2017)**" on "Dynamics of Library for Excellence in Electronic Revolution" during 06-08 April 2017, in association with Special Libraries Association (SLA) Asian Chapter and Society for Library Professionals (SLP). The conference was attracted by more than 300 Library professionals from 12 countries across the globe. The conference inauguration dais was graced by **Dr Dee Magnoni**, President, SLA, **Prof. Arun Kumar Grover**, Vice Chancellor, Panjab University, **Prof. N. Sathymurthy**, Director, IISER Mohali.
3. Automated 'Entry & Exit of Library 'by just one click opened on January 8, 2018
4. Organized "Library Orientation Programme" for new Int/PhD students and faculty on 6th Jan 2018.
5. '**American Chemical Society (ACS) on Campus**' event was organized by library on 9th Feb 2018. Around 500 students and faculty participated not only from CRIKC Institutes but also from other Universities and students of neighbouring states. Apart from Talks of Editorial team of ACS i.e Vince Rotello, Editor-in-Chief, Bioconjugate Chemistry, Kirk Schanze, Editor-in-Chief, Applied Materials & Interfaces, Rinti Banerjee, Associate Editor, Biomaterials Science & Engineering, Abishek Dey, Associate Editor, ACS Catalysis, there were first 100 poster presentation by Chemistry students. Two students from IISER Mohali, one from IIT Ropar and one from INST bagged best poster presentation award along with token amount. Library also arranged Interactive round table face to face discussion of budding researchers with Editorial team.
6. Organized Training Programme by M/S Informatics for Staff on latest version of KOHA during 3rd and 4th July 2017.
7. Library Coordinated many events between its readers and British Council to participate in various many personality Development activities like 'Effective Public Speaking ' ' How to prepare effective C.V' etc.,
8. Library is contributing the data to National Digital Library (NDL) on behalf of Institute as Coordinator of the Project.

9. Held Library Orientation Programme for BS-MS-2017 Batch from 9.00am to 10.30am on 05/08/2017
10. Held Library Orientation Programme for Int PhD and PhD 2017 Batch from 11.00am to 1.30 pm on 05/08/2017
11. Library opened "Walk-through-Institute" at sixth floor of Informatics Centre on September 12, 2017 where it made pictorial representation on Journey of IISER Mohali since 2006, Poster presentation of each Laboratory of Institute, Profile of Faculty and students of each department, display of Undergraduate Research, Regular News on IISER Mohali Research, Showcasing Research output of Institute and many more.
12. Library Created and opened to Community on 9th September 2017 the Students Corner – where photos of Academic Excellence of students, Faculty Corner – Displayed the Photos of Awards received by faculty during 2016 & 2017 and Alumni Corner – displayed the Photos with details of Alumni who brought laurels to Institute.
13. Organized hands-on training Databases / Softwares on TURNITIN – Antiplagiarism software, SciFinder, Grammarly Tool to its readers on 28/10/2017
14. Library in collaboration with the British Council organized "Christmas Trivia" on Sunday, 17 December 2017 from 2 pm to 5 pm in Lecture Hall Complex. More than 120 Kids with parents participated from IISER Mohali, ISB, IIT Ropar, NIPER, CIAB, INST and many more Institutes from Tricity (CRIKC Institutes). During the event, the kids had lot fun by playing story-time, crafts, word games, Puzzle, writing letters to Santa, Santa give gifts to children and a lot of laughs etc



Dr. Debal Kar, Dr. P.K. Jain, Prof. Arun Kumar Grover, Prof. N. Sathyamurthy, Dr. Dee Magnoni, Dr. P. Visakhi



Inaugural Function of Conference

Dr. Debal Kar, Dr. P.K.Jain, Prof. Arun Kumar Grover, Prof. N. Sathyamurthy, Dr. Dee Magnoni, Dr. P. Visakhi

Use Statistics of Library:

No. Readers visited Library: 86,348

No. of Books acquired: 929

Publications:

1. Visakhi, P.B M. Gupta, Ritu Gupta and Ashok Kumar Garg (2017). "Health Tourism Research: A Scientometric Assessment of Global Publications Output during 2007-16", Int J Med. Public Health. 2017; 7(2) : 73-78. A Multifaceted Peer Reviewed Journal in the field of Medicine and Public Health. www.ijmedph.org/www.journalonweb.com/ijmedph.
2. Gupta BM1, Bansal M2*, Visakhi P 3 . (2018) . Chronic Pancreatitis Research in India: A Scientometric Assessment of Publications during 2007-16 „Kenkyu Journal of Gastroenterology - 3:17-31 (2018) <http://www.kenkyugroup.org/article/42/136/Chronic-Pancreatitis-Research-in-India--A-Scientometric-Assessment-of-Publications-during-2007-16>
3. Gupta, B.M., Dhawan, S.M., Kumar A., & Visakhi, P. (2018). E-waste research: A scientometric assessment of global publications output during 2007-16. International Journal of Information Dissemination and Technology, 8(1), 31-36.

14 Computer Centre



Computer centre manages three computer teaching labs two of which double up as a general computer lab and one as a centre for NKN activities. In the two semesters during 2017-18, computer labs were used for a large number of courses courses with more than 500 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 manages the campus wide Wi-Fi network and connectivity to the Wide Area Network ("internet"). Computers in any part of the institute connect with each other with high speed data transfer rates. The networking setup has been designed with redundancy and a management and monitoring system. The automated alarm system is currently via e-mail; phone and text based alarms are currently being implemented. The Internet connectivity is currently at 100 Mbps for the BSNL network, and Gbps for the NKN network.

A review of the the Computer Centre was undertaken with the help of external experts and an agenda was drawn up for improvement of all services over the coming years. Data management for Academics, Hostels, Students, Salaries and other accounts are currently managed through an ERP system. This was reviewed and a new contract for the same was awarded. The work of the external agency hired to implement new modules and providing additional features for existing modules will be reviewed in the coming year.

A workshop on Matlab and Simulink was organised on March 23, 2018. The aim of this workshop was to familiarise users with useful features in these programming environments.

The Computer Centre is currently in the process of implementing a central single authentication system for all users of its services. This has already been done for access to course notes and other material. It is also used to provide access to computation and storage services. The use of this for Wi-Fi key generation and e-mail access will be taken up in the coming year.

15 National Institutional Ranking Framework (NIRF) rank



In 2018, IISER Mohali was ranked 55 in the overall category of National Institutional Ranking Framework. The results were announced in the spring of 2018 at a ceremony in Vigyan Bhavan, New Delhi and was

attended by Professor Purnananda Guptasarma, Dean (Research and Development). The ranking required the submission of an enormous amount of data that related to the faculty and student strength, expenditures on infrastructure, equipment and library and various other operational expenditures, external funding received, placement of students and fellowship drawn by students. The collation of the data from the different sections of the institute and its submission to the NIRF was done by Dr. Dipanjan Chakraborty, the Nodal Officer in consultation with the Director, Heads of the Departments and the Deans of the institute.

The assessment process of ranking is heterogenous for different categories and considers different time frames for which we had to submit our data. For student strength, the data required was for the period of last five years, whereas for the publication details, external funding and financial resource utilization, the time frame was three years.

During the period 2011-2016 our total student strength has increased to a number slightly above 1200 and the faculty strength has increased to 89. The number of publications from the Institute during the period 2014-2016 has become close to 500 with more than 3000 citations and the external funding received during the same period is over Rs. 14 Crores.

The NIRF ranks are the outcome of the National Ranking system established by the Ministry of Human Resource Development (MHRD) in September, 2015. In 2016, during the first rounds of ranking, IISER Mohali was ranked 43 amongst institutes in the engineering category, along with other institutes such as IISc, IITs, NITs, IISERs and other Engineering Universities/Institutes/Colleges in the country. In 2017, IISER Mohali was considered under the overall category, which included all Universities/Institutes/Colleges and was ranked 52.

16 Lectures by Visitors

16.1 Public Lectures

1. March 20, 2018: Professor Bharat Ratra, Kansas State University: The Accelerating Expanding Universe: Dark Matter, Dark Energy, and Einstein's Cosmological Constant.
2. September 27, 2017: Dr. Madhavan Nair Rajeevan, Secretary, Ministry of Earth Sciences, Government of India: Earth System Science for Socio-Economic Benefits.
3. August 23, 2017: Professor Samir K. Brahmachari, J.C. Bose National Fellow; Founder Director, CSIR-IGIB; Academy Professor, AcSIR; Chief Mentor, OSDD; Former Director General, CSIR; Former Secretary, DSIR, Molecular Theory Through Boundary Less Science.
4. May 25, 2017: Professor CNR Rao, National Research Professor & Linus Pauling Research Professor, Honorary President, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, India: Photochemical, Thermochemical and Electrochemical splitting of water.
5. May 11, 2017: Professor Anurag Kumar, Director and Professor, ECE Department Indian Institute of Science, Bangalore: Cyber Physical Systems over the Internet of Things: Technology, Research, and Prospects.

16.2 Institute Colloquia

1. February 13, 2018: Prof. Tejinder P. Singh, Tata Institute of Fundamental Research, Mumbai: Is quantum theory exact, or approximate?"
2. January 31, 2018: Prof. Jayanta Roy-Chowdhury, Albert Einstein College of Medicine, Bronx, New York, USA: "In Vivo Genome Editing For Inherited Liver Diseases".
3. December 05, 2017: Prof. Richard W. Kriwacki, Department of Structural Biology, St. Jude Children's Research Hospital, Memphis, Tennessee, USA: "A Deep Dive into Disorder-Function Relationships for the Cyclin-dependent Kinase Inhibitors, p21 and p27".
4. November 01, 2017: Prof. Volker Hartenstein, Department of Molecular Cell and Developmental Biology, University of California Los Angeles, Los Angeles, USA: "Structure and Development of Neuronal Circuits of the Drosophila brain: A lineage-centered approach".
5. September 29, 2017: Prof. N. Mukunda, INSA C V Raman Research Professor, Indian Academy of Sciences, Bangalore: "The Roles of Phase Space in Classical and Quantum Physics - a historical account"
6. September 20, 2017: Prof. Naresh Dadhich, Former Director & Emeritus Professor, IUCAA Pune: "Understanding General Relativity after 100 years".
7. September 13 2017: Dr. T.R. Sharma, Director, National Agri-Food Biotechnology Institute (NABI), Mohali: "Plant Genome Analysis for the Discovery of Novel Genes and their Utilization in Rice Breeding".
8. August 02, 2017: Prof. Pradip Sinha, IIT Kanpur: "It takes two to tango: oncogenically targeted cells bank on their neighbors for transformation".
9. April 18, 2017: Prof. Rahul Roy, Indian Statistical Institute, Delhi: "Coverage of space by random sets."

10. April 12, 2017: Prof. V. Ramakrishnan Director, IISER Thiruvananthapuram: "The potential of Raman imaging in materials research."
11. April 06, 2017: Prof. Samir Bhattacharya, Visva-Bharati, Santiniketan: "Failure of energy sensors disrupts energy homeostasis that leads to metabolic syndrome." "LH-3, Lecture Hall Complex"
12. April 03, 2017: Prof. Mahan Mj, TIFR Mumbai: "Hyperbolic Geometry and Chaos in the Complex Plane."

16.3 Institute Seminars

1. February 28, 2018: Dr. Pralok Kumar Samanta, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore: "Light Matter Interactions and Their Responses"
2. February 27, 2018: Lathashree K.S.: Public Archaeologist; Founder, Chai With History; Course Instructor, Azim Premji University: "Jataka Tales: a Journey into Ancient India"
3. February 26, 2018: Dr. Nishikanta Khandai (NISER, Bhubaneswar): "Revisiting The HI Mass Function"
4. February 23, 2018: Prof. Elangannan Arunan, IISC Bangalore: "Hydrogen Bonding and van der Waals Radii"
5. February 23, 2018: Dr. Souvik Bhattacharjee, School of Molecular Medicine, JNU, New Delhi: "A molecular mechanism for artemisinin-resistance in Plasmodium falciparum malaria"
6. February 22, 2018: Dr. Anupam Bandyopadhyay, Department of Chemistry, MIT-Cambridge: "Fundamental understanding and applications of Iminoboronate Chemistry"
7. February 22, 2018: Prof. Dipendra Prasad (TIFR Mumbai): "Groups with involutions- their place in geometry and representation theory"
8. February 19, 2018: Dr. Srinivasa Reddy, CSIR-NCL Pune: "Application Oriented Organic Synthesis: Our Group Efforts in Total Synthesis and Medicinal Chemistry"
9. February 16, 2018: Dr. Hemakesh Mohapatra, Institute for Molecular Engineering, University of Chicago: "Mechanochemical strengthening of polymeric materials using piezoelectric nanoparticles"
10. February 16, 2018: Dr. Shib Sankar Ganguli, DST Inspire Faculty, IIT Kanpur: "Optimizing Carbon Sequestration through CO₂-Enhanced Oil Recovery in an Indian Mature Reservoir: An Integrated Approach"
11. February 16 2018: Prof. Suresh Rattan, PhD, DSc, Laboratory of Cellular Ageing, Department of Molecular Biology and Genetics; Aarhus University, Denmark : "Healthy ageing: from homeodynamics to hormesis"
12. February 15, 2018: Dr. Indranath Chakraborty, Alexander von Humboldt Fellow and Junior Group Leader, Center for Hybrid Nanostructure (CHyN), University of Hamburg: "Tuning Nanoparticle Surfaces: From Cluster Induced Assembly to Dynamics at Single Particle Level"
13. February 13, 2018: Dr. Ved Prakash Maurya, Coordination of Geophysics (COGE) at Observatorio Nacional (ON), Rio de Janeiro, Brazil: "Three-Dimensional Magnetotelluric Imaging: Case histories for the tectonic evolution of 'Metallogenic provinces' and 'Petroleum basin' systems from two different continents"

14. February 07 2018: Prof Paul Walton, University of York, UK: "The Discovery, Structures and Spectroscopy of Lytic Polysaccharide Monooxygenases: Enzymes to Change the Biofuel World"
15. February 02, 2018: Prof. Vasant Shinde (Deccan College, Pune): "Technological and Scientific Achievements during the Harappan Civilization"
16. February 01, 2018: Prof. Asit K. Chakraborti, NIPER Mohali: "Sustainable Approaches in Medicinal Chemistry: New Concepts and Applications"
17. January 23, 2018: Dr. Aninda Mitra, Mechanobiology Institute, National University of Singapore, Singapore & FIRC Institute of Molecular Oncology (IFOM), Milan, Italy: "Cell-geometry regulates response to TNF α -signaling"
18. January 22, 2018: Prof. Shashikant R. Dugad (TIFR, Mumbai): "Applications of Silicon Sensors in High Energy Physics and Astronomy"
19. January 15, 2018: Dr. Krishna Mohan Parattu (IIT Madras): "Boundary Terms in Gravity"
20. January 15, 2018: Dr. Santosh B. Satbhai, Salk Institute for Biological Studies, San Diego, USA,: "The Genetic Bases of Natural Variation for Iron Homeostasis and Root Growth"
21. January 12, 2018: Prof Miguel Yus, Department of Organic Chemistry, University of Alicante, Spain.: "Chiral N-Sulfinylamines: New discoveries"
22. January. 12, 2018: Prof Carmen Nájera, Department of Organic Chemistry, University of Alicante, Spain,: "Coinage Metal Complexes as Chiral Catalysts for the Asymmetric 1,3-Dipolar Cycloaddition of Azomethine Ylides"
23. January 09, 2018: Dr. Himadri Chatterjee, Postdoctoral Fellow, Department of Humanities and Social Sciences, IISER Mohali: "Land and Labour at the 'Borders' of Kolkata: Refugee Lives in-between Town and Country"
24. January 05, 2018: Dr. Rahul Kitture: "Groups with exactly two sizes of conjugacy classes and nilpotency class 3"
25. January 02 2018: Dr. Kedar Natarajan, European Bioinformatics Institute, Cambridge, UK: "Single cell exploration of cell cycle:"
26. November 23, 2017: Dr. Dimpy Kalia, DST-INSPIRE Faculty, Department of Chemistry, Savitribai Phule Pune University: "Efficacious strategies for cysteine-mediated protein bioconjugation"
27. November 21, 2017: Swarup Kumar Panda, Ecole Polytechnique, France: "First-principles simulations of strongly correlated materials: a density functional theory + dynamical mean field theory (DFT+DMFT) perspective"
28. November 21, 2017: Dr. Nagarjuna Nagaraj, PhD, Head of Mass spectrometry and Proteomics Core facility, Max Planck Institute for Biochemistry, Am Klopferspitz 18, Martinsried/Munich 82152 Germany: "Pragmatic proteomics - a tool for answering biochemical and biological questions"
29. November 16, 2017: Dr. Soumen Kumar Samanta, Department of Chemistry and Biochemistry, University of Maryland, College Park, MD 20740, USA.: "Supramolecular Self-Assembly: From Molecular Machine to Biomedical Application"
30. November 14, 2017: Dr. Stefano Kaburu, Postdoctoral Fellow, Department of Population, Health and Reproduction, School of Veterinary Medicine; University of California, Davis : "Individual differences in the development and adaptation of social behaviors in non-human primates"

31. November 10, 2017: Sukumar Muralidharan, Associate Professor, School of Journalism and Communication, Jindal University: "State, Civil Society and Secularism: Unravelling the Tangle"
32. November 10, 2017: Dr. Kinjalk Lochan, IISER Mohali: "A Quantum Tryst with Gravity"
33. November 06, 2017: Tusharkanti Dey, EP-VI, EKM, Institute for Physics, University of Augsburg, Germany: "Search for Kitaev spin liquid materials"
34. November 06, 2017: Prof. L S Shashidhara, Department of Biology, Indian Institute of Science Education and Research Pune: "Fly Genetics to study Growth Control in Development and its aberration in cancer"
35. November 03, 2017: Dr. Ranjit Das, National Research Center for Integrated Natural Disaster Management, Chile Pontificia Universidad Catolica De Chile: "Seismic Hazard Assessment: Methodology and Uncertainties"
36. November 03, 2017: Prof. Parjit Kaur, Department of Biology, Georgia State University, Atlanta, GA, USA: "Function and Assembly of a Bacterial Multi-Drug Transporter"
37. October 30, 2017: Manabendra Nath Bera: "Universal Laws of Thermodynamics"
38. October 27, 2017: Dr. Arijit K. De, IISER Mohali: "'Optical trapping with a femtosecond laser tweezer: Theory & experiment"
39. October 26, 2017: Vivek Mishra, Oak Ridge National Laboratory: "Pairing in cuprates: Signatures of a non-BCS paradigm"
40. October 26, 2017: Dr. Sudipto Roy Senior Principal Investigator, Institute of Molecular and Cell Biology, 61 Biopolis Drive, Singapore Visiting Professor, National Institute of Biomedical Genomics, Kalyani, West Bengal, India.: "Cilia and Ciliopathies"
41. October 25, 2017: Prof. Jayant Murthy, Indian Institute of Astrophysics, Bangalore: "Nightfall: An Asimov Tribute or How I made it into Wikipedia"
42. October 18, 2017: Dr. Rajesh Viswanathan, Frank Hovorka Assistant Professor in Chemistry, Case Western Reserve University, OH, USA.: "Genome-Enabled Molecular Synthesis Unraveling New Natural Product Pathways and Inhibitors of Mammalian Cancer Targets"
43. October 17, 2017: Nirat Ray, School of Physical Sciences, Jawaharlal Nehru University: "Investigating Charge Transport in Designer solids"
44. October 16, 2017: Dr. Shubhra Sharma, Physical Research Laboratory, Ahmedabad: "Climatic implications of Holocene floods in the Western Himalaya: A case study of the Satluj Valley"
45. October 03, 2017: Sourav Mitra, Surendranath College, Kolkata: "Towards concise modeling of Cosmological Reionization and Galaxy formation"
46. September 29, 2017: Dr. Harvinder K. Jassal (IISER Mohali): "Constraining the accelerating universe"
47. September 26 2017: Dr. Pulak Kar, Department of Physiology, Anatomy and Genetics, University of Oxford, Oxford, U.K.: "CRAC channels Ca^{2+} microdomains in NFAT activation and gene expression"
48. September 22, 2017: Prof. Naresh Dadhich (Emeritus Professor, IUCAA Pune): "Einstein is Newton with space curved"

49. September 21, 2017: N. Shankaraiah, TIFR Centre for Interdisciplinary Sciences, Hyderabad: "Phase-ordering dynamics in martensitic transitions"
50. September 21, 2017: Rovin Sharma: "(Re)Introduction to Gender, Identity and Diversity"
51. September 20, 2017: Siddhartha Ghos, NUS Singapore: "Exotic Phenomena at Oxide Interfaces"
52. September 15, 2017: Dr. Yogesh Singh, IISER Mohali: "Spin Liquids in Frustrated Magnets"
53. September 08, 2017: PhD defense of Ms. Divya Khatter: "Role of small GTPase Arl8b and its effector proteins in regulating cargo trafficking to lysosomes"
54. September 08, 2017: Mr. Manvendra Pratap Rajvanshi, IISER Mohali: "Dark Energy perturbations in presence of non-linear clustering in matter"
55. September 07, 2017: Dr. Ambresh Shivaji, CP3, UCL, Chemin du Cyclotron, Belgium: "Phenomenology of loop-induced processes at hadron colliders: Standard Model and Beyond"
56. September 05, 2017: Dr. Som Lata: "Exploring Endocytic processes of Entamoeba histolytica"
57. September 01, 2017: Dr. Satyajit Jena, IISER Mohali: "India based Neutrino Observatory"
58. August 31, 2017: Dr. Ashok Kumar, The University of Oklahoma, USA: "Quantum-enhanced plasmonic sensors"
59. August 31, 2017: Dr. Rajeev Yadav, NGRI, Hyderabad, India: "Crustal deformation study from GPS measurements: a case study on Northwest Himalaya"
60. August 28, 2017: Anirban Polley, Columbia University, New York, USA: "Multiscale Modeling to unravel cellular and subcellular process in biological systems"
61. August 28, 2017: Dr. Dhiraj Bhatia: "DNA based emerging technologies for biological and biomedical applications"
62. August 25, 2017: Dr. Nishant Singh, Max Planck Institute for Solar System Research, Gottingen: "Predicting solar magnetic activity: implications for space weather and global dynamo"
63. August 25, 2017: Dr. Sharmila Bhattacharya, IIT Bombay: "Biomarkers: Decoding Palaeobiology and Past Ecosystems"
64. August 25, 2017: Dr. Vishal Bhardwaj (IISER Mohali): "Beauty & Charm from Belle"
65. August 24, 2017: Dr. Saurabh Das, Centre for Soft Computing Research; Indian Statistical Institute: "Radio remote sensing studies of tropical rain and water vapor"
66. August 24, 2017: Dr. Sagarika Roy, Indian Institute of Science, Bangalore: "Ecohydrology and Geoinformatics: In Pursuit of Environmental Sustainability"
67. August 23, 2017: Prof. S.K. Brahmachari J.C. Bose National Fellow; Founder Director, CSIR-IGIB; Academy Professor, AcSIR; Chief Mentor, OSDD; Former Director General, CSIR; Former Secretary, DSIR: "Special Lecture on Molecular Journey Through Boundaryless Science"
68. August 22, 2017: Chaitanya Joshi, Cardiff University, United Kingdom: "Light, matter and losses: a non-equilibrium quantum toolbox"
69. August 21, 2017: Dr. Anupam Singh, IISER Pune "z-classes in Symmetric and Alternating groups"
70. August 21, 2017: Dr. Dibakar Roychowdhury, Department of Physics, Swansea University, United Kingdom: "Gauge/Gravity duality: Overview & Applications"

71. August 21, 2017: Pramod Kanwar, Ohio University-Zanesville: "On idempotents and units in certain polynomial rings"
72. August 21, 2017: Pramod Kanwar, Ohio University-Zanesville "From Computations to Abstraction"
73. August 18, 2017: Dr. Anand Sawant(Ludwig-Maximilian University of Munich, Germany): "Central extensions and A^1 -fundamental groups"
74. August 18, 2017: Dr. Yogesh Singh (IISER Mohali): "Spin Liquids in Frustrated Magnets"
75. August 17, 2017: Dr. Mukesh Jewariya: "Generation of Intense Monocycle Terahertz Pulse using Tilted Wavefront Technique and its Application: Nonlinear Terahertz Spectroscopy and 3-Dimensional Computed Tomography"
76. August 16, 2017: Dr. Akhilesh Gupta, FNAE, FIMS, Adviser/Scientist-G & Head Strategic Programmes, Large Initiatives and Coordinated Action Enabler (SPLICE) and Climate Change Programme: "Special Seminar on Climate Change Research in India: DST's initiatives"
77. August 11, 2017: Dr. Dipanjan Chakraborty (IISER Mohali) "The Middle World"
78. August 10, 2017: Satender Kataria (Faculty Candidate), RWTH Aachen Uni, Chair for Electronic Devices, Germany: "–Two-Dimensional Materials Exploring and Tapping the Potential of the True Surfaces"
79. August 10, 2017: Dr. Satender Kataria, RWTH Aachen University, Chair for Electronic Devices, Germany: "–Two-Dimensional Materials Exploring and Tapping the Potential of the True Surfaces"
80. August 09 2017: Vimal Simha (Faculty Candidate), Center for Extra-Galactic Theory, University of Western Cape Town: "Probing Cosmology with Galaxy Clustering"
81. August 07, 2017: Dr. Anosh Joseph, ICTS, Bangalore: "Exact Lattice Supersymmetry"
82. August 04, 2017: Ashis Kumar Nandy, Department of Physics and Astronomy, Uppsala University, Sweden: "Skyrmion: a real-space topology in chiral magnet"
83. August 04, 2017: Dr. Indrajit Jana (Temple University, USA): "Spectrum of Random Band Matrices"
84. August 04, 2017: Dr. Mandip Singh (IISER Mohali): "'Quantum Reality and Schrodinger's Cat"
85. August 02, 2017: Dr. Elaine Fisher, Stanford University: "Hindu Pluralism: Religion and Public Space at the Dawn of Modernity"
86. July 21, 2017: Prof. Partha Sarathi Mukherjee (Boise State University): "A Multi-resolution and Adaptive Image Denoising Framework"
87. July 21, 2017: Dr. Neelam Dabas Sen: "Unraveling the interplay of DEAD-box RNA helicases in regulating translation initiation at genome-wide level"
88. July 13, 2017: Prof Abdou Saad El-Tabl, Department of Chemistry, Menoufia University, Egypt: "Metal complexes as a new class of bioactive compounds"
89. June 28, 2017: Prof Roderick W. Bates, Division of Chemistry and Biological Chemistry, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore: "Successes, Failures and Surprises in the Synthesis of Piperidines"
90. June 16, 2017: Dr. Geeta Ram: "The role of staphylococcal pathogenicity islands (SaPIs) in the adaptation and virulence of *Staphylococcus aureus*"

91. June 15, 2017: Prof. Amitava Patra, Department of Materials Science, Indian Association for the Cultivation of Science, Jadavpur, Kolkata: "Nanomaterials Based Light Harvesting Systems for Potential Applications"
92. June 05, 2017: Prof. RaviKant Pathak, Associate Professor, And University of Gothenburg, Sweden: "Formation and Transformation of Atmospheric Black carbon"
93. May 17, 2017: Dr. Jaishri Sanwal, Jawaharlal Nehru Centre for Advance Scientific Research, Bangalore: "The proxy record of Quaternary Climate and Tectonics from the Himalaya"
94. May 08, 2017: Dr. Kartik Sunagar: "Deadly innovations. 'Venomics' for evolution, ecology, and snakebite management."
95. May 05, 2017: Prof. G. Sekar, Department of Chemistry, IIT Madras, Chennai: "Synthesis of Chiral Alcohols by Enantioselective Oxidation and Reduction."
96. May 03, 2017: Dr. Jayita Nayak, Max-Planck Institute for Chemical Physics of Solids, Dresden, Germany: "Electronic structure of topological materials and quasicrystals."
97. May 02, 2017: Dr. Shiv Prasad: "Geometric realizations of torsion elements in the mapping class group."
98. April 21, 2017: Dr. Kalyan Banerjee (IISER Mohali): "Algebraic cycles and non-rationality of a cubic fourfold."
99. April 21, 2017: Dr. Ashwani K. Tiwari, Associate Professor, Department of Chemical Sciences, Indian Institute of Science Education and Research Kolkata: "Dynamics of H₂O dissociation on Nickel Surfaces."
100. April 21, 2017: Dr. Hasthi Ram: "Regulation of lateral organ initiation by transcription factors (TFs) involved in dorso-ventral (DV) patterning in Arabidopsis"
101. April 14, 2017: Dr. V. Krishna Ananth, Dept of History, Sikkim University, Gangtok: "One Hundred Years after Champaran and the Idea of India."
102. April 12, 2017: Dr. Prasun Dutta (IIT-BHU): "Investigating the Structure and Dynamics of the Interstellar Medium of Galaxy."
103. April 07, 2017: Dr. Mayukh Majumdar (Univ. of Augsburg, Germany): "Quantum spin liquid ground state in Ba₃InIr₂O₉: NMR and μ SR as local techniques."
104. April 05, 2017: Professor Mahendra K. Verma (IIT Kanpur): "Free Turbulence, Bounded Turbulence, and Universal Theories."
105. April 04, 2017: Dr. Sourabh Lahiri (ICTS, Bengaluru): "Stochastic Thermodynamics, Fluctuation Theorems and optimal protocols."
106. April 04, 2017: Prof. Sandhya Visweswariah Dept. of Molecular Reproduction, Development and Genetics Indian Institute of Science, Bangalore: "Cyclic Nucleotides and Bacterial Pathogens: New Messages from Old Messengers."
107. April 04, 2017: Prof. Mahan Mj, TIFR Mumbai: "Discontinuous Motions of limit sets."
108. April 03, 2017: Dr. Sabari Sankar Thirupathy, University of Wisconsin-Madison: "The conflict between DNA replication and transcription."

17 Postdoctoral fellows at the Institute

1. **Anupa Majumdar** (*Biology*)
2. **Arpana Kumari** (*Biology*)
3. **Banani Chattopadhyay** (*Biology*)
4. **Hema Kumari Alajangi** (*Biology*)
5. **Mohinder Pal** (*Biology*)
6. **Monika Mahajan** (*Biology*)
7. **Nidhi Kumari** (*Biology*)
8. **Pooja Badotra** (*Biology*)
9. **Poonam Sharma** (*Biology*)
10. **Pratima Pandey** (*Biology*)
11. **Rajinder Kumar** (*Biology*)
12. **Sourav Singha Roy** (*Biology*)
13. **Sujan S Bimal** (*Biology*)
14. **Tripti Negi** (*Biology*)
15. **V. Mahandran** (*Biology*)
16. **Yogesh Dahiya** (*Biology*)
17. **Anamika Mukhopadhyay** (*Chemistry*)
18. **Arabinda Baruah** (*Chemistry*)
19. **Arindam Das** (*Chemistry*)
20. **Dhananjay Dey** (*Chemistry*)
21. **Dhiraj Das** (*Chemistry*)
22. **Gaganpreet** (*Chemistry*)
23. **Golam Mohiuddin** (*Chemistry*)
24. **Krishna Kumar Manar** (*Chemistry*)
25. **Manisha Devi** (*Chemistry*)
26. **Nazma Begum** (*Chemistry*)
27. **N Pandurangan** (*Chemistry*)
28. **P. Esakki Karthik** (*Chemistry*)
29. **Prasanta Bhowmik** (*Chemistry*)
30. **Prinka Singla** (*Chemistry*)
31. **Priya Ghosh** (*Chemistry*)
32. **Rajib Kumar Nandi** (*Chemistry*)
33. **T Vivekanand** (*Chemistry*)
34. **Vinod Khatri** (*Chemistry*)
35. **L. Lamminthang Simte** (*Humanities & Social Science*)
36. **Abhay Soman** (*Mathematics*)
37. **Charu Goel** (*Mathematics*)
38. **Dishari Chaudhuri** (*Mathematics*)
39. **Kalyan Banerjee** (*Mathematics*)
40. **Kuldeep Kaur** (*Mathematics*)
41. **Makoto Sakagaito** (*Mathematics*)
42. **Pritam Ghosh** (*Mathematics*)
43. **Sugandha Maheshwary** (*Mathematics*)
44. **Suman Ahmed** (*Mathematics*)
45. **Ankan Mukherjee** (*Physics*)
46. **Biswajit Pathak** (*Physics*)
47. **Jacky Kumar** (*Physics*)
48. **Jayanta Dutta** (*Physics*)
49. **M. Suman Kalyan** (*Physics*)
50. **Mamta Gulati** (*Physics*)
51. **Mehra Singh Sidhu** (*Physics*)
52. **Minaxi Sharma** (*Physics*)
53. **Mohd Asad Siddiqui** (*Physics*)
54. **Moutushi Dutta Choudhury** (*Physics*)
55. **Rajeswari Roy Chowdhury** (*Physics*)
56. **Pushpa Kumari** (*Physics*)
57. **Ram Lal Awasthi** (*Physics*)
58. **R. K Gopal** (*Physics*)
59. **Shri Krishna** (*Physics*)
60. **Sirshendu Gayen** (*Physics*)
61. **Subhadip Ghosh** (*Physics*)
62. **Seema Satin** (*Physics*)
63. **Venkata Suryanarayana Mummidi** (*Physics*)
64. **Yogyata Pathania** (*Physics*)

18 Graduates of 2017

18.1 BS-MS Graduates

S. No.	Name	Reg. No.	Subject
1.	SHIVPRAJVAL DIVAKAR	Ms10048	BIOLOGY
2.	DEVWRAT DUBE	Ms11015	PHYSICS
3.	HARIKRISHNAN. P. S	Ms11066	PHYSICS
4.	VIVEK SINGH	Ms11067	PHYSICS
5.	SHIRINA ARORA	Ms12002	MATHEMATICS
6.	GAURAV SAXENA	Ms12003	PHYSICS
7.	YENGKHOM ROJA DEVI	Ms12006	BIOLOGY
8.	KANISHK JAIN	Ms12009	PHYSICS
9.	JYOSMITA LAGACHU	Ms12010	MATHEMATICS
10.	ANUJ KRISHNASUNDAR PENNATHUR	Ms12011	CHEMISTRY
11.	AMIT DEVRA	Ms12012	PHYSICS
12.	RAVI RANJAN	Ms12013	CHEMISTRY
13.	ANKIT	MS12014	CHEMISTRY
14.	ADITYA VYAS	MS12016	PHYSICS
15.	ABHIJEET ROY	MS12018	PHYSICS
16.	RAHUL BANSAL	MS12021	PHYSICS
17.	BHARTI YADAV	MS12022	PHYSICS
18.	TEJASVINEE ATUL MODY	MS12023	BIOLOGY
19.	AJIT KUMAR YADAV	MS12024	CHEMISTRY
20.	SUNIDHI TANEJA	MS12025	MATHEMATICS
21.	PREM KUMAR	MS12026	CHEMISTRY
22.	SHIVAM	MS12028	PHYSICS
23.	SHIKHA NAGAL	MS12029	MATHEMATICS
24.	ANIRUDH C R	MS12032	CHEMISTRY
25.	NITESH KUMAWAT	MS12034	MATHEMATICS
26.	ROHAN GUPTA	MS12035	MATHEMATICS
27.	HARPREET SINGH	MS12037	BIOLOGY
28.	ARPITA NATH	MS12038	BIOLOGY
29.	MEDHA SHARMA	MS12039	BIOLOGY
30.	KARAN CHOUDHARY	MS12040	BIOLOGY
31.	AKANKSHA SINGH	MS12041	BIOLOGY
32.	PARUL JANAGAL	MS12042	PHYSICS
33.	BINDIA CHAWLA	MS12045	BIOLOGY

S. No.	Name	Reg. No.	Subject
34.	SHIVALI SOKHI	MS12046	PHYSICS
35.	K T MUSHIR UL HASAN	MS12047	CHEMISTRY
36.	MUGDHA THAKUR	MS12048	MATHEMATICS
37.	SAMRIDHI PANWAR	MS12049	BIOLOGY
38.	VIBHU JOSHI	MS12051	BIOLOGY
39.	VAISHNAVI NIRAJ NIVSARKAR	MS12052	BIOLOGY
40.	NIMISHA. E.S	MS12053	BIOLOGY
41.	ANJALI KRISHNAN	MS12054	PHYSICS
42.	ASHUTOSH TIWARI	MS12055	BIOLOGY
43.	SIDHANT VIVEK WAGULDE	MS12056	CHEMISTRY
44.	AARATHY. R.G	MS12057	BIOLOGY
45.	ATEESHA NEGI	MS12058	BIOLOGY
46.	BHUPENDRA GOSWAMI	MS12059	CHEMISTRY
47.	MOHAMED MUSTHAFA IQBAL	MS12061	CHEMISTRY
48.	KETIKA GARG	MS12062	BIOLOGY
49.	MEGHA TREESA TOM	MS12064	BIOLOGY
50.	DEVIKA.S	MS12065	PHYSICS
51.	SANJIB KUMAR DAS	MS12066	PHYSICS
52.	NIMYA.S.S	MS12067	CHEMISTRY
53.	VIKRAM SINGH BHATI	MS12068	CHEMISTRY
54.	SATAVISA JANA	MS12069	CHEMISTRY
55.	KARAN KHURANA	MS12074	PHYSICS
56.	DONY VARGHESE	MS12075	MATHEMATICS
57.	SRUTHY K. CHANDY	MS12076	CHEMISTRY
58.	MARUTHI PRASAD M I	MS12077	BIOLOGY
59.	MARTIK CHATTERJEE	MS12079	BIOLOGY
60.	NEERU MITTAL	MS12080	CHEMISTRY
61.	T H ANISHYA	MS12081	PHYSICS
62.	RISHABH DHIMAN	MS12082	MATHEMATICS
63.	VAISHNAVI SRIDHAR	MS12083	BIOLOGY
64.	AMAL MATHEW	MS12084	BIOLOGY
65.	VIKAS SRIVASTAVA	MS12085	MATHEMATICS
66.	AAYUSH	MS12087	CHEMISTRY
67.	SUSHMA THINGUJAM	MS12088	BIOLOGY
68.	MISHTY RAY	MS12089	MATHEMATICS
69.	MALPURE ABHISHEK PRAVIN	MS12090	MATHEMATICS

S. No.	Name	Reg. No.	Subject
70.	LATA KALRA	MS12092	BIOLOGY
71.	MOHAN LAL	MS12094	BIOLOGY
72.	KARTHIKA RAJEEV	MS12095	MATHEMATICS
73.	SHRUTHI RAVINDRANATH	MS12096	BIOLOGY
74.	HIMANSHI BALECHA	MS12097	BIOLOGY
75.	SHRINIT SINGH	MS12098	MATHEMATICS
76.	SUMIT KUMAR AGRAWAL	MS12099	CHEMISTRY
77.	SANDE SUMAIYA ZAKIRHUSEN	MS12100	MATHEMATICS
78.	EBIN GEORGE	MS12101	CHEMISTRY
79.	BHARTI SOHPAUL	MS12102	CHEMISTRY
80.	JAYANTH GUHAN	MS12104	MATHEMATICS
81.	ANGEL D S	MS12105	CHEMISTRY
82.	AKANKSHA GAUTAM	MS12106	PHYSICS
83.	SANDRA U.S	MS12107	BIOLOGY
84.	MUHAMMED SHABIN.S	MS12108	CHEMISTRY
85.	ATHUL R VIJAYAN	MS12109	BIOLOGY
86.	PAWAR HARSHAL SANJAY	MS12110	BIOLOGY
87.	HARSHITA MAHLA	MS12111	MATHEMATICS
88.	PAWAR VISHAKHA VIJAY	MS12112	MATHEMATICS
89.	ALEENA ANNA THOMAS	MS12115	CHEMISTRY
90.	RATHI SIDDHI SUNILKUMAR	MS12116	BIOLOGY
91.	HARITHA. R	MS12117	PHYSICS
92.	ASHISH THAMPI	MS12118	PHYSICS
93.	EKTA	MS12120	BIOLOGY
94.	AKSHAY SANGWAN	MS12121	BIOLOGY
95.	AKSHAY KUMAR	MS12123	PHYSICS
96.	ANUSREE. P. V	MS12125	CHEMISTRY
97.	RIYA AHUJA	MS12126	BIOLOGY
98.	VISHNU. P.K	MS12127	PHYSICS
99.	JYOTI RANI	MS12128	PHYSICS
100.	ASHISH RANJAN	MS12129	PHYSICS
101.	BODDU SATYA SPANDANA	MS12131	PHYSICS
102.	VIJITH KUMAR. V	MS12133	BIOLOGY

18.2 MS Graduates

S. No.	Name	Reg. No.	Dept.	Title of the thesis
1	GURKARAN SINGH MEHTA	MP14001	BIO	<i>Structural analysis of 4-α-Glucanotransferase from Pyrococcus furiosus</i>
2	PRIYA SHARMA	MP14002	BIO	<i>Understanding the role of Wnt signaling in context of zebrafish fin regeneration</i>
3	PRATIK CHATTOPADHYAY	MP14005	PHY	<i>Gauge-hierarchy Problem, Seesaw Mechanisms and Discrete symmetries</i>
4	PRATYUSH KUMAR MISHRA	MP14008	MTH	<i>From Braids to Mapping Class Groups</i>
5	JITENDRA RATHORE	MP14009	MTH	<i>Growth of Groups</i>
6	GURDEEP SINGH	MP14012	CHM	<i>Bis-(dialkylamino)-cyclopropenyliene(BAC) catalyzed Conjugate Addition of Nucleophiles to para-Quinone Methides and Chalcones</i>

18.3 PhD Graduates

S. No.	Name	Reg. No.	Dept.	Title of the thesis
1	NIDHI SHARMA DEY	PH08014	BIO	<i>Studies on Larval Hematopoiesis in Drosophila: the Microenvironment and its Hematopoietic Stem Cells</i>
2	VENKATA SUBBA RAO R	PH08015	CHM	<i>Description of Radio-Frequency (RF) pulses in Quadrupolar nuclei</i>
3	JUNAID KHAN	PH09021	BIO	<i>Study of Vibrio cholerae OmpU-mediated host-immunomodulation and underlying signaling mechanism</i>
4	POONAM AGGARWAL	PH09025	BIO	<i>Studying the role of Decapentaplegic in regulating cell fate alteration in larval imaginal discs of Drosophila</i>
5	SIVARANJAN UPPALA	PH09035	CHM	<i>Multi-spin analysis of Rotational resonance NMR using Rabi oscillations and Reduced density matrix</i>
6	VADLA RAJKUMAR	PH09037	CHM	<i>Studies on the Stereo- and Regioselective Synthesis of New Sets of Functionalized Pyrrolidine, Spiro- Pyrrolidine / Pyrrolizidine, Furfurylamine and 2-/3- (Aminoalkyl)-Thiophene Scaffolds via the Azomethine Ylide Cycloaddition and C- H Functionalization Methods</i>
7	B CHENNAKESAVAREDDY	PH09039	CHM	<i>Studies on Stereoselective Construction of Functionalized Carbo- and Heterocycles through the Barbier-Type Reaction and C-H Activation Strategies</i>
8	BARKHA KHILWANI	PH10042	BIO	<i>Study of the immunomodulatory responses elicited by Vibrio cholerae cytotoxin, a β- barrel pore-forming toxin</i>
9	M ZULKIFLI	PH10047	BIO	<i>Substrate Specificity and Mapping of Residues Critical For Transport in the Yeast Glutathione Transporter, Hgt1p</i>
10	SANICA CHANDRAKANT SAKHARWADE	PH10050	BIO	<i>Study of modulation of host innate and adaptive immune responses by Vibrio cholerae porin OmpU</i>
11	SHELLY GUPTA	PH10053	BIO	<i>Study of modulation of host-cell death by Vibrio cholerae porin OmpU and the underlying mechanism</i>

S. No.	Name	Reg. No.	Dept.	Title of the thesis
12	SHISHRAM REBARI	PH10054	PHY	<i>Low Temperature Dissipation Scenarios in Palladium Nano-mechanical Resonators</i>
13	REDDY VIRSINHA VENKAT	PH10059	CHM	<i>Synthetic Approaches toward Benzannulated N-Heterocycles and Related Natural Products through Metal Catalyzed Domino Electrophilic Cyclization Reactions</i>
14	AMANDEEP KAUR	PH10061	BIO	<i>Characterization of ChaC2 Proteins and their Role in Glutathione Degradation</i>
15	KANIKA	PH10063	PHY	<i>Unconventional magnetic ordering in Heisenberg and Hubbard models</i>
16	NAVEEN	PH10064	CHM	<i>Studies on The Synthesis of New Classes of Crown Ether-Type/Polyether Macrocycles and Optically Active Aza-Oxo-Thia Polyether Macrocycles</i>
17	PANJAB BHAGWATRAO ARDE	PH10066	CHM	<i>Discovering new organocatalytic organic transformations using Nheterocyclic carbene as acatalyst</i>
18	SAURABH PANDEY	PH10070	BIO	<i>Modulation of metabotropic glutamate receptor 1 (mGluR1) intracellular trafficking</i>
19	SHRUTI ARYA	PH11079	CHM	<i>Mechanism of Disorder-to-Order Amyloid Transition: The Role of Conformational Plasticity and Water Mobility of Disordered Proteins</i>
20	GOPAL VERMA	PH11083	PHY	<i>Unravelling the Nano-Mechanical Effect of Photon Momentum at Fluid Interface Using Optical Techniques</i>
21	SEEMA RANI	PH11096	CHM	<i>One-Pot Approaches for the Synthesis of Annulated Heteroarenes</i>
22	YOGESH MISHRA	PH12100	HSS	<i>Beautiful Prison: Geopolitics of everyday life in Kashmir</i>

19 Account Statement

19.1 Plan Grant

The Institute received a sum of Rs. 76.60 crores as Grant-in-Aid from the Ministry of Human Resource Development in the Year 2017-18. There is an opening balance of Rs. 13.18 crores from the previous year. Thus out of the total amount of Rs. 89.78 crores available under plan grant, the following expenditure has been made under different budget heads in 2017-18.

S.No.	Budget Head	(Rs. in crores)
I.	Salary Component	23.82
II.	Non-Salary Component	36.35
III.	Purchase of Equipment's	12.21
IV.	Purchase of Furniture	1.63
V.	Library Books	0.23
VI.	Computer Accessories & Peripherals	3.04
	Total	Rs. 77.28 crores

That leaves a closing balance of Rs.12.50 crore.

19.2 Research & Development Grant

In addition to the Plan Grant, the Institute also received a sum of Rs. 23.21 crore (in 2017-18) under Research & Development Account (with an opening balance of Rs. 9.40 crore carried over from the year 2016-17). The details of this account are as follows:

Grant received

This leaves a closing balance of Rs. 16.18 crore

S.No.	Details	(Rs. in crores)
I.	Opening Balance as on 01.04.2017	9.40
II.	Grant received in 2017-18	23.21
	Total	Rs. 32.61 crores

Expenditure

S.No.	Details	(Rs. in crores)
I.	Pay and Allowances	1.44
II.	TA	0.49
III.	Scholarship	6.33
IV.	Purchase of Equipment	2.88
V.	Contingency	0.85
VI.	Consumables	3.41
VII.	Overheads	1.01
VIII.	Other Expenditure	0.02
	Total	Rs. 16.43 crores

19.3 Endowment Fund

The balance available under this account is Rs. 40.04 crores as on 31.03.2018.

19.4 Student Welfare Account

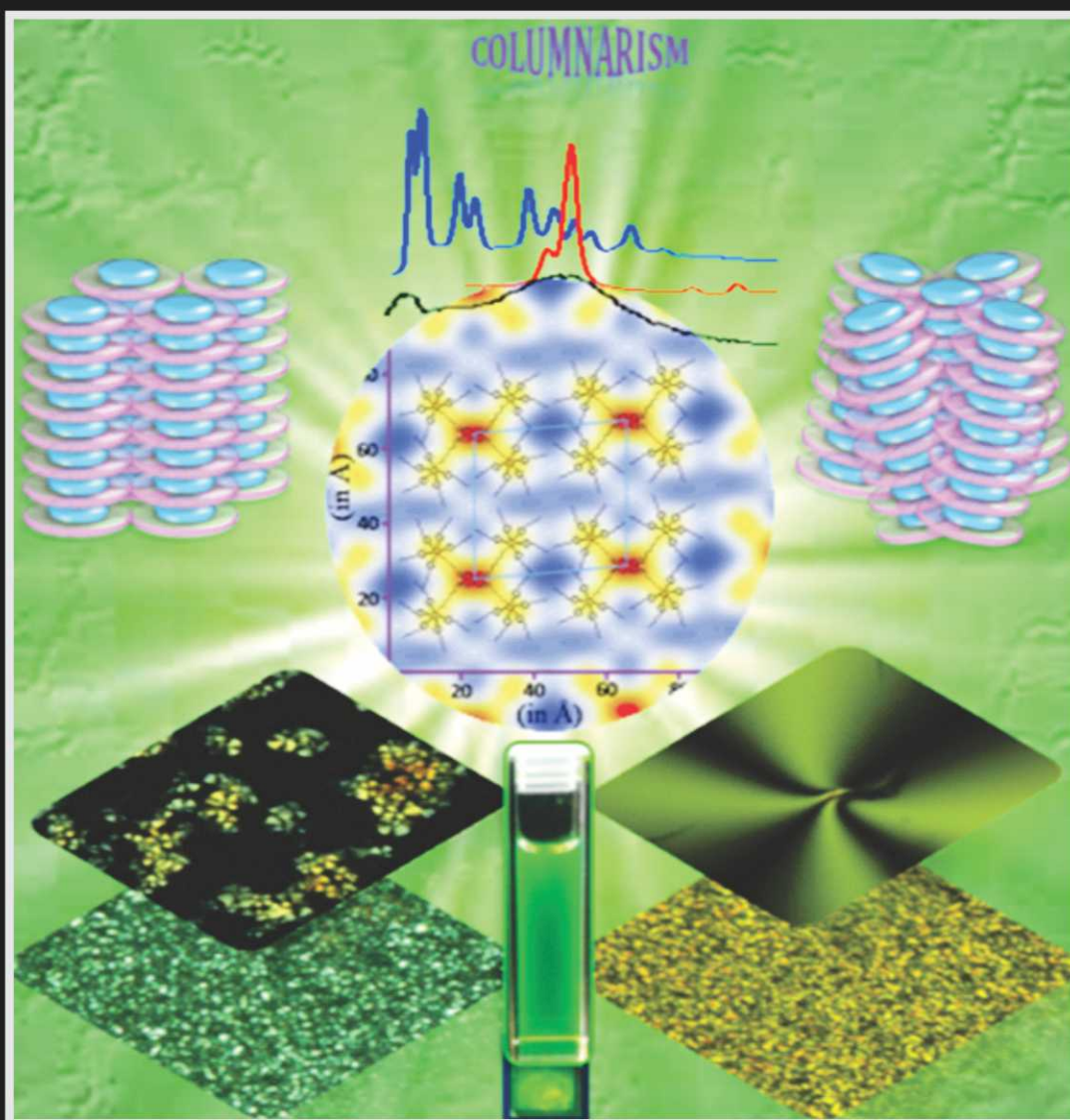
The balance available under this account is Rs. 1.69 crore as on 31.03.2018.



Hostel



Firing of eco friendly fire cracker : The Ignition Point!



Observation of disordered mesomorphism in three-ring-based highly polar bent-core molecules: design, synthesis and characterisation".: Santanu K Pal's lab



INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH MOHALI
Knowledge City, Sector-81, SAS Nagar, PO Manauli (Punjab) - 140 306

