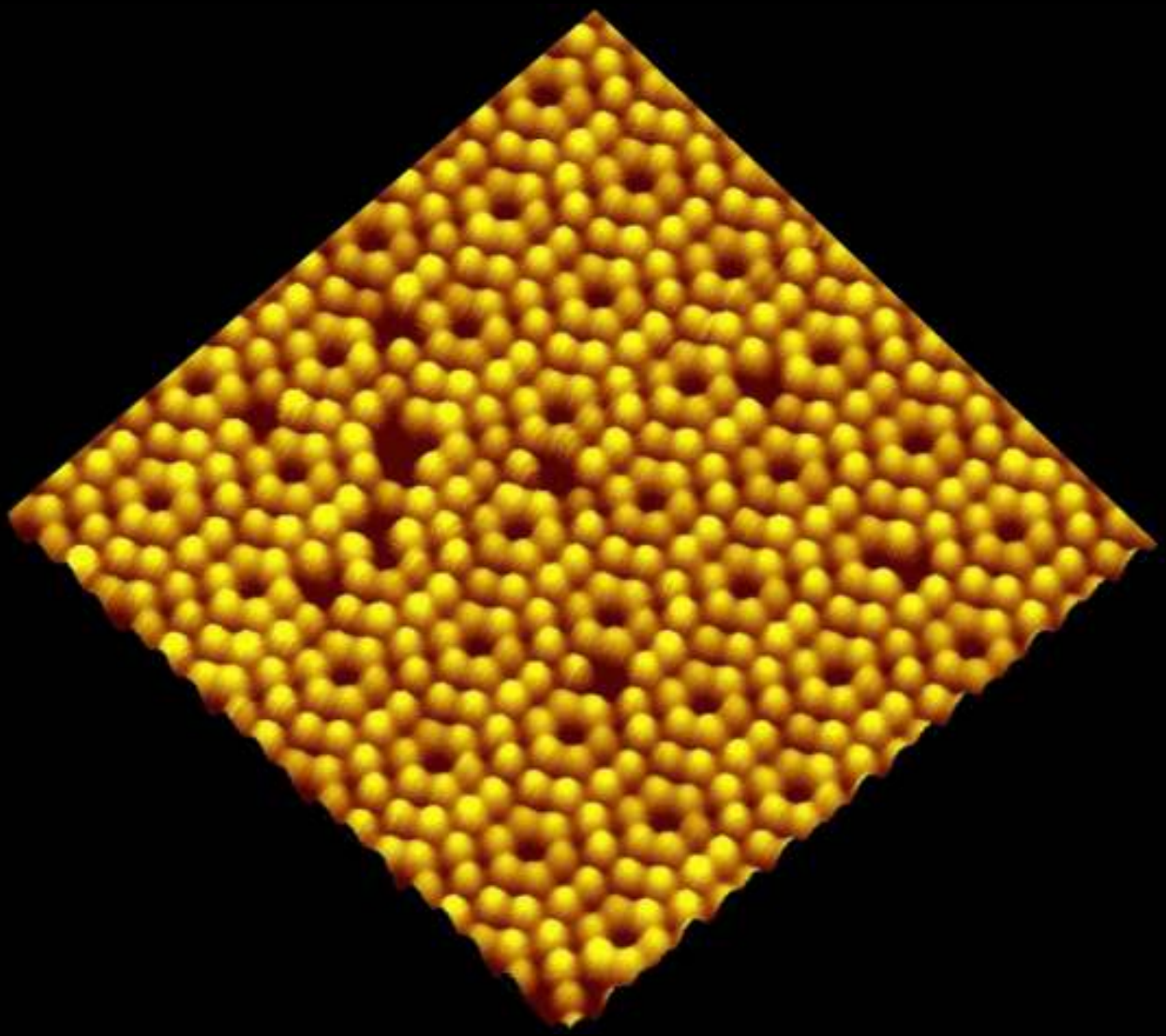
Annual Report

2016-17



Indian Institute of Science Education and Research Mohali

in pursuit of knowledge

A panoramic view of the campus

Hostels at IISER Mohali

Cover art **A** 7×7 **reconstruction of the atomic surface of Si (111)** from the new STM facility.
Photo credits **Indranil Banerjee, Abhay Soman, Aditya Kanwal.**
Compiled by **Amit Kulshrestha and Purnananda Guptasarma.**
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An inner view of Academic Block 2

Contents

Preface

Ten years is a short time in the history of an institution, particularly, the first ten years. When I agreed to become the Director of IISER Mohali in June 2007, I did not know what it would take to build an institution. Coming from IIT Kanpur, I had heard so many stories about the building of IIT Kanpur and the role played by the founder Director, Dr. Kelkar, but I had no first-hand experience. Looking back, it is amazing to see how things fell in place with several people participating in institution building and supporting it from within and without. Now we have an institution called IISER Mohali; full of energy, enthusiasm and potential, and raring to go!

We have outstanding faculty members and excellent students who have entered the portals of IISER Mohali through highly competitive processes. Here I must thank the first three Chairmen, Professor P. Ramarao, Dr. R. A. Mashelkar and Professor K. K. Talwar for their able guidance in the first nine years. I am also grateful to our current Chairperson, Dr. Madhuchanda Kar, a well known oncologist. I am sure, she would guide us into research that would be of value to the society as well.

Year after year, the number of students graduating from IISER Mohali is increasing, slowly but steadily. Something special about IISERs is that the undergraduates pursue research in summer and in their final year. Some of them publish research papers with their seniors and mentors. The faculty have done well in terms of their research and have published papers that have received global attention. Drs. Lolitika Mandal and Sudip Mandal and their students published a paper in eLife that has received global attention. The paper by Dr. Mahak Sharma and her collaborators in the Journal of Cell Biology identifies how protein machinery present in cellular compartments known as lysosomes receive cargo, which they degrade and recycle for building new molecules. Dr. Yogesh Singh published a paper in Nature Physics on spin liquids. Dr. Mandip Singh has been able to get some remarkable results on laser cooling, atom chip and polarization entanglement of photons. Dr. Goutam Sheet has established a state-of-the-art STM lab with support from nanomission. He has been able to achieve atomic resolution in the solid state and has discovered tip-induced superconductivity. The work has been published in Nature Communications. The work of Dr. Samrat Mukhopadhyay, published in J. Phys. Chem. Letters, was selected for ACS Liveslides. Our archaeologist Dr. Parth Chauhan and his team have been digging in Narmada valley and elsewhere and they have discovered new Paleolithic and vertebrate fossil sites. A conference on rock art was organized by him at IISER Mohali in September 2016. Dr. Prasad has established himself as an evolutionary biologist of standing in India. He has been organizing the Great Bird Count every year. I understand that IISER Mohali has emerged as a hotspot for birds in Punjab.

When one does work of quality, recognitions follow. Many students have presented their work in national and international conferences and have received best poster awards. Divya Khatter, a 5th yr PhD student received the highly prestigious "ASCB travel award" to attend the annual conference of the American Society of Cell Biology (ASCB) held in San Francisco, USA from Dec 3 rd - Dec 7th, 2016. Karishma Bhasne, a PhD student in the lab of Dr. Samrat Mukhopadhyay was selected for an oral presentation at the Biophysical Society meeting that was held at New Orleans, USA in February 2017. Ms. Vidhika Punjani, PhD student in the lab of Dr. Santanu Pal received The Dewan Jawahar Lal Nayar Memorial prize at the 23rd National Conference on Liquid Crystals (NCLC) held at Indian Institute Of Technology (Indian School of Mines), Dhanbad, during 7-9 Dec. 2016. Jagadish P. Hazra received the most commendable poster Award at IBS 2017, held in IISER Mohali and Gayathri S. Singharaju received the Best poster award in OWLS 2016 held at TIFR, Mumbai. Kanchan Jaswal received the best poster prize at the EMBO conference on Bacterial Morphogenesis, Survival and Virulence held in Thiruvananthapuram, Kerala, from the 27th November to 1st December 2016. Richa Singh got an award for the Best oral presentation and Lata Kalra got a Best poster award in the National Ecology Conference, YETI 2017 held in Tezpur Univ. in January 2017. Dr. Ranjana Jaiswal, an institute RA, received a travel grant to carry out some work on cricket taxonomy and systematics in the Natural History of Museum, Paris. Dr. Seema Rani, a PhD student of Dr. Ramasastry received the Lilly Outstanding Thesis Award for the year 2016. Dr. Chinmoy Sarkar, the first PhD graduate in Earth and Environmental Sciences from IISER Mohali has received the prestigious Fulbright-Kalam Post-Doctoral Fellowship to work with Professor Guenther in University of California, Irvine, USA. This list is only illustrative of the accomplishments of our students.

Dr. Ramasastry received the Young Scientist award in Chemical Frontiers Meeting held in Goa in August 2016. He has also received the Thieme Chemistry Journal Award 2017. Dr. Mahak Sharma received the "SERB Women Excellence Award" from the Department of Science and Technology, which includes a research grant of Rs.5.00 lakh per annum for a period of 3 years. Dr. Vinayak Sinha received the NASI-SCOPUS Young Scientist award for his work in the area of Earth, oceanographic and environmental studies. Dr. Goutam Sheet received the Swarnajayanti Fellowship from the Department of Science and Technology. Dr. Anu Sabhlok got the Fulbright Nehru Academic and Professional Excellence Fellowship and she will be spending a sabbatical year in the US. Professor Sudesh Kaur Khanduja, after retirement from IISER Mohali stays on as INSA Senior Scientist. She has been elected Fellow of the World Academy of Sciences, Trieste, Italy. Professor Somdatta Sinha also retired from IISER Mohali, but stays on as a Visiting Professor. She has received a prestigious visiting research Fellowship from the Peter Walls Institute of Advanced Study of the University of British Columbia, Canada. Professor R Gadagkar, Professor at the Indian Institute of Science, Bengaluru and an Honorary Professor at IISER Mohali has been elected Fellow of the American Academy of Arts and Sciences.

In addition to publishing research papers, some of our colleagues have been able to publish books and monographs. Dr. Santanu Pal published a book on Liquid Crystal Dimers. Professor H L Vasudeva, a visiting Professor with us until recently, has published a book on Elements of Hilbert Spaces and Operator Theory. The proceedings of "The first workshop on Beyond Standard Model Physics" held at IISER Mohali in April 2016 is coming out as a special issue of Pramana, a Journal of Physics. Our colleagues have organized several national and international conferences. One of the largest events was the meeting of the Indian Biophysical Society held in the campus in March 2017. More than 400 people attended the meeting that lasted for 4 days. Dr. Kausik Chattopadhyay and colleagues organized the 11th international symposium on Cell surface macromolecules during February 24-28, 2017. Drs. Mahender Singh and Krishnendu Gongopadhyay organized a Discussion Meeting on Topology and Groups. They have received a huge grant from the Department of Science and Technology for collaboration with Russian mathematicians.

Dr. Visakhi, our Librarian and her colleagues hosted the 6th International Library and Information Professionals Summit (I-LIPS 2017) during April 6-8, 2017. All the Directors of IISERs converged at IISER Mohali on February 25, 2017 and shared their experience in building the different IISERs. Shri K K Sharma, the Secretary, Higher Education sat through the proceedings the whole day. We hope to publish the proceedings soon so that the lessons learned can be of use to others. While it is too early to talk about national and global ranking of IISERs, the fact remains that four IISERs came within the top 100 institutions in the country. IISER Mohali was ranked 52.

What is unique about the IISERs is that they have built a global brand name in a span of 10 years. In chemistry, the IISERs collectively are ahead of the Indian Institute of Science Bangalore and the IITs and CSIR laboratories as reflected in the recent Nature Index. To become an institute of global importance, global outreach is essential. We have had several outstanding scholars from all over the world visit us. Professor Richard N. Zare from Stanford University was one of them. Professor Shiv Grewal from National Institute of Health, Bethesda, USA was another. The latter is also an adjunct professor at IISER Mohali. As a part of the MHRD initiative, we have organized two GIAN workshops. The one on "Cognition: an interdisciplinary perspective" was organised by Dr. Samarjit Bhattacharya and Prof. Somdatta Sinha along with Prof. Mriganka Sur from MIT as a resource person. We have signed MOUs with Saitama University, Japan and Cardiff University, UK.

The Directors of IISERs are about to visit France to explore the possibilities of collaboration with their Ecole Normale Superiorie. Although the logo of the institute says, "In pursuit of knowledge", we are conscious of the need to convert knowledge into wealth. Some of our colleagues have filed national and international patents. The Board of Governors have approved an IPR policy that is progressive and it would facilitate our joining hands with industry. We have set up a Technology based Business Incubator under the DST's and MHRD's guidance and with the help of the Government of India. Shri Rakesh Sharma will join us as the CEO of the TBI on July 1, 2017. Our neighbour Indian School of Business is an important partner in this endeavour. Our Chairperson

has congratulated the institute for keeping the campus clean. I am grateful to the students and the rest of the community for their contribution in making IISER Mohali a part of Swachh Bharat.

Our students organised the annual cultural event "Insomnia 2017" on a grand scale. The highlight of the event was the performance by Guthrie Govan, the world renowned guitarist. IISER Mohali has a vibrant set of student clubs that are well supported by the institute. These clubs have participated in and won multiple competitions. Our dance team has won many accolades. Classical Dance group Malhar won the Chandigarh round of MTV Coy6 and went to the zonal round at Mumbai. The Bhangra group has won multiple competitions. The IISER Mohali Quiz Club, A Brighter lamp has established itself as a strong group in the quizzing circles. Because of their efforts, IISER Mohali was able to host the prestigious TATA Crucible quiz this year. All the clubs came together and organised a month-long series of events during August 2016 designed to help the incoming batch of BS-MS students adjust to life at IISER Mohali. A movie making workshop was conducted by the National Award winning directors Nirmal Chander and Reena Mohan and National Award winning photographer Sonu Singh. As part of this workshop, our students have made five short movies that have been greatly appreciated by professional movie makers.

The sports activity at IISER Mohali have developed very well. Our sports teams performed very well in Inter IISER sports meet held at IISER Kolkata. The Badminton men, women and mixed double teams were winners. Our lawn Tennis men's team were also winners. Our students won gold in Shot-Putt and Long Jump. They were runners up in many sports including football and Kho-Kho. Yoga classes are being held regularly on campus. We were a proud part of the world Yoga day celebrations led by the Prime Minister at Chandigarh last year. We have established a state of the art Gym facility at IISER Mohali. YATN (Youth's Attempt To Nurture) organised a three day camp for 80 under-privileged kids in collaboration with the Make A Difference organisation. We are proud of our alumni. The Board of Governors have approved setting up of an Alumni association.

While it is too early to talk about the accomplishments of our alumni, I can share the good news that Asif Equbal and Sumit Mittal of 2008 batch, who graduated with a Masters in 2013, have completed their PhD degrees from Denmark and Germany, respectively. Rishi Raj Trivedi of the pioneer (2007) batch has completed his PhD degree programme from the University of Wisconsin, Madison, Wisconsin a few days ago. He also earned a PhD minor in Business and a graduate certificate in Entrepreneurial Management. Some of our doctoral graduates have already become faculty members in some of the academic institutes in different parts of the country. What is particularly worth mentioning is the fact that two of them have become faculty members in IISER Berhampur. One of them, Dr. Bodhisatta Nandy received the INSPIRE faculty fellowship earlier and has recently been awarded the Young Scientist Medal from the Indian National Science Academy, New Delhi. IISER Mohali is an active member of the Chandigarh Region Innovation and Knowledge Cluster (CRIKC). We have signed an MOU with the Semiconductor Laboratory, Mohali. Several distinguished visitors gave Public Lectures during the year. Training the trainers is an important task in the hands of enlightened faculty. Professor Arvind, Coordinator, Outreach has been active in interacting with the Punjab Government and organizing workshops for the teachers in the region. He has also been responsible for reaching out to a large number of students and colleagues from the region and from far off places. In addition to hosting a large number of summer interns coming through the Academies, IISER Mohali from its inception has been organizing summer programmes for undergraduates. This year also, we have about 50 such interns working with our faculty in the campus. We hosted a workshop for students from North East.

IISER Mohali is about to start its decennial celebrations. While it is important for us to celebrate what we have accomplished in the last ten years, it is equally important to take stock of things and review the progress made thus far. In addition to review of each department, an appraisal of the institute as a whole was undertaken through a committee appointed by the Board of Governors. A curriculum review committee with Professor Kapil Paranjape as the Chairman has been appointed by the Senate and we hope to have its report soon. The Department of Earth and Environmental Sciences is keen to start a major in the subject. The Department of Humanities and Social Sciences is keen to start a Masters Programme in Science, Environment and Society. To grow further, IISER Mohali needs money, money in large quantity, to build buildings and to improve the infrastructure. Contributions

to IISER Mohali will receive tax exemption under Section 35 of the income tax Act of India. I hope all of you will come forward and contribute liberally in cash or kind to the growth of IISER Mohali.

N. Sathyamurthy
Director, IISER Mohali

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4 Administration

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5.1 Faculty Members

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   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

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Inorganic chemistry

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Statistical Mechanics

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Quadratic forms, Central simple algebras and related structures

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

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Condensed Matter Theory: Correlated electron systems, disordered systems

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

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Algebraic Geometry

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Hematopoiesis, Cardiogenesis and Molecular pathways in stem and progenitor cell development in Drosophila

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

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

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

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

51. **Santanu Kumar Pal** (Associate Professor, Chemistry)
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Algebraic Geometry

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

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

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Theoretical High Energy Physics

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

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

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

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

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

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

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

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

64. **Pranab Sardar** (Assistant Professor, Mathematics)
Geometric Group Theory

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

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

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

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

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

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

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

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

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

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

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

76. **Somdatta Sinha** (Professor, Biology) - *superannuated October 31, 2016*
Mathematical & Computational Biology

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

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

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

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

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

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

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

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

85. **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. **Anil Kumar** (Professor, Physics)	*NMR Spectroscopy*
4. **N. Mukunda** (Professor, Physics)	*Theoretical Physics*
5. **I. B. S. Passi** (Professor, Mathematics)	*Algebra*
6. **T. Ramasami** (Professor, Chemical Sciences)	*Chemistry*
7. **Ashok Sahni** (Professor, Earth & Environmental Sciences)	*Earth Sciences*

5.3 Visiting Faculty

1. **Sudesh Kaur Khanduja**	INSA Senior Scientist, Mathematics
2. **Shobha Madan**	Visiting Faculty, Mathematics
3. **Meera Nanda**	Visiting Faculty, History & Philosophy of Science
4. **Somdatta Sinha**	Visiting Faculty, Biology

5.4 Adjunct Faculty

1. **Paramvir Singh Ahuja** (Biotechnology) - *deceased January 2017*	Former Director General, CSIR
2. **Praveen Chaddah** (Physics)	Former Director, UGC-DAE consortium for scientific Research
3. **Amitabha Chattopadhyay** (Biology)	Professor, CCMB, Hyderabad
4. **Shiv Grewal** (Biology)	Distinguished Investigator, NIH, USA
5. **Amitabh Joshi** (Biology)	Professor, JNCASR, Bangalore
6. **Jayant Udgaonkar** (Biology)	Senior Professor, NCBS Bangalore

5.5 INSPIRE Faculty Fellows

1. **Bimalendu Adhikari**	Chemistry
2. **Anoop Ambili** - *till March 20, 2017*	Earth & Environmental Sciences
3. **Anandam Banerjee**	Mathematics
4. **Vishal Bhardawaj**	Physics
5. **Satyajit Guin**	Mathematics
6. **Debrina Jana**	Chemistry
7. **Kinjal Lochan**	Physics
8. **Smriti Mahajan**	Physics
9. **Manimala Mitra** - *till January 22, 2017*	Physics
10. **Lakshmi Narayanan** - *till December 22, 2016*	Earth & Environmental Sciences
11. **Ketan Patel** - *till May 04, 2016*	Physics
12. **Monika Sharma**	Chemistry
13. **Sudhanshu Shekhar** - *till August 10, 2016*	Mathematics
14. **Divya Srivastava** - *till January 05, 2017*	Physics

6 Events : 2016-17

6.1 Meetings of Institute Bodies

During 2016–17, various administrative bodies of the Institute met for deliberations.

Board of Governors Meetings	24^{th} meeting of the Board of Governors	23/05/2016
	25^{st} meeting of the Board of Governors	05/10/2016
	26^{nd} meeting of the Board of Governors	21/12/2016
	27^{rd} meeting of the Board of Governors	18/03/2017
Finance Committee Meetings	20^{th} meeting of the Finance Committee	23/05/2016
	21^{th} meeting of the Finance Committee	05/10/2016
	22^{th} meeting of the Finance Committee	21/12/2016
	23^{th} meeting of the Finance Committee	18/03/2017
Academic Senate Meetings	21^{th} meeting of the Academic Senate	17/05/2016
	22^{th} meeting of the Academic Senate	27/07/2016
	23^{th} meeting of the Academic Senate	19/12/2016
	24^{th} meeting of the Academic Senate	04/01/2017

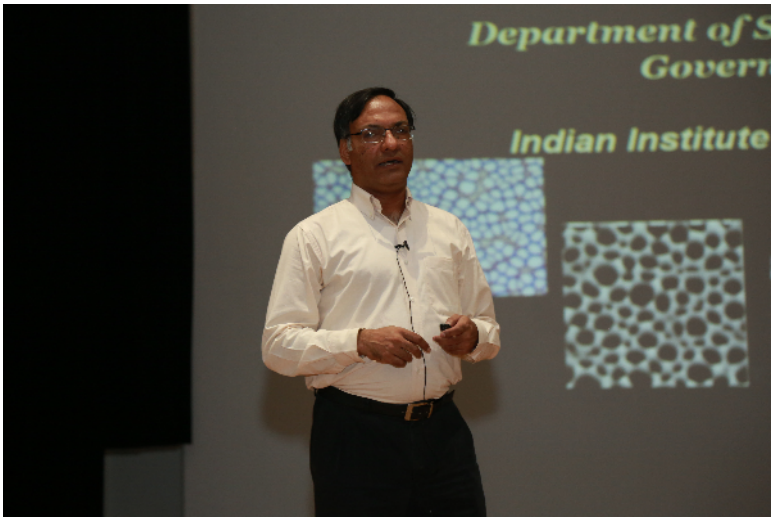
6.2 Convocation 2016

The Fifth Convocation of IISER Mohali was held on May 24, 2016, with Professor T. V. Ramakrishnan, FRS as the Chief Guest. Chairman Board of Governors, presided over the function. In this convocation 82 graduates

received their BS-MS degrees, 9 received MS degrees and 25 received PhD degrees. The Director congratulated the graduates and also the award and medal winners.

Chief Guest, Professor T. V. Ramakrishnan delivering the convocation address

6.3 Foundation Day 2016

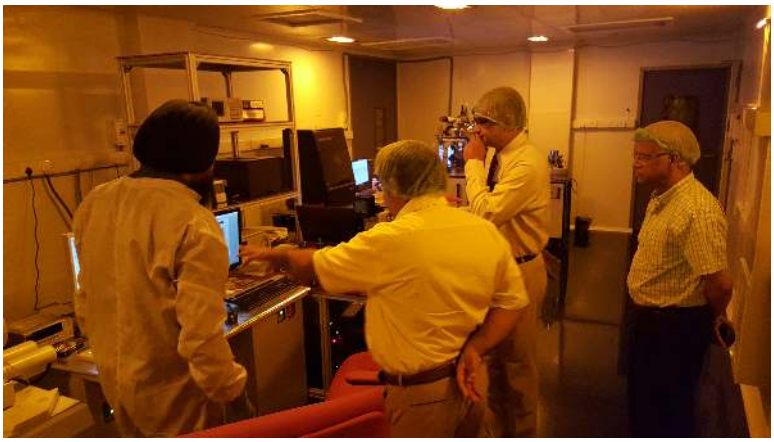


Professor Ashutosh Sharma delivering the Foundation Day lecture

The IISER Mohali Foundation Day was celebrated on September 27, 2016. The Foundation Day Lecture was delivered by Professor Ashutosh Sharma, Secretary of the Department of Science and Technology, Government of India. Professor N. Sathyamurthy, Director, gave the welcome address and spoke about the achievements of the institute during the year that had passed since the last Foundation Day. Professor Purnananda Guptasarma, Dean R&D, introduced Professor Sharma, who spoke most engagingly about the delights of doing research in the areas of nanomaterials and nanostructuring from both materials and engineering perspectives. Professor Sharma has been a doyen of engineering at the Indian Institute of Technology, Kanpur, for long years, before taking up the

assignment of heading the Department of Science and Technology. At IISER, on the Foundation Day, Professor Sharma met with faculty members, toured various facilities in different departments and also inaugurated the brand new STM facility set up under the DST's nano-mission scheme, spearheaded by physics faculty member, Dr. Goutam Sheet.

6.4 Technology Day 2016



Professor Indranil Manna, Director, IIT Kanpur, touring the IISER SEM & Clean Room facility

Technology Day (May 11) was celebrated at IISER Mohali on May 12. Professor Indranil Manna, Director, IIT Kanpur, delivered the Technology Day Lecture. His talk was titled 'Material Science & Engineering & Technology: Challenges and Opportunities'. He was introduced by the Dean, R&D. A tour of all the central facilities at IISER Mohali was organized, with the pride of place being occupied by the new Animal House. Professor Manna also visited the materials analysis clean room and SEM facility, AFM facility and STM facility, and was shown around by Dr. Ananth Venkatesan and Dr. Goutam Sheet.

6.5 Independence Day 2016

Seventieth Independence Day of the Nation was celebrated in the Institute on August 15, 2016. Director hoisted the flag and gave away prizes for best academic performance in various academic programs. Following students

received awards.

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

- Yash Rana (MS15042)
- Shridhar Vinayak (MS15060)
- Kabeer Manali Rahul (MS15152)

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 2015-16

2014 Batch

- Jorawar Singh (MS14085)
- Shruti Jose Maliakal (MS14024)

2013 Batch : Biology

- Saloni Rose (MS13019)
- Sweetu Susan Sunny (MS13033)
- Akshai J. Kurup (MS13034)
- Jayesh Kumar S. (MS13054)
- Sumanjit Datta (MS13111)

2013 Batch : Chemistry

- Amala Raj (MS13068)
- Vaishnavi S. (MS13132)

2013 Batch : Mathematics

- Simran S. Tinani (MS13010)

2013 Batch : Physics

- Anjaly S. Menon (MS13151)

2012 Batch : Biology

- Tejasvinee Atul Mody (MS12023)
- Megha Treesa Tom (MS12064)
- Himanshi Balecha (MS12097)
- Sandra U. S. (MS12107)

2012 Batch : Chemistry

- Neeru Mittal (MS12080)
- Aayush (MS12087)

2012 Batch : Mathematics

- Karthika Rajeev (MS12095)

2012 Batch : Physics

- Vishnu P. K. (MS12127)

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

2015 Batch : Chemistry

- Ipsita Pani (MP15002)

- Kaustav Chatterjee (MP15012)

2015 Batch : Mathematics

- Damanvir Singh Binner (MP15017)

2014 Batch : Chemistry

- Surbhi Garg (MP14004)

2014 Batch : Mathematics

- Jitendra Rathore (MP14009)

6.6 Republic Day 2017

Sixty-eighth Republic Day of the Nation was celebrated in the Institute on January 26, 2017. 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 2016-17.

- Shradha Sapru (MS16034)
- Rahul Ramesh (MS16036)
- Satvik Singh (MS16075)
- Satyapan Munshi (MS16099)

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 2016-17

2015 Batch

- Anjana R Kammath (MS15021)
- Kabeer Manali Rahul (MS15152)

2014 Batch : Biology

- Leesa Joyce (MS14108)
- Dandavate Vaishnavi Ravindra (MS14081)
- Archi Sharma (MS14157)

2014 Batch : Chemistry

- Shiny Maity (MS14113)

2014 Batch : Mathematics

- Ramandeep Singh Arora (MS14030)

2014 Batch : Physics

- Meenakshi (MS14077)

2013 Batch : Biology

- Saloni Rose (MS13019)
- Jayesh Kumar S. (MS13054)
- Sumanjit Datta (MS13111)

2013 Batch : Chemistry

- Amala Raj (MS13068)

2013 Batch : Mathematics

- Simran S. Tinani (MS13010)

2013 Batch : Physics

- Kriti Kamal Gupta (MS13022)
- Shreyan Ganguly (MS13149)

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

2016 Batch : Biology

- Prateek Chawla (MP16018)

2016 Batch : Chemistry

- Pankaj Seliya (MP16005)

2016 Batch : Physics

- Vassu Doomra (MP16016)

2015 Batch : Chemistry

- Kaustav (Chatterjee MP15012)

6.7 Outreach Activities

The outreach committee organised two specific activities aimed at improving teaching at the high school level under the Rashtriya Avishkar Abhiyaan. High school teachers from around the state were invited for a brain storming session to identify difficult-to-teach topics in the syllabus and come up with improved ways of teaching those topics. In the follow-up program, teachers demonstrated the models, games and other educational aids that they had come up with to teach these difficult topics. These ideas were then compiled in the form of a booklet. The outreach committee also organised the Foundation Day programs for school children. Students from 5th to 12th standards of schools around the Tricity and the rest of Punjab were invited to an open house on Foundation Day of IISER Mohali. The students took part in various science related activities such as quiz, treasure hunt etc. IISER Mohali students also put up a large number of science demonstrations for the school students.

6.8 Teachers' Day

Teachers' Day was celebrated in the Institute on September 05, 2016. On this occasion Dr. Mandip Singh (Department of Physical Sciences) was awarded the The Best Teacher Award for the year 2016.

6.9 Students Activities

Moods of INSOMNIA 2017

Our students organised the annual cultural event INSOMNIA 2017 on a grand scale. The highlight of the event was the performance by Guthrie Govan, the world renowned guitarist.

IISER Mohali has a vibrant set of student clubs that are well supported by the institute. These clubs have participated in and won multiple competitions. Our dance team has won many accolades. Classical Dance group Malhar won the Chandigarh round of MTV Coy6 and went to the zonal round at Mumbai. The Bhangra group has won multiple competitions.

The IISER Mohali Quiz Club, A Brighter lamp has established itself as a strong group in the quizzing circles. Because of their efforts, IISER Mohali was able to host the prestigious TATA Crucible quiz this year.

All the clubs came together and organised a month-long series of events during August 2016 designed to help the incoming batch of BS-MS students adjust to life at IISER Mohali.

We organised a movie making workshop which was taught by the National Award winning directors Nirmal Chander, Reena Mohan and National Award winning photographer Sonu Singh. As part of this workshop, our students have made five short movies that have been greatly appreciated by professional movie makers.

The sports activities at IISER Mohali have developed very well. Our sports teams performed very well in Inter IISER sports meet held at IISER Kolkata. The Badminton men's, women's and mixed doubles teams were winners. Our lawn Tennis men's team were winners. We also won gold in Shot-Putt and Long Jump. We were runners up in many sports including football and Kho-Kho.

Yoga classes are being held regularly on campus. We were a proud part of the world Yoga day celebrations led by the Prime Minister at Chandigarh last year. We have established a state of the art Gym facility at IISER Mohali.

YATN (Youth's Attempt To Nurture) organised a three-day camp for 80 underprivileged kids in collaboration with Make A Difference organisation.

7 Scientific Meetings/Conferences/Workshops

7.1 11th International Symposium on Cell Surface Macromolecules

The meeting was attended by around 100 scientists/researchers. The symposium covered seminars on the research activities conducted by a galaxy of internationally reputed scientists in the area of cell surface macromolecules, with special emphasis to work on cell membranes, membrane lipids, receptors and cell surface glycoconjugates. Altogether, there were 33 invited lectures delivered by renowned scientists in the field, with 15 invited lectures delivered by the scientists from USA, UK, Italy, Belgium, Portugal and Japan. Apart from the invited lectures, there were 6 short presentations from the young researchers. The topics of the main symposium covered multiple fascinating aspects of the cell surface, membrane biology, glycobiology etc. There were specific sessions dedicated on the following topics: (a) cell surface macromolecules: infection, immunity and disease, (b) membrane organization, (c) membrane biophysics, (d) glycobiology, (e) GPCRs, (f) neurobiology/neurochemistry, (g) microbial cell surface etc. Apart from the invited lectures and the short presentations, there was poster session where a large number of young researchers/investigators/post-docs/PhD students presented their work. Dr. Kausik Chattopadhyay was the local organizer of this symposium.

Participants of International Symposium on Cell Surface Macromolecules

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

Pheno1@IISERM is intended to be the first of a Bi-annual series of workshop on Beyond Standard Model physics to be organized by the recently nucleated particle Physics Group at IISER Mohali. Over 50 active researchers in BSM phenomenology and related areas from all over India and even overseas gathered as participants in PHENO1@IISERM. Besides review talks on theoretical and experimental Neutrino physics participants enjoyed a rich menu of topical presentations including : A claim of first evidence of the discovery of right handed currents at LHC, Neutrino symmetries and Phenomenology, Flavour physics, Higgs physics and searches, Supersymmetry phenomenology and searches as well as Susy GUTs, Hierarchy problem and higher dimension physics, Dark Matter physics, Left-Right Models and inflationary cosmology in Susy GUTs. The overwhelming sentiment expressed by all participants was that the meeting had achieved a very high standard of relevance and timeliness as well as excellence of research work and review presentations. Active and enthusiastic discussion was the order of the day for the entire duration of the workshop. Many of the participants were regulars at the well established WHEPP

series of workshops and found the atmosphere, professionalism and activity comparable in every way to them. Professor C. S. Aulakh, Dr. Manimala Mitra and Dr. Ketan Patel were the local organizers of this workshop.

7.3 The Annual Symposium of the Indian Biophysical Society 2017

The Annual Symposium of the Indian Biophysical Society (IBS 2017) was held between 22 nd March and 25 th March 2017. The symposium began with a preconference lecture series on biophysical techniques, held on 22 nd March, with lectures by scientists representing manufacturers of bioanalytical equipment. The main symposium began on 23 rd March 2017 with a lecture on structure determnation by cryoelectron microscopy by Dr Sriram Subramaniam (NIH, Bethesda, USA). The symposium featured 40 talks, approximately 350 registered participants, and 200 posters presentations covering all subjects and areas in molecular, cellular, organellar, organismal biophysics. A refreshing feature of the symposium was that talks began at 8:00 in the morning and continued until nearly midnight with high levels of attendance. Nearly twenty awards were given for best posters, including seven named poster awards. The symposium was organized by Professor Purnananda Guptasarma, Secretary, Indian Biophysical Society.

Participants of Annual Symposium of the Indian Biophysical Society 2017

7.4 Cognition - An Interdisciplinary Perspective : GIAN course

The awareness of physical and social circumstances, the ability to have thoughts and feelings, to express these things to our fellow humans by language, and to store such information in memory - are considered to be the most intriguing functions of the human brain. "Cognition" is related to all mental abilities for the processing of information, applying knowledge and changing preferences. Cognition is an abstract property of advanced living organisms. Therefore, it is mostly studied by investigating various properties of the brain or studying the abstract mind at symbolic and sub-symbolic levels. These processes can be concrete or abstract, natural or artificial, conscious or unconscious. Due to these reasons, the properties of cognition are analyzed and approached from many different angles, using diverse approaches, in a variety of scientific, engineering, and social science

disciplines. Thus, Cognitive Science is an interdisciplinary subject that deals with the study of the mind and its processes. It is a highly fascinating subject having applications in medicine and engineering. The aim of this course was to expose participants to the basic ingredients that go into the study of Cognition and also to initiate the notion of interdisciplinary nature of science in general and the high interdisciplinarity of the subject "Cognition" in particular, and its applicability to society. Dr. Samarjit Bhattacharyya and Professor Somdatta Sinha were the local organizers of this Global Initiative for Academic Networks (GIAN) course under the aegis of MHRD.

7.5 RSC and IISER Mohali Salters' Chemistry Camp

The Indian Institute of Science Education and Research Mohali, the Salters' Institute , the Royal Society of Chemistry, UK and the State Institute of Science Education, Punjab, conducted a three day camp from July 25-27 , 2017 for school students and teachers at IISER Mohali. The camp was inaugurated by Director IISER Mohali and a special talk by Prof. Bhasin from Punjab University set the stage for the participants to immerse themselves in the world of chemistry experiments.Day long chemistry experiments designed by the Salters' Institute were the highlight for the teacher and student participants who were drawn from schools in Punjab and tricity area. Evneing sessions were very interactive and several interesting and innovative chemistry demonstrations were performed by IISER student volunteers to enthuse the school students. The camp was very ably supported by the lab attendants of the Chemistry department. Outreach Committee IISER Mohali , Salters' Institute, Royal Society of Chemistry and State Institution of Science Education Punjab were the joint organizers of this camp.

7.6 Discussion Meeting on Topology and Groups

The aim of the meeting was to bring together young Indian mathematicians working in topology and groups, and hold discussions on several aspects of these areas with their Russian counterparts. The discussion provided up to date information of current themes of research in topology with interaction to group theory. The meeting was also part of the ongoing DST-RSF project at IISER Mohali coordinated by Dr. Mahender Singh. He along with Dr. Krishnendu Gongopadhyay were the local organizers of this discussion meeting.

8 Research Activities

8.1 Department of Biological Sciences

8.1.1 Summary of the research work

Kavita Babu : We study how neurons communicate with each other and with muscles to allow for normal behaviour. Our studies use the model organism Caenorhabditis elegans to study aspectd of molecular and behavioural neurobiology.

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

Samarjit Bhattacharyya : *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 : Metabolism provides energy, creates building blocks, and regulates macromolecular processes. Integrating metabolism with stress responses provides the robustness enabling bacterial survival in diverse nutrient and toxic environments, key to their success as commensals, pathogens and industrial workhorses. My research group at IISER-Mohali is interested in studying metabolic pathways and stress responses in bacteria, with a special focus on Long chain fatty acid (LCFA) metabolism. LCFAs are carboxylic acids with a long unbranched aliphatic chain and are used as a tremendous source of metabolic energy by several bacteria including many important pathogens. My lab has utilized high-throughput quantitative genetic screening methodology (response of every gene deletion strain, $\approx$ 4000 strains, to chemical perturbations), to identify novel players and stress response pathways in LCFA metabolism in E. coli. The information extracted from genetic screening has been integrated with knowledge from other high-throughput datasets to generate testable hypotheses about the function of novel genes, the process they participate in, and interconnections between pathways. Such an analysis has provided us lead in two different directions. First, since LCFA metabolism generates oxidative stress in E. coli, we are investigating the reason for LCFA-mediated oxidative stress and the strategies employed by bacteria to avoid damage during LCFA metabolism. Second, we have identified a putative transcriptional regulator to be required for successful growth of the bacteria on LCFAs. We are performing a detailed characterization of the predicted regulator in order to understand its role in LCFA metabolism. Our work intends to provide new information regarding LCFA metabolism that can be harnessed to design novel antibacterials.

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

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

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

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

Purnananda Guptasarma : Our 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://wwwguptasarmalab.in.

Manjari Jain : My research interests falls under the domain of animal behaviour and sensory ecology. In this, I am primarily interested in understanding the ecology and evolution of acoustic communication in animals. My research team is carrying out different projects examining the variation and complexity in acoustic communication in different animal systems, the numerous constraints on communication and how animals deal with these. I am also interested in developing acoustics as a reliable and non-invasive tool to monitor biodiversity.

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

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

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

Shravan Kumar Mishra : *Ubiquitin-related proteins as regulators of pre-mRNA splicing*: Ubiquitin and ubiquitin-related proteins (collectively referred to as UBL) are highly conserved, generally small (around 10 kilo-daltons), which share a typical ubiquitin fold, but with distinct surfaces. Using a set of dedicated enzymes, an UBL attaches through covalent linkages to its substrates, which can be proteins, lipids or RNAs. The reversible nature of this modification makes UBLs key regulators of multiple processes in the cell. A majority of UBLs also interact non-covalently with proteins harboring specific UBL-binding domains. Thus, UBLs determine fates of their targets either through proteasomal destruction or confer functional diversity to factors in DNA repair, recombination, ribosome biogenesis or cellular signaling in non-proteolytic ways.

UBLs are also reported to act on spliceosome – the catalyst that removes non-coding parts (introns) and joins protein-coding parts (exons) from pre-messenger RNAs by the process of pre-mRNA splicing. Alternative splicing by spliceosomes increases cellular repertoire of mRNAs to fulfill the demand of a larger proteome from a lower gene number. UBLs modify spliceosomal proteins, but outcome of such modifications is not clear. The composition of spliceosomes core is well studied, but regulatory factors that ensure constitutive and alternative splicing of nearly every gene in humans are not known.

We study RNA splicing regulation by UBL and UBL-associated proteins. As UBLs and the process of RNA splicing are conserved from yeast to humans, we use approaches of molecular cell biology, biochemistry and genetics in yeasts Saccharomyces cerevisiae and Schizosaccharomyces pombe.

We have reported that the UBL Hub1 modifies spliceosomes by a non-covalent association with HIND-containing splicing factors and plays a critical role in alternative RNA splicing and splicing of pre-mRNAs containing introns with weak splice sites. We recently identified a UBL-containing protein Sde2 as a component of spliceosomes. Sde2 is activated after cleavage of the UBL by specific deubiquitinating enzymes and promotes splicing in an intron-specific manner. Our findings show that selected introns in pre-mRNAs are recognized differently by the spliceosome, wherein UBL-like regulatory factors become crucial for certain splicing events.

Arunika Mukhopadhaya : Our overall research interest is focused towards elucidating the immunomodulatory role of porin family of outer membrane proteins from the Gram negative pathogenic bacteria. In our recent studies, we have shown how Vibrio cholerae porin OmpU exerts immunomodulatory functions in the context of host innate immune system. Toward exploring the implications of V. cholerae OmpU for the host-pathogen interaction processes, we have also shown that OmpU can trigger a unique 'caspase-independent programmed cell death' upon translocating to the host cell mitochondria. Our studies have provided novel insights regarding OmpU functionalities in the context of host-pathogen interaction processes and immunity.

Samrat Mukhopadhyay : Intrinsically disordered proteins (IDPs) belong to the emerging class of proteins that do not undergo autonomous folding into a well-defined 3D structure and challenge the tenets of traditional sequence-structure-function paradigm. They are associated with a number of important cellular functions and devastating human diseases such as Alzheimer's and Parkinson's diseases. My laboratory at IISER Mohali is involved in addressing some important and intriguing structural, dynamical, nanoscopic and mechanistic issues of amyloid-forming IDPs. The astonishing structural plasticity of IDPs allows them to sample a wide range of structural ensembles under the physiological condition due to the presence of large-amplitude internal backbone dynamics. In order to directly map the backbone torsional mobility in the Ramachandran's phi-psi dihedral angle space, we have chosen an amyloid-forming IDP, namely alpha-synuclein, aggregation of which is implicated in Parkinson's disease. Using highly-sensitive and site-specific picosecond time-resolved fluorescence depolarization measurements, we have been able to discern the intrinsic torsional mobility under the native condition. Recently, using femtosecond and picosecond time-resolved fluorescence spectroscopy, in conjunction with all-atom MD simulations, we have embarked upon studies aimed at unraveling the crucial role of hydration water in amyloid formation. Our new results illuminate the intriguing behavior of water in IDPs and reveal a novel mechanistic aspect of aberrant protein aggregation implicated in Alzheimer's and Parkinson's diseases.

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

mechanistic aspect of enzyme promiscuity and study their evolution. In addition to this, we will study the role of protein dynamics in ligand-protein interactions. Many enzymes are multi-domain proteins. In order to investigate domain-domain structural roles, we are developing tools for tertiary structure prediction of multi-domain proteins employing our recently developed method TASSER (Threading ASSembly and Refinement).

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

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

Sharvan Sehrawat : In a quest to clear infections of various kinds, the host responds to the insults and induces activation of cells of innate and adaptive immune system that eradicate invading pathogens. At the same time regulatory mechanisms also operate to curtail excessive inflammatory responses. The timely induction of an adaptive immune response and its maintenance in the memory phase forms the basis of lasting protective immunity against infectious diseases and provides clue for successful vaccination. After receiving help from CD4 T cells, pathogen-specific CD8 T cells are appropriately activated to control the spread of intracellular pathogens such as viruses. Animal models are used to investigate host-pathogen interaction. Employing various molecular and immunological approaches, we try to understand the host-pathogen interaction. We are also putting efforts in developing novel animal models to study immunity and immunopathology during viral infections.

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

molecules were similar with respect to their composition and position suggesting indeed this same peptide could serve as an immunodominant peptide for Uda. Generation of these reagents already put us in a good steed to jumpstart the project.

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

Mahak Sharma : With the advent of compartmentalization in eukaryotic organisms, it became crucial for proteins to traffic to their correct location within the cell and therefore need for constant communication between these compartments. Membrane trafficking is a fundamental process that mediates the directed movement of proteins and membranes between different cellular locations, critical for the proper functioning of all eukaryotic cells. The primary research interests of my laboratory focus on studying the molecular mechanisms regulating the membrane trafficking events inside the cells.

Somdatta Sinha : The focus of our theoretical research is to understand the logic and design of biological processes at different spatio-temporal scales. Towards this we have continued our research in the areas of - a) Protein structure-function analysis; b) collective behaviour of cells in tissues; and c) Population dynamics. We have used a combined computational approach, integrating the coarse-grained graph theoretic and fine-grained molecular dynamics simulaton methods, to analyse protein structures at different length scales to understand the 'small' allosteric conformational changes that underlie new or improved functional properties in proteins of similar three-dimensional structures. We have studied bacterial Lipase A and its thermostable mutants, and Anthranilate Synthase, and elucidated their structural features and mechanism of regulation for functional alterations. The role of connectivity in arrays of bursting and silent Hodgkin-Huxley neurons in transmission of nerve impulse was studied. We analyzed a population dynamic model of multi-stage organisms, such as, holometabolous insects, that incorporated the inter-stage specific feedback loops in regulation of population size of the adult insects. We showed that the model was capable of showing diversity in population dynamics at different density dependent parameters related to mortality and fecundity. These results are matched with population dynamic data from laboratory.

Ram Yadav : We study the transcriptional gene networks involved in cell fate specification in plants. We use tools of genetics, genomics, live-imaging and systems biology to build and test the role of individual transcription factors (TFs) in a regulatory network. Recent findings from our lab suggests that in plants the broadly expressed TFs regulate the cell type specific TFs. In addition, we have discovered the role of auxin in stem cell differentiation in shoot.

8.1.2 Visits of faculty members

- **Rachna Chaba**
  - visited *Indian Institute of Science, Bangalore (India)* during March 15-16, 2017.
- **Manjari Jain**
  - visited *Department of Environmental Studies, University of Delhi (India)* on May 16, 2016.
  - visited *Department of Environmental Studies, University of Delhi (India)* during September 6-9, 2016.
  - visited *DAV College; Department of Biotechnology, Chandigarh (India)* on March 29, 2017.
- **Samrat Mukhopadhyay**
  - visited *Indian Institute of Science, Bangalore* in February 2017.
  - visited *Jadavpur University, Kolkata* in February 2017.
  - visited *Indian Institute of Technology, Guwahati* in December 2016.
  - visited *National Centre For Biological Sciences, Bangalore* in November 2016.
- **Mahak Sharma**
  - visited *Indian Institute of Science, Bangalore (India)* during June 30 - July 01, 2016.
- **Somdatta Sinha**
  - visited *Mathematical Institute and Zoology Department, Oxford University (United Kingdom)* during June 27 - 30, 2016.
  - visited *Biochemistry Department, University of Cambridge (United Kingdom)* on July 4, 2016.
  - visited *Department of Biology & Mathematics, University of York (United Kingdom)* during July 7-8, 2016.
- **Ram Yadav**
  - visited *Defense Institute of High Altitude Research, Leh (India)* during September 12-16, 2016.
  - visited *G.H.G. Khalsa College, Gurusar Sadhar, Ludhiana (India)* on December 25, 2016.
  - visited *IISER Pune, (India)* during January 4-6, 2017.

8.1.3 Talks delivered

1. Aastha Sindhwani: Cell Biology of Infection: National Center for Biological Sciences, Bangalore: October 13-14, 2016
2. Anand K. Bachhawat: Bose Institute, Kolkata, Oct 2016
3. Anand K. Bachhawat: CIAB Mohali, Dec 2016
4. Anand K. Bachhawat: IMTECH, Chandigarh, April 2017
5. K. Babu : From Memory to Movement: The role of CREB1/CRH-1 in Animal Behaviour : WT-DBT Review meeting, New Delhi, India : Jan 4-5, 2017
6. K. Babu : G-protein coupled receptors in C. elegans circuits : IISER, Mohali, India : Feb 24-27, 2017
7. K. Babu : Role of Cell adhesion molecules at the C. elegans NMJ : IBRO/APRC School at Punjab University, India : Dec 19, 2016

8. K. Babu : Role of Cell adhesion molecules at the C. elegans NMJ : IISc, Bangalore, India : Feb 9, 2017
9. K. Babu : The role of CREB1/CRH-1 in C. elegans circuits : MRC Centre for Developmental Neurobiology, KCL, London, UK : Mar 15, 2017
10. K. Babu : Understanding circuit function in C. elegans : TIFR, Mumbai, India : Feb 10-11, 2017
11. Karishma Bhasne: A Tale of Two Amyloidogenic Intrinsically Disordered Proteins: Interplay of Tau and α-Synuclein: Biophysical Society meeting, 15th February 2017, New Orleans, USA
12. Mahak Sharma: INSPIRE Internship Camp: IISER Mohali: January 2016
13. Mahak Sharma: Ishan Vikas Program: IISER Mohali: July 2015
14. Mahak Sharma: Ishan Vikas Program: IISER Mohali: June 2016
15. Mahak Sharma: Science Communication Workshop: September 2015
16. Mahak Sharma: Story of CRISPR: State Institute of Science Education Panjab: December 2016
17. Manjari Jain: Understanding the causes and consequences of animal behaviour: DAV College Chandigarh: Lecture Series, National Academy of Science India: March 29, 2017
18. Nitika Kandhari : A Complex Network Approach to Understand the Structural Basis of Thermostability in Lipase A : IBS at IISER Mohali : 23-25 Mar, 2017 (Poster)
19. Nitika Kandhari : A Complex Network Approach to Understand the Structural Basis of Thermostability in Lipase A : Central University of Himachal Pradesh, Dharamshala : 12-14 Nov, 2016 (Poster)
20. Nitika Kandhari : A Complex Network Approach to Understand the Structural Basis of Thermostability in Lipase A : University of Milan, Italy : 30 Nov-2 Dec, 2016 (Poster)
21. Rachna Chaba: A genome-wide screen in E. coli reveals the role of ubiquinone as a key antioxidant in long chain fatty acid metabolism: Meeting on Molecular Microbiology: CDFD, Hyderabad, India: February 10-11, 2017
22. Rachna Chaba: Discussion meeting on Mathematical Modeling of Natural and Synthetic Genetic Networks under the National Network on Mathematical and Computational Biology (NNMCB): Lonavala, India: March 18-19, 2017
23. Rachna Chaba: Systems-level analysis reveals a differential requirement of electron transport chain for the metabolism of non-fermentable carbon sources: Molecular Biophysics Unit, Indian Institute of Science, Bangalore, India: March 16, 2017
24. Rachna Chaba: Ubiquinone combats oxidative stress generated by long chain fatty acid degradation in E. coli: EMBO conference on Bacterial Morphogenesis, Survival and Virulence- Regulation in 4D: Trivandrum, India: November 27 to December 1, 2016
25. Ram Yadav: How plants grow and form organs : G.H.G. Khalsa College : December 2016
26. Ram Yadav: Identification of transcriptional gene network using genomic approaches : IISER Pune : January 5, 2017
27. Ram Yadav: Understanding the inner functioning of Arabidopsis shoot apical meristem : Defense Institute for High Altitude Research : September 15, 2016
28. Ranjana Jaiswara: Eavesdropping on insect sounds for biodiversity studies: International conference on Entomology: Punjabi University, Patiala: December 3, 2016

29. Ravinder Gulia: Role of ubiquitination in group I metabotropic glutamate receptor (mGluR) trafficking: 11th International Symposium on Cell Surface Macromolecules: IISER Mohali: February 27, 2017.

30. Ravinder Gulia: Role of ubiquitination in group I metabotropic glutamate receptor (mGluR) trafficking: International Brain Research Organization meeting: Panjab University: December 21, 2016.

31. Richa Singh: Spacing pattern and acoustic interactions in a field cricket species: YETI 2017: Tezpur University, Assam: January 4, 2017

32. Samarjit Bhattacharyya: How do we learn and remember? The rapidly changing brain: NASI lecture: DAV college, Chandigarh: March 29, 2017

33. Samarjit Bhattacharyya: Metabotropic glutamate receptor trafficking: Ins and outs: Annual meeting of Indian Academy of Neurosciences (IAN): National Brain Research Centre (NBRC), Gurgaon, India: October 19, 2016.

34. Samarjit Bhattacharyya: Metabotropic glutamate receptor trafficking: Ins and outs: Annual meeting of Society for Neurochemistry, India (SNCI): Centre for Cellular & Molecular Biology (CCMB), Hyderabad, India: December 9, 2016.

35. Arunika Mukhopadhyaya: Department of Biochemistry, PGIMER Chandigarh, India: March 25, 2017.

36. Arunika Mukhopadhyaya: Annual Symposium of Society of Biological Chemists (SBC) India, Mysuru, India: November 2017.

37. Shravan Kumar Mishra : Ubiquitin-like processing of the conserved splicing regulator SDE2 promotes telomeric silencing and genome stability : Institute of Life Sciences (ILS) Bhubaneswar : July 21, 2017

38. Somdatta Sinha : Designs of regulation and pathway dynamics : In Modelling Natural and Synthetic Biological Networks by NNMCB (IISER Pune and CSIR-NCL, Pune) at Karla Caves, Maharashtra : March 18, 2017

39. Somdatta Sinha : Does Sensitivity analysis validate biological relevance of parameters in model development ? Revisiting two basic malaria models : : Chern Institute, Nankai University (P R China) : Nov 1, 2016

40. Somdatta Sinha : Dynamics of multi-cell systems : Mathematical Institute, Oxford (UK) : June 27, 2016

41. Somdatta Sinha : Host-Pathogen Interaction - Results from HIV-1 genome analysis : In Discussion meeting on Mathematical Models of Infection, Inflammation and Immunity at IISc, Bangalore : April 6, 2017

42. Somdatta Sinha : Introduction to quantitative aspects of neural processes : GIAN at IISER Mohali : Aug 17, 2016

43. Somdatta Sinha : Introduction to quantitative aspects of neural processes : GIAN at IISER Mohali : Aug 17, 2016

44. Somdatta Sinha : Large scale genome analysis of the Human Immunodeficiency Virus HIV-1 : In National Symposium cum Workshop on Bioinformatics for Medical Research:, Biomedical Informatics Centre, PGIMER, Chandigarh : January 20, 2017

45. Somdatta Sinha : Malaria in India: Mathemaical modelling data visualization and analysis : EMBO-Global Exchange Lecture Course at the Center for Research in Medical Entomology (CRME), Madurai : Feb 3, 2017

46. Somdatta Sinha : Modelling Infectious Diseases - from genomes to populations : York University, York (UK) : July 6, 2016

47. Somdatta Sinha : Modelling Infectious Diseases - from genomes to populations : Zoology Department, Univ of Oxford (UK) : June 30, 2016

48. Somdatta Sinha : Propagation of extrinsic perturbation in multi-step biochemical pathway : In BIOMAT 2016 at Chern Institute, Nankai University (P R China) : Nov 3, 2016

49. Somdatta Sinha : Protein strudture-function analysis - a network approach : Biochemistry Department, Univ of Cambridge (UK) : July 4, 2016

50. Y. Dahiya : The Role of the CREB-1 homolog, CRH-1, in associative learning in Caenorhabditis elegans : C. elegans topics meeting on Neuronal development, Synaptic function and behavior in Nagoya, Japan : July 27-30, 2016

8.1.4 Conferences attended by researchers

- **Kavita Babu**
  - C. elegans topics meeting on Neuronal development, Synaptic function and behavior in Nagoya, Japan
  - 11th Indian Society of Cell Surface Macromolecules meeting (ISCSM), IISER, Mohali, India
  - Indian C. elegans PI meeting at TIFR, Mumbai, India.
  - The Royal Society Meeting on the Evolution and Function of Neuropetides, held at Chicheley hall, UK
- **Samarjit Bhattacharyya**
  - Samarjit Bhattacharyya: Annual meeting of Indian Academy of Neurosciences (IAN) : October 19 - 21, 2016: Indian Academy of Neurosciences (IAN): National Brain Research Centre (NBRC), Gurgaon, India.
  - Samarjit Bhattacharyya: Annual meeting of Society for Neurochemistry, India (SNCI): December 9 - 11, 2016: Society for Neurochemistry, India (SNCI): Centre for Cellular & Molecular Biology (CCMB), Hyderabad, India.
  - Samarjit Bhattacharyya: 11th International Symposium on Cell Surface Macromolecules: IISER Mohali: February 24 - 28, 2017.
  - Ravinder Gulia: International Brain Research Organization meeting: December 14-22, 2016: Panjab University. India
  - Namrata Ramsakha: International Brain Research Organization meeting: December 14-22, 2016: Panjab University. India
  - Ravinder Gulia: 11th International Symposium on Cell Surface Macromolecules: IISER Mohali: February 24 - 28, 2017.
  - Namrata Ramsakha: 11th International Symposium on Cell Surface Macromolecules: IISER Mohali: February 24 - 28, 2017.
  - Rohan Sharma: 11th International Symposium on Cell Surface Macromolecules: IISER Mohali: February 24 - 28, 2017.
  - Prachi Ojha: 11th International Symposium on Cell Surface Macromolecules: IISER Mohali: February 24 - 28, 2017.
  - Prabhat kumar Mahato: 11th International Symposium on Cell Surface Macromolecules: IISER Mohali: February 24 - 28, 2017.
- **Rachna Chaba**
  - Rachna Chaba: EMBO conference on Bacterial Morphogenesis, Survival and Virulence- Regulation in 4D: November 27 to December 1, 2016: Trivandrum, India

- Rachna Chaba: Meeting on Molecular Microbiology: February 10-11, 2017: CDFD, Hyderabad, India
- Rachna Chaba: Discussion meeting on Mathematical Modeling of Natural and Synthetic Genetic Networks under the National Network on Mathematical and Computational Biology (NNMCB): March 18-19, 2017: Lonavala, India
- Bhupinder Singh: Meeting on Molecular Microbiology: February 10-11, 2017: CDFD, Hyderabad, India
- Bhupinder Singh: EMBO conference on Bacterial Morphogenesis, Survival and Virulence- Regulation in 4D: November 27 to December 1, 2016: Trivandrum, India
- Kanchan Jaswal: EMBO conference on Bacterial Morphogenesis, Survival and Virulence- Regulation in 4D: November 27 to December 1, 2016: Trivandrum, India

- **Kausik Chattopadhyay**
  - Kausik Chattopadhyay : 85th Annual Meeting of SBC (I) : November 21 - 24, 2016 : Society of Biological Chemists India : CSIR-CFTRI, Mysore
  - Reema Kathuria : 85th Annual Meeting of SBC (I) : November 21 - 24, 2016 : Society of Biological Chemists India : CSIR-CFTRI, Mysore

- **Purnananda Guptasarma**
  - Arpana Kumari: Annual symposium of the Indian Biophysical Society 2017 : 22-25 March, 2017 : IISER Mohali
  - Arpana Kumari: Bioprocessing INDIA 2016 : 15-17 December, 2016 : CIAB, Mohali
  - Nitin Kishor: Targeted proteomics and big data analysis : December 2016 : NIPGR, New Delhi
  - Nitin Kishor: Biopharma School : July 2016 : Waters India head office, Bangalore
  - Nitin Kishor: Annual symposium of the Indian Biophysical Society 2017 : 22-25 March, 2017 : IISER Mohali
  - Pallavi Kaila: Annual symposium of the Indian Biophysical Society 2017 : 22-25 March, 2017 : IISER Mohali
  - Pallavi Kaila: Bioprocessing INDIA 2016 : 15-17 December, 2016 : CIAB, Mohali
  - Prince Tiwari: Annual symposium of the Indian Biophysical Society 2017 : 22-25 March, 2017 : IISER Mohali
  - Prince Tiwari: 11th international Symposium on Cell Surface Macromolecules : 24-28 February 2017 : IISER Mohali
  - Bhishem Thakur: Annual symposium of the Indian Biophysical Society 2017 : 22-25 March, 2017 : IISER Mohali
  - Arpita Mirgwani: Annual symposium of the Indian Biophysical Society 2017 : 22-25 March, 2017 : IISER Mohali

- **Manjari Jain**
  - Ranjana Jaiswara: International conference on Entomology: December 3-5, 2016: Entomological Society of India: Punjabi University, Patiala
  - Richa Singh, Lata Kalra, Soniya Yambem: Young Ecologists Talk and Interact (YETI): January 4-7, 2017: Tezpur University: Tezpur, Assam.

- **Shravan Kumar Mishra**
  - XL All India Cell Biology Conference & International Symposium: Functional Genomics & Epigenomics : November 17-19, 2016: Jiwaji University Gwalior

- Max Planck Partner Group Meeting : March 3-4, 2017 : IISER Mohali

- **Samrat Mukhopadhyay**
  - Hema Swasthi: Gordon Research Conference on Proteins: June 2017, New Hampshire, USA
  - Karishma Bhasne: Biophysical Society Meeting: February 2017, New Orleans, USA
  - Samrat Mukhopadhyay: International Symposium on Protein Folding: November 2016, NCBS Bangalore
  - Samrat Mukhopadhyay: International Conference on Perspectives in Vibrational Spectroscopy: November 2016, University of Lucknow
  - Samrat Mukhopadhyay: International Symposium on Amyloidosis: July 2016, Uppsala University, Sweden
  - Samrat Mukhopadhyay: Gordon Research Conference on Intrinsically Disordered Proteins: June 2016, Les Diablerets, Switzerland

- **Mahak Sharma**
  - Mahak Sharma: Annual American Society for Cell Biology Conference: December 03-07, 2016: ASCB: San Francisco, California (USA)
  - Divya Khatter: Annual American Society for Cell Biology Conference: December 03-07, 2016: ASCB: San Francisco, California (USA)

- **Somdatta Sinha**
  - Nitika Kandhari : Second Instructional School and pre-School on Computational Biology : May 18-31, 2016 : National Network for Mathematical and Computational Biology (NNMCB) : Indian Institute of Science (IISc) Bangalore.
  - Nitika Kandhari : National Symposium on Bioinformatics and Computational Systems Biology (NSBCSB-2016) : Nov 12-14, 2016 : Central University of Himachal Pradesh, Dharamshala (CUHP) and NNMCB : CUHP Dharamshala
  - Nitika Kandhari : 5th International Workshop on Complex Networks and their Applications : Nov 30 -Dec 2, 2016 : Italian Society for Chaos and Complexity (SICC) : University of Milan, Italy
  - Nitika Kandhari : Annual symposium of the Indian Biophysical Society : Mar 23-25, 2017 : Indian Biophysical Society : IISER Mohali
  - Nitika Kandhari : School on Mathematical BIology in Dynamics of Complex Systems-2017 programme : May 10 -25, 2017 : International Centre of Theoretical Sciences - TIFR (ICTS) : ICTS, Bangalore
  - Somdatta Sinha : MATHEMATICS & STATISTICS OF BIOLOGICAL POPULATIONS : May 23-28, 2016 : International Centre for Mathematical Sciences (ICMS), UK and Department of Science & Technology, India : Chail (HP) (ORGANISER)
  - Somdatta Sinha : Cognition: An Interdisciplinary Perspective : August 13 - 21, 2016 : GIAN (MHRD) : IISER Mohali (ORGANISER)
  - Somdatta Sinha : India Africa Health Sciences Meet : Sep 1-3, 2016 : Indian Council of Medical Research and Ministry of External Affairs, India : New Delhi
  - Somdatta Sinha : ConferenceÂ onÂ NonlinearÂ SystemsÂ &Â Dynamics 2016 : Dec 16 - 18, 2016 : NCNSD and IISER Kolkata : IISER Kolkata, Kalyani
  - Somdatta Sinha : BIOMAT 2016 : Oct 30 - Nov 5, 2016 : Chern Institute of Mathematics, Nankai University and BIOMAT Consortium, Brazil : Nankai University, China

- **Ram Yadav**
  - 6th Ramalingaswami Fellows Meeting : January 4-6, 2017 : Department of Biotechnology : IISER Pune

8.1.5 Publications : Biological Sciences

[1] S. Pathania, G. Bagler, and **P. Ahuja**, "Differential network analysis reveals evolutionary complexity in secondary metabolism of rauvolfia serpentina over catharanthus roseus," *Frontiers in Plant Science*, vol. 7, 2016.

[2] **A. Kaur**, **R. Gautam**, **R. Srivastava**, **A. Chandel**, **A. Kumar**, S. Karthikeyan, and **A. K. Bachhawat**, "Chac2, an enzyme for slow turnover of cytosolic glutathione," *Journal of Biological Chemistry*, vol. 292, no. 2, pp. 638–651, 2017.

[3] A. A. Deshpande, M. Bhatia, S. Laxman, and **A. K. Bachhawat**, "Thiol trapping and metabolic redistribution of sulfur metabolites enable cells to overcome cysteine overload," *Microbial Cell*, vol. 4, no. 4, p. 112, 2017.

[4] **M. Zulkifli** and **A. K. Bachhawat**, "Identification of residues critical for proton-coupled glutathione translocation in the yeast glutathione transporter, hgt1p," *Biochemical Journal*, vol. 474, no. 11, pp. 1807–1821, 2017.

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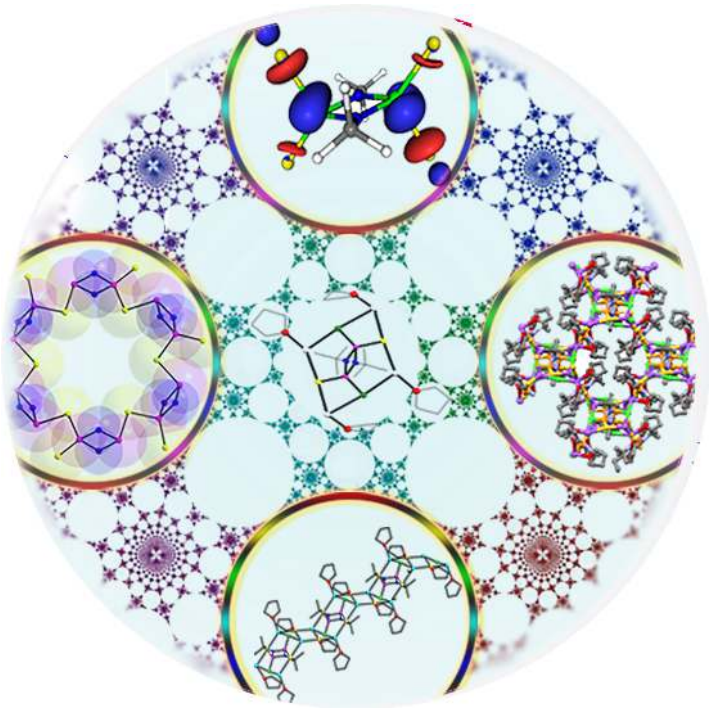

8.2 Department of Chemical Sciences

8.2.1 Summary of the research work

Bimalendu Adhikari : Our research is quite interdisciplinary in nature ranging from noncovalent polymer, responsive soft materials, smart nanomaterials, dynamic combinatorial library. Supramolecular polymer is a current topic of great interest because of its extraordinary properties including high degree of internal order, reversibility, stimuli-responsiveness and promising applications. In order to be able to compete with conventional covalent polymers and/or mimic the function of biopolymers, control over structure/conformation, properties and function of the supramolecular polymer is required. We plan to develop strategy for dynamic control over structure of supramolecular polymer with interesting properties and functions where we will look into various aspects including supramolecular polymerization, pathway complexity, self-repairing capacity, dynamic behavior, far-from-equilibrated assembly, mimicking functionality of biopolymer in man-made supramolecular polymer. In this regard, various stimuli including light, redox, ultrasound, pH will be applied making responsive dynamic materials and supramolecular transformations. Biomolecule based responsive materials will be tested for bio-application through proper biocompatible nano-structurization. We are also interested in dynamic peptide libraries for discovery of nanomaterial binding ligands to expand the opportunities for nanomaterials in areas where they are to be interfaced with biological systems. Here we would like to develop conceptually a new methodology for bio-functionalization of nanomaterials where binding ligands are self-constructive. Students will be exposed to learn techniques ranging from organic synthesis, supramolecular synthesis, physical characterization of various materials through spectroscopic (UV/Vis, Fluorescence, etc.) as well as morphological (AFM, TEM, SEM) studies and functionality studie

R. Vijaya Anand : Our research is focussed primarily on the development of novel organic transformations using N-heterocyclic carbene (NHC) or bis(dialkylamino)cyclopropenylidene (BAC) as an organocatalyst. Recently, we have developed an efficient method for the synthesis of diarylated arylketones through BAC catalyzed 1,6-

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

S. Arulananda Babu : In recent years, the directing group-aided or directing group-free C-H activation/functionalization is considered as a powerful method for installing functional groups in a given organic molecule. While a given organic molecule contains various C-H bonds, one of the main objectives of Babu group's research is to accomplish regio- and stereoselective (site-selective) functionalization of C-H bonds of small organic molecules. Babu's group is actively working on various projects pertaining to directing group-aided or directing group-free C-H activation and functionalization.

Given that there is a demand for finding new synthetic drug molecules for treating Malaria disease one of the objectives of Babu group's research is to synthesize novel oxindoles/trioxanes/tetraoxanes and identify their antimalarial activity.

Babu's group is also actively involved in using the Barbier-/Reformatksy-type reactions for the stereoselective synthesis of aliphatic chains, carbo- and heterocyclic frameworks related to natural products and bioactive synthetic molecules e.g. isoindolinones, lactones, lactams, amino alcohols, unnatural amino acid derivatives, etc. Additionally, a part of Babu group's research programme is also focused to develop synthetic transformations catalysed by magnetically supported catalysts.

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

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

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

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

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

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

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

Arijit Kumar De : Ultrafast non-linear spectroscopy, fluorescence microscopy, optical trapping.

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

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

Debrina Jana : Our *Chemistry at nanoscale* group is interdisciplinary in nature. Group's research work mainly consists of synthesis of materials in nanoscale, understanding their property, application study and lab scale device fabrication. Research directions are given below.

Mesoporous materials and nanocomposites: Nanoscale structural proficiencies and high surface area in mesoporous materials combined with fascinating properties of metal nanoparticles make the nanocomposites suitable candidate towards adsorption, separation, drug delivery, sensors, catalysis, energy storage and conversion. In this context, we are interested in fabricating hybrid mesoporous oxides with ordered mesopores having different symmetrical pore arrangement by cooperative assembly as well as liquid crystal templating approach. The next

challenge is to incorporate/generate metal nanoparticle, graphene dot, semiconductor quantum dots, perovskite etc. inside the mesoporous channel keeping in view the goal to fabricate advanced materials for optoelectronic, catalytic applications.

Controlled synthesis and assembly of metallic nanoparticles: Control on the size, shape and composition of the nanoparticles allow tuning their property and thus it is crucial to customize nanoparticles according to their arena of application. We are interested in designing strategies for synthesizing nanomaterials (monometallic, bimetallic including core-shell and alloy) with controllable size, shape and composition and assembling them in a predetermined fashion. Our aim is to construct functional nanocomposites and use them towards heterogeneous catalysis, bio-sensing and bio-targeting.

Estimation of optical enhancing properties of nanoparticle assemblies and coupled nanostructures: Surface enhanced Raman spectroscopy is capable of probing single molecule and plasmonic nanoparticles are required to provide the electromagnetic field needed for this enhancement. This enhancement can be tailored by the shape, size and composition as well as the extent of coupling between the nanoparticles. We would like to examine the effect on SERS enhancement by different shaped coupled nanostructures and nanoparticle assemblies.

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

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

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

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

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

Sripada S. V. Rama Sastry :

- Development of novel stereoselective reactions with relevance to both medicinal and natural products chemistry with particular emphasis on: Brønsted and Lewis acid catalysis, Asymmetric organocatalysis (involving small molecule amines and amino acids, and phosphines).
- Development of green and sustainable synthetic chemistry, and atom economic reactions.
- Application of aforementioned strategies in the total synthesis of architecturally complex N, O-containing bioactive natural products and pharmaceutically important compounds.

N. Sathyamurthy : Our research group is involved in studying the structural motifs underlying chemical structures, particularly in atomic and molecular clusters, noncovalent interactions, nonadiabatic interactions and geometric phase, symmetry and pattern formation in flowers and temporal oscillations in flowering.

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

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

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

Monika Sharma : I am primarily interested in application of molecular dynamics to understand the structure, function and dynamics of biomolecules and their complexes. I am currently investigating mRNA complexation by STAR family of transcriptional regulators via conventional and enhanced MD simulations. In addition, I am also interested in understanding the conformational aspects of substrate binding and transport in yeast and human transporters. This modeling work is in collaboration with experimentalists as structure of such transporters are not known.

Sanjay Singh : Our research contributions address a few fundamental questions in the broad area of inorganic & organometallic chemistry. Our work has direct consequences on aspects of organometallic chemistry of group 13 and 14 elements from main group and late transition elements (Co, Ni, Cu, Pd, Hg, Au, Zn and Hg) in the form of their N-heterocyclic carbene (NHC) and cyclic Alkyl Amino Carbene (cAAC) adducts, their reaction chemistry

and applications in molecular transformations. In addition to this, we are also actively involved in exploring synthesis and properties of inorganic macrocycles and cryptands. These systems are based on phosp(III)azane units, boron-nitrogen (boraamidinate) linked pyridinophanes, aluminum/nitrogen (aluminum amide) linked calixarenes.

Chemistry of group 13 elements: Synthesis of low coordinated hydroborenium and cationic organoaluminum complexes: A series of highly reactive cationic species of boron as hydroborenium ions (three coordinated boron cations) and aluminum congeners with weakly coordinating anions have been isolated. These borenium and cationic aluminum complexes, due to the positive charge and coordination number of three at the B or Al centre, exhibit very strong Lewis acid character and have been useful in promoting/catalyzing organic reactions mediated by Lewis acids. These cationic boron and aluminum complexes have respectively been used in 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 are major theme of this research area. Study of host-guest complexation and use of cations, anions or neutral molecules as templates in assembling macrocycles and cryptands are important aspect of our work. The mixed valent P(III/V) and sulfur based hexameric macrocycle $[(S{=})P(\mu\text{-}NtBu)_2P(\mu\text{-}Se)]_6$ is an important discovery in this area. Similarly, the boraamidinate bridged pyridinophanes and the aluminum congeners are very novel molecules including the aluminum anchored calixarenes.

Sugumar Venkataramani :

- *Computational studies on heterocyclic radicals*: Radicals are very important species, showing tremendous potential in the astrochemical, biological and organic synthesis. However, heterocyclic radicals have been investigated scarcely. Their fundamental importance in understanding the role of heteroatoms in the stability, electronic structural and reactivity aspects are vital in tuning the radical properties and utilising them for various applications. In this regard, we have investigated the computational studies on various heterocyclic radicals with mono- and diheteroatoms containing systems. Their structural, stability and reactivity aspects have been investigated computationally.

- *Photoswitchable functional molecular materials*: Azobenzenes are well-known for their characteristic cis-trans isomerization reactions under the influence of light. Upon tethering multiple azobenzenes to a core moiety, a light induced void can be created reversibly, which can be utilized in transport of small molecules. In this regard, various azobenzenes including heteroarenes have been chosen and their linkages have been varied to screen the cavity size. Their photoswitching studies have been performed using UV-Vis and NMR spectroscopic techniques. Further exploration towards the molecular transporter applications are underway."

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

8.2.2 Visits of faculty members

- **Bimalendu Adhikari**
  - visited *Chiba University, Chiba (Japan)* during December 17-28, 2016.
- **Sripada S. V. Rama Sastry**

- visited *CSIR-National Chemical Laboratory, Pune (India)* during April 15-16, 2016.
- visited *Indian Institute of Technology Kanpur (India)* during July 15-16, 2016.
- visited *Oxford University (UK)* on September 12, 2016.
- visited *Southampton University (UK)* on September 13, 2016.
- visited *Indian Institute of Technology Bombay (India)* during December 11-16 2016.
- visited *Indian Institute of Science Education and Research Kolkata (India)* during January 27-28, 2017.
- visited *University of Hyderabad (India)* during February 22-24, 2017.
- visited *PEC University of Technology, Chandigarh (India)* on March 4, 2017.
- visited *Guru Nanak Dev University (GNDU) Amritsar (India)* during March 6-7, 2017.
- visited *Chemical Frontiers-2016' held at the Planet Hollywood hotel, Goa (India)* during August 26-28, 2016.

- **N. Sathyamurthy**
  - visited *National Institute of Science Education and Research, Bhubaneswar (India)* on September 6, 2016.
  - visited *Indian Institute of Technology Kanpur (India)* on September 24, 2016.
  - visited *HansRaj Mahila Maha Vidyalaya, Jalandhar (India)* on January 16, 2017.
  - visited *Guru Nanak Dev University, Amritsar (India)* on January 27, 2017.
  - visited *Indian Institute of Technology Roorkee (India)* on February 28, 2017.

8.2.3 Talks delivered

1. A. K. De: Femtosecond Laser Techniques: From Spectroscopy to Imaging, National Workshop on Laser Techniques, Guru Jambheshwar University of Science & Technology, Hisar, 2 March, 2017.
2. A. K. De: Generalized Lorentz-Mie theory of optical Kerr effect in femtosecond laser trapping of dielectric nanoparticles, IIT Kanpur, India; 7 December, 2016.
3. A. K. De: Optical Trapping with Femtosecond Laser, National Workshop on Laser Techniques, Guru Jambheshwar University of Science & Technology, Hisar, 2 March, 2017.
4. A. K. De: Probing picosecond solvation dynamics using fluorescent probes with very small Stokes shift, IISER Bhopal, India; 22 January, 2017.
5. A. K. De: Probing Ultrafast Energy Transfer Dynamics: From Ensemble to Single Particle Measurements, BITS-Pilani, India; 18 March, 2017.
6. A. K. De: Quantum Secrets of Light-Harvesting: From Photosynthetic Systems to Solar Cells, Dept. of Chemistry, GGDSD College, Chandigarh, India; 16 March, 2017.
7. A. K. De: Ultrafast Energy Transfer Dynamics within Aggregates: From Ensemble Measurements to Single Particle Probing, BARC, Mumbai, India; 26 November 2016.
8. Anita Devi: Theoretical investigation on optical Kerr effect in femtosecond laser trapping of dielectric microspheres, International Conference on Light and Light-based Technologies,Tezpur University, Napaam, 26 November 2016.
9. B. Gopalakrishnan: Pd(II)-Catalyzed sp3 C-H Arylation Followed by Ring-Opening of Cyclopropanecarboxamides: Inter IISER Chemistry Meet: IISER Bhopal: 20-22 January 2017.

10. Bimalendu Adhikari: Folding-unfolding of supramolecular polymer by light: MRS-Japan 2016: December 19-22, 2016

11. D. Jana: Small can do wonder- Exploiting plasmonic metal nanoparticles: NIT Sikkim: April 12, 2016

12. Monika Sharma: In silico design of conformational shift to control protein binding specificity: IISER Mohali: Mar 17, 2016.

13. Monika Sharma: Molecular Dynamics Simulations of Biomolecules: Significance in Life Sciences: National Conference Dept. of Zoology, Dev Samaj College for Women, Ferozepur: Mar 7, 2017

14. N. Sathyamurthy: Atoms and Molecules in a Confined Environment, 5th Modeling of Chemical and Biological (Re)activity, Central Leather Research Institute, Chennai: Feb. 18-21, 2017

15. N. Sathyamurthy: Atoms and Molecules in a Confined Environment, Foundation Day Lecture, Institute of Nano Science and Technology Mohali: March 2, 2017

16. N. Sathyamurthy: Atoms and molecules in a confined environment, HansRaj Mahila Maha Vidyalaya, Jalandhar, January 16, 2017

17. N. Sathyamurthy: CV Raman Medal (2016) Lecture on Atoms and Molecules in a Confined Environment: Annual General Meeting of the Indian National Science Academy, National Institute of Science Education and Research, Bhubaneswar: December 29, 2016

18. N. Sathyamurthy: Institution building: the story of IISERs, Biology Day Lecture, Indian Institute of Technology Kanpur: September 24, 2016

19. N. Sathyamurthy: Institution building: the story of IISERs, Foundation Day Lecture, National Institute of Science Education and Research, Bhubaneswar: September 6, 2016

20. N. Sathyamurthy: Institution Building: the Story of IISERs, Indian Institute of Science Education and Research Mohali: February 25, 2017

21. N. Sathyamurthy: Non-adiabatic interactions and geometric phase, Guru Nanak Dev University, Amritsar: January 27, 2017

22. N. Sathyamurthy: Non-adiabatic interactions and geometric phase, Recent Advances in Multi-Electron Theory, Goa: February 9-12, 2017

23. N. Sathyamurthy: Non-adiabatic interactions and geometric phase, Recent Advances in Theoretical Chemistry, Indian Institute of Science, Bangalore: July 8-9, 2016

24. N. Sathyamurthy: Symmetry and Pattern Formation in Flowers, DST-Max-Planck-Partner group meeting, Indian Institute of Science Education and Research Mohali, March 4, 2017

25. N. Sathyamurthy: Symmetry and Pattern Formation in Flowers, Science Day, Indian Institute of Technology Roorkee: February 28, 2017

26. S. A. Babu: Stereoselectie C-C bond construction via Pd-catalyzed C-H Activation reactions: New Paradigm in Chemical Sciences: Synthetic and Analytical Perspectives - 2017: Department of Chemistry, Punjabi University: 9-10 February 2017.

27. Sanjay Singh : Borenium Ions and the Aluminum Congeners: New Catalysts from Main Group Elements : New Paradigm in Chemical Sciences: Synthetic and Analytical Perspectives (NPICS: SAP-2017) : February 09-10, 2017 : Department of Chemistry, Punjabi University, Patiala

28. Sanjay Singh : Inorganic Macrocycles Based on Main Group Elements : Chandigarh Science Congress (CHASCON-2017) : March 10, 2017 : Department of Chemistry, Panjab University, Chandigarh

29. Sanjay Singh : Reactive yet Bottle-able Hydrido borenium Cations and Their Aluminum Congeners : Inter-IISER Chemistry Meet (IICM 2017) : January 20-22, 2017 : Department of Chemistry : IISER Bhopal

8.2.4 Conferences attended by researchers

- **Bimalendu Adhikari**
  - Bimalendu Adhikari: 26th Annual Meeting of MRS-Japan-2016: Dec19-22, 2016 : MRS-J: Yokohama, Japan
- **R. Vijaya Anand**
  - R. Vijaya Anand: "Celebrating 25 Years of Harmony with Organic Chemistry" (CYHOC-2016): December 16-17, 2019: Thiruvananthapuram
  - R. Vijaya Anand: "53rd Annual Convention of Chemists": December 27-29, 2016: Indian Chemical Society: GITAM University, Visakhapatnam
  - R. Vijaya Anand: "Molecules and Materials Technology": March 21-26, 2017: NIT, Kurukshetra
- **S. Arulananda Babu**
  - B. Gopalakrishnan: Inter IISER Chemistry Meet: 20-22 January 2017: IISER Bhopal.
  - R.Sankar: XII J-NOST: 24-27 November 2016: CSIR-Central Drug Research Institute, Lucknow.
  - S. A. Babu: New Paradigm in Chemical Sciences: Synthetic and Analytical Perspectives - 2017: 9-10 February 2017: Department of Chemistry, Punjabi University.
- **Arijit Kumar De**
  - 17th International Congress on Photosynthesis Research, Maastricht, the Netherlands; 7-12 August 2016.
  - DAE-BRNS Theme Meeting on Ultrafast Science-2016 (UFS-2016), BARC, Mumbai, India; 24-26 November 2016.
  - Photonics-2016, IIT Kanpur, India; 4-8 December, 2016.
  - Inter IISER Chemistry Meet 2017 (IICM 2017), IISER Bhopal, India; 20-22 January, 2017.
  - North West Meeting on Spectroscopy, Structure and Dynamics, BITS-Pilani, India; 18-19 March, 2017.
- **Sripada S. V. Rama Sastry**
  - Seema Dhiman: RSC-CRSI symposium held at the Punjab University, Chandigarh: February 5-7, 2016
  - Rajendra and Siddheshwar: CRSI symposium held at the Punjab University, Chandigarh: February 5-7, 2016
- **N. Sathyamurthy**
  - Recent Advances in Theoretical Chemistry: July 8-9, 2016: Indian Institute of Science, Bangalore
  - Theoretical Chemistry Symposium: December 14-16, 2016: University of Hyderabad
  - Recent Advances in Multi-Electron Theory: February 9-12, 2017: Indian Institute of Technology Bombay in Goa
  - 5th Modeling of Chemical and Biological (Re)activity: Feb. 18-21, 2017: Central Leather Research Institute, Chennai
- **Monika Sharma**
  - Advanced Techniques in Protein Design and Engineering: Mar 15-19, 2016: CPSDE: IISER Mohali
  - Young Investigators' Meeting (YIM): Feb 28- Mar 2, 2016: Indian BioScience: Manesar, Gurugram.

- **Sanjay Singh**
  - Deependra Bawari, Sanjay Singh : The International Symposium on Macrocyclic and Supramolecular Chemistry (ISMSC 2016) : July 10-14, 2016 : Seoul, South Korea : Sulfur Bridged Inorganic Macrocycle, [(μ-S)P(μ-NtBu)2P(=S)]6 and Stable Biradicaloid Dianion [S-P(Cl)(μ-NtBu)]22-
  - Bhupendra Goswami, Sanjay Singh : Inter-IISER Chemistry Meet (IICM 2017) : January 20-22, 2017 : Department of Chemistry : IISER Bhopal : Cyclic (Alkyl) (Amino) Carbene (CAACs)-Mercury(II) Adducts and Their and Their Role as Catalysts in Intermolecular Hydroamination Reactions
- **Sugumar Venkataramani**
  - Mayank Saraswat (PhD student): Electronic Structure of Coordination Complexes" (WESCC): May 16-18, 2016 : Dept. Of Chemistry: IIT Bombay
  - Mayank Saraswat (PhD student): Modern Trends in Molecular Magnets" (MTMM): May 19-21, 2016: Dept. Of Chemistry: IIT Bombay (Presented Poster: "A theoretical investigation on the unimoleculer decomposition pathways of pyridine and pyridine-N-oxide radicals)
  - Mayank Saraswat (PhD student): Workshop on "Introduction to GAUSSIAN: Theory and Practice" : January 15-20, 2017: Hotel Radisson Blu : New Delhi
  - Chitranjan Sah (PhD student): Electronic Structure of Coordination Complexes" (WESCC): May 16-18, 2016 : Dept. Of Chemistry: IIT Bombay
  - Chitranjan Sah (PhD student): Modern Trends in Molecular Magnets" (MTMM): May 19-21, 2016: Dept. Of Chemistry: IIT Bombay (Presented Poster: "Bimolecular reactions of pyridine and pyridine-N-oxide radicals with small molecules")
  - Surbhi Grewal (PhD student):ICOS 21 21st International Conference on Organic Synthesis: DECEMBER 11-16, 2016 : IUPAC : IIT Bombay, Mumbai (Presented Poster: "Synthesis and photoswitching studies of triazole connected multiple azobenzene connected systems")
  - Ajit Kumar Yadav (MS student): Inter IISER Chemistry Meet (IICM) Jan 20-22, 2017 : Dept. of Chemistry: IISER Bhopal (Presented Poster: " Electronic structure of five membered heterocyclic radicals- A Computational Study")

8.2.5 Publications : Chemical Sciences

[1] **B. Adhikari**, T. Suzuki, L. Xu, M. Yamauchi, T. Karatsu, and S. Yagai, "Photoresponsive supramolecular copolymers from diarylethene–perylene bisimide hydrogen bonded complexes," *Polymer*, 2017.

[2] M. Bhunia, P. Hota, G. Vijaykumar, **D. Adhikari**, and S. Mandal, "A highly efficient base-metal catalyst: Chemoselective reduction of imines to amines using an abnormal-NHC-Fe(0) complex," *Organometallics*, vol. 35, no. 17, pp. 2930–2937, 2016.

[3] M. Bhunia, S. Sahoo, G. Vijaykumar, **D. Adhikari**, and S. Mandal, "Cyclic (alkyl)amino carbene based iron catalyst for regioselective dimerization of terminal arylalkynes," *Organometallics*, vol. 35, no. 21, pp. 3775–3780, 2016.

[4] M. Yamauchi, N. Kanao, **B. Adhikari**, T. Karatsu, and S. Yagai, "Phototriggered supramolecular polymerization of barbituric acid rosette," *Chemistry Letters*, vol. 46, no. 1, pp. 111–114, 2016.

[5] D. D. Prabhu, K. Aratsu, M. Yamauchi, X. Lin, **B. Adhikari**, and S. Yagai, "Supramolecular polymerization of hydrogen-bonded rosettes with anthracene chromophores: regioisomeric effect on nanostructures," *Polymer Journal*, 2016.

[6] **A. Jadhav** and **R. V. Anand**, "1,6-conjugate addition of zinc alkyls to para-quinone methides in a continuous-flow microreactor," *Organic and Biomolecular Chemistry*, vol. 15, no. 1, pp. 56–60, 2017.

[7] **S. Mahesh** and **R. V. Anand**, "Cu-catalyzed hydrophosphonylation of 2-(2-enynyl) pyridines: Easy access to indolizine-containing diarylmethylphosphonates," *European Journal of Organic Chemistry*, vol. 2017, no. 19, pp. 2698–2706, 2017.

[8] P. Goswami, G. Singh, and **R. V. Anand**, "N-heterocyclic carbene catalyzed 1, 6-conjugate addition of me3si-cn to para-quinone methides and fuchsones: Access to α-arylated nitriles," *Organic Letters*, vol. 19, no. 8, pp. 1982–1985, 2017.

[9] **A. S. Jadhav** and **R. V. Anand**, "Triflic acid catalyzed 1,6-conjugate addition of thiols to p-quinone methides under continuous-flow conditions," *European Journal of Organic Chemistry*, vol. 2017, no. 25, pp. 3716–3721, 2017.

[10] **P. Arde** and **R. V. Anand**, "Expedient access to unsymmetrical triarylmethanes through n-heterocyclic carbene catalysed 1, 6-conjugate addition of 2-naphthols to para-quinone methides," *RSC Advances*, vol. 6, no. 81, pp. 77111–77115, 2016.

[11] **S. Mahesh**, **G. Kant**, and **R. V. Anand**, "$B(C_6F_5)_3$ catalysed 1,6-conjugate allylation of para-quinone methides: Expedient access to allyl diarylmethanes," *RSC Advances*, vol. 6, no. 84, pp. 80718–80722, 2016.

[12] **V. Reddy**, **A. Jadhav**, and **R. V. Anand**, "Catalyst-controlled regioselective approach to 1-aminoisoquinolines and/or 1-aminoisoindolines through aminative domino cyclization of 2-alkynylbenzonitriles," *European Journal of Organic Chemistry*, vol. 2016, no. 3, pp. 453–458, 2016.

[13] **R. Shirke**, **V. Reddy**, **R. V. Anand**, and **S. Ramasastry**, "Furans to benzofurans: Intramolecular cross-benzoin reactions catalysed by n-heterocyclic carbenes," *Synthesis (Germany)*, vol. 48, no. 12, pp. 1865–1871, 2016.

[14] **V. Rajkumar**, **S. A. Babu**, *et al.*, "Palladium (II)-promoted directing group-enabled regioselective C–H arylation of the c-3 position of 2-or 3-(aminoalkyl)-thiophene and furfurylamine derivatives," *ChemistrySelect*, vol. 1, no. 6, pp. 1207–1219, 2016.

[15] **V. Rajkumar**, **Naveen**, **S. A. Babu**, and **B. Gopalakrishnan**, "Pd (II)-catalyzed bidentate directing group-aided chemoselective acetoxylation of remote ε-C (sp^2)– H bonds in heteroaryl- aryl-based biaryl systems," *J. Org. Chem*, vol. 81, pp. 12197–12211, 2016.

[16] C. Reddy, **S. A. Babu**, and R. Padmavathi, "The barbier-type allylation/lactamization cascade route to isoindolinones and the heck-type annulation route to isoindolo [2, 1-a] quinolines," *ChemistrySelect*, vol. 1, no. 11, pp. 2952–2959, 2016.

[17] **S. A. Babu**, "Exploitation of intramolecular glaser-eglinton-hay macrocyclization for the synthesis of new classes of optically active aza-oxo-thia polyether macrocycles from amino alcohol building blocks," *Synlett*, vol. 28, no. 2, pp. 253–259, 2017.

[18] **N. Bisht** and **S. A. Babu**, "Synthesis of ortho-arylated/benzylated arylacetamide derivatives: $Pd(OAc)_2$-catalyzed bidentate ligand-aided arylation and benzylation of the γ-C–H bond of arylacetamides," *Tetrahedron*, vol. 72, no. 39, pp. 5886–5897, 2016.

[19] **B. Gopalakrishnan**, **S. Mohan**, **R. Parella**, and **S. A. Babu**, "Diastereoselective Pd(II)-catalyzed sp^3 C–H arylation followed by ring opening of cyclopropanecarboxamides: Construction of anti β-acyloxy carboxamide derivatives," *Journal of Organic Chemistry*, vol. 81, no. 19, pp. 8988–9005, 2016.

[20] **S. Mohan**, **B. Gopalakrishnan**, and **S. A. Babu**, "Multicomponent reaction comprising one-pot installation of bidentate directing group and Pd(II)-catalyzed direct β-arylation of C(sp^3)–H bond of aliphatic and alicyclic carboxamides," *Tetrahedron*, vol. 72, no. 39, pp. 5853–5863, 2016.

[21] **Naveen** and **S. A. Babu**, "An entry into new classes of optically active aza-oxo polyether macrocycles via the ring closing metathesis-based macrocyclization," *Tetrahedron Letters*, vol. 57, no. 50, pp. 5690–5694, 2016.

[22] **Naveen** and **S. A. Babu**, "Edc/dmap-mediated direct condensation of dicarboxylic acids and diols: A concise synthesis of extra large polyether macrocyclic lactones and their x-ray structures," *Tetrahedron Letters*, vol. 57, no. 51, pp. 5801–5807, 2016.

[23] **Naveen**, **V. Rajkumar**, **S. A. Babu**, and **B. Gopalakrishnan**, "Pd(II)-catalyzed bidentate directing group-aided chemoselective acetoxylation of remote ϵ-C(sp^2)–H bonds in heteroaryl-aryl-based biaryl systems," *Journal of Organic Chemistry*, vol. 81, no. 24, pp. 12197–12211, 2016.

[24] **V. Rajkumar**, **S. A. Babu**, and R. Padmavathi, "Regio- and diastereoselective construction of a new set of functionalized pyrrolidine, spiropyrrolidine and spiropyrrolizidine scaffolds appended with aryl- and heteroaryl moieties via the azomethine ylide cycloadditions," *Tetrahedron*, vol. 72, no. 36, pp. 5578–5594, 2016.

[25] C. Reddy, **N. Bisht**, **R. Parella**, and **S. A. Babu**, "4-amino-2,1,3-benzothiadiazole as a removable bidentate directing group for the Pd(II)-catalyzed arylation/oxygenation of sp^2/sp^3 β-C–H bonds of carboxamides," *Journal of Organic Chemistry*, vol. 81, no. 24, pp. 12143–12168, 2016.

[26] P. Alam, C. Climent, **G. Kaur**, D. Casanova, **A. R. Choudhury**, A. Gupta, P. Alemany, and I. Laskar, "Exploring the origin of aggregation induced emission activity and crystallization induced emission in organometallic Iridium(III) cationic complexes: Influence of counterions," *Crystal Growth and Design*, vol. 16, no. 10, pp. 5738–5752, 2016.

[27] **A. De**, D. Dey, **H. Yadav**, M. Maji, V. Rane, R. Kadam, **A. R. Choudhury**, and B. Biswas, "Unprecedented hetero-geometric discrete copper(ii) complexes: Crystal structure and bio-mimicking of catecholase activity," *Journal of Chemical Sciences*, vol. 128, no. 11, pp. 1775–1782, 2016.

[28] **A. De**, M. Garai, **H. Yadav**, **A. R. Choudhury**, and B. Biswas, "Catalytic promiscuity of an iron(II)–phenanthroline complex," *Applied Organometallic Chemistry*, vol. 31, no. 1, 2017.

[29] D. Dey, S. Das, **H. Yadav**, A. Ranjani, L. Gyathri, S. Roy, P. Guin, D. Dhanasekaran, **A. R. Choudhury**, M. Akbarsha, and B. Biswas, "Design of a mononuclear copper(II)-phenanthroline complex: Catechol oxidation, dna cleavage and antitumor properties," *Polyhedron*, vol. 106, pp. 106–114, 2016.

[30] M. Garai, D. Dey, **H. Yadav**, **A. R. Choudhury**, N. Kole, and B. Biswas, "Catalytic aspects of a nickel(II)–bipyridine complex towards phosphatase and catechol dioxygenase activity," *Polyhedron*, vol. 129, pp. 114–122, 2017.

[31] A. Ghosh, M. Mitra, A. Fathima, **H. Yadav**, **A. Roy Choudhury**, B. Nair, and R. Ghosh, "Antibacterial and catecholase activities of Co(III) and Ni(II) schiff base complexes," *Polyhedron*, vol. 107, pp. 1–8, 2016.

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

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

[34] M. Mitra, T. Kundu, **G. Kaur**, G. Sharma, **A. R. Choudhury**, Y. Singh, and R. Ghosh, "Catecholase and phenoxazinone synthase activities of a ferromagnetically coupled tetranuclear Cu(II) complex," *RSC Advances*, vol. 6, no. 63, pp. 58831–58838, 2016.

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

[36] **A. Devi** and **A. K. De**, "Theoretical investigation on nonlinear optical effects in laser trapping of dielectric nanoparticles with ultrafast pulsed excitation," *Optics Express*, vol. 24, no. 19, pp. 21485–21496, 2016.

[37] **A. K. Pennathur**, **A. Devi**, and **A. K. De**, "Probing ultrafast energy transfer dynamics: From ensemble to single particle measurements," *ISRAPS Bulletin*, vol. 28, no. 3, pp. 24–32, 2016.

[38] **A. Devi** and **A. K. De**, "Generalized lorentz-mie theory of optical kerr effect in femtosecond laser trapping of dielectric nanoparticles," in *International Conference on Fibre Optics and Photonics 2016*, Optical Society of America, 2016.

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

[40] **M. Rana**, K. Subramani, M. Sathish, and **U. Gautam**, "Soya derived heteroatom doped carbon as a promising platform for oxygen reduction, supercapacitor and CO_2 capture," *Carbon*, vol. 114, pp. 679–689, 2017.

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[42] A. Bhalla, S. Bari, J. Bhalla, S. Khullar, and **S. Mandal**, "Facile synthesis of novel halogenated 4-pyrazolylspirocyclic-β-lactams: Versatile heterocyclic synthons," *Tetrahedron Letters*, vol. 57, no. 25, pp. 2822–2828, 2016.

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[44] R. Chadha, P. Singh, S. Khullar, and **S. Mandal**, "Ciprofloxacin hippurate salt: Crystallization tactics, structural aspects, and biopharmaceutical performance," *Crystal Growth and Design*, vol. 16, no. 9, pp. 4960–4967, 2016.

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[47] A. Saini, R. Chadha, A. Gupta, P. Singh, S. Bhandari, S. Khullar, **S. Mandal**, and D. Jain, "New conformational polymorph of hydrochlorothiazide with improved solubility," *Pharmaceutical Development and Technology*, vol. 21, no. 5, pp. 611–618, 2016.

[48] S. Shakoor, S. Kumari, S. Khullar, **S. Mandal**, A. Kumar, and R. Sakhuja, "Ruthenium(II)-catalyzed regioselective ortho amidation of imidazo heterocycles with isocyanates," *Journal of Organic Chemistry*, vol. 81, no. 24, pp. 12340–12349, 2016.

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[50] ,**A. Mukhopadhyay**, "Interplay between C–H$\cdots$ O, O–H$\cdots$ X (X=C, F, Cl) and H–O$\cdots$ Y (C, Cl, F) interactions in methane-water and halogen substituted methane-water complexes: Theoretical investigations of structure and energy", *Computational and Theoretical Chemistry*, vol. 1083, pp. 19–30, 2016.

[51] **I. Bala** and **S. K. Pal**, "Rod–disc oligomeric liquid crystal based on 4-cyanobiphenyl and truxene core," *Liquid Crystals*, vol. 43, no. 7, pp. 963–971, 2016.

[52] **M. Gupta** and **S. K. Pal**, "Triphenylene-based room-temperature discotic liquid crystals: A new class of blue-light-emitting materials with long-range columnar self-assembly," *Langmuir*, vol. 32, no. 4, pp. 1120–1126, 2016.

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8.3 Department of Earth & Environmental Sciences

8.3.1 Summary of the research work

Anoop Ambili : My research work has been focussed on identifying organic matter (OM) sources using the distribution and $\delta^{13}C$ composition of n-alkanes. The investigations have been conducted on Ashtamudi Estuary located at Southern India characterised by a unique hydrological setting. 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 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 Paq and TAR indices demonstrate maximum aquatic productivity in the tidal dominated region of the Ashtamudi Estuary. The quantitative apportion of organic matter sources in Ashtamudi sediments using compound-specific carbon isotope analysis (CSIA) of long-chain n-alkane shows dominance (53-83$\%$) of C3 terrestrial plants derived OM. The results clearly demonstrate the effectiveness of an integrated molecular and stable carbon isotope analysis for quantitatively assessing OM sources in estuarine environments.

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

Direct observational evidence is obtained for the process of merging of two individual EPBs. The process of

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

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

Bärbel Sinha : This year the work of our group has focussed on developing new source receptor modelling tools and applications. We used a positive matrix factorization model (US EPA PMF version 5.0) in constraint mode to source-apportion 37 non-methane volatile organic compounds (NMVOCs) measured from 19 December 2012 to 30 January 2013 during the SusKat-ABC international air pollution measurement campaign in the Kathmandu Valley. In addition, we developed two new statistical source apportionment models, MuSAM and MuReSAM, to perform quantitative statistical source apportionment of PM10 at multiple receptor sites in South Hessen. MuSAM uses multi-site back trajectory data to quantify the contribution of long-range transport, while MuReSAM uses wind speed and direction as proxy for regional transport and quantifies the contribution of regional source areas based on statistical analysis of multi-site data.

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

8.3.2 Visits of faculty members

- **Anoop Ambili**
  - visited *Indian Institute of Science Education and Research Kolkata (India)* during October 1-15, 2016.
  - visited *Wadia Institute of Himalayan Geology (India)* during February 2-5, 2017.
  - visited *Indian Institute of Science Education and Research Kolkata (India)* during February 17-March 2, 2017.
- **Baerbel Sinha**
  - visited *PGIMER, Chandigarh (India)* on February 21, 2017.
- **Vinayak Sinha**
  - visited *Indian Institute of Technology, Gandhinagar (India)* during April 1-2, 2016.
  - visited *Indian Institute of Tropical Meteorology, Pune (India)* during July 28-29, 2016.
  - visited *Sri Sathya Sai Institute of Higher Learning, Prashantinilayam (India)* on July 30, 2016.
  - visited *Panjab University, Chandigarh (India)* on October 26, 2016.
  - visited *Indian Institute of Technology, Delhi (India)* on November 25, 2016.
  - visited *Post Graduate Institute of Medical Education and Research, Chandigarh (India)* on February 21, 2017.

8.3.3 Talks delivered

1. Baerbel Sinha: Environmental issues for administrators : Training Program for IAS Probationers MGSIPAP Chandigarh: August 19, 2016

2. Baerbel Sinha: Environmental issues for administrators : Training Program for Newly recruited PCS Officers MGSIPAP Chandigarh: March 29, 2017

3. Baerbel Sinha: Environmental issues for administrators : Training Program for Newly recruited PCS Officers MGSIPAP Chandigarh: September 5, 2016

4. Baerbel Sinha: Global Warming & Climate Change: CPCB / DHR Training Programme on Global Warming, Climate Change & Disaster Management at the School of Public Health, PGIMER, Chandigarh: Feb 21, 2017 S

5. Prafulla Chandra: Contribution of post-harvest agricultural paddy residue fires in the N.W. Indo-Gangetic Plain to ambient carcinogenic benzenoids, toxic isocyanic acid and carbon monoxide: European Geophysical Union Meeting, Vienna, Austria: April 17-22, 2016

6. Vinayak Sinha: Atmospheric chemistry research at the climate and air quality interface: NASI Scopus Elsevier: August 20, 2016

7. Vinayak Sinha: Research at the Interface of Air Quality-Atmospheric Chemistry and Climate, Thematic Perspectives and Illustration using the Agricultural Stubble Burning Practice in North India: Panjab University Faculty Development Program, Chandigarh, India: October 26, 2016

8. Vinayak Sinha: Smog Pollution, CFC & Ozone Layer Depletion CPCB / DHR Training Programme on Global Warming, Climate Change & Disaster Management : PGIMER, Chandigarh: February 21, 2017.

9. Vinayak Sinha: The Earth's Atmospheric Chemistry: Sri Sathya Sai Institute of Higher Learning Colloquia, Prashantinilayam: July 30, 2016

10. Vinod Kumar : Mini MAX -DOAS measurements: WMO co-sponsored Max-DOAS Inter-comparison Field Campaign and Workshop (CINDY), Cabauw, Holland: September, 2016

8.3.4 Conferences attended by researchers

- **Anoop Ambili**
  - General Assembly European Geosciences Union: May 23-28, 2017:Coppernicus meetings: Vienna, Austria.
  - 2nd National Geo research Scholars meet : May 17-20, 2017: Wadia Institute of Himalayan Geology: Dehradun, India
- **Vinayak Sinha**
  - European Geosciences Union General Assembly: April 17-22 , 2016: EGU: Vienna, Austria
  - Symposium on Frontiers in Pure and Applied Chemistry: Sri Sathya Sai Institute of Higher Learning, Whitefield Campus, : February 28 2017: Bengaluru
  - Workshop on Climate Change & Regional Impacts over South Asia: July 28-29, 2016: Indian Institute of Tropical Meteorology, Pune, India
  - International Global Atmospheric Chemistry Open Science Conference: September 26-30, 2016: Colorado, USA

8.3.5 Publications : Earth and Environmental Sciences

[1] S. Basu, **A. Anoop**, P. Sanyal, and P. Singh, "Lipid distribution in the lake Ennamangalam, south India: Indicators of organic matter sources and paleoclimatic history", *Quaternary International*, p. 443, 238 –247.

[2] Y. Ankit, P. Kumar, **A. Anoop**, P. Mishra, and S. Varghese, "Mid-late holocene climate variability in the indian monsoon: Evidence from continental shelf sediments adjacent to rushikulya river, eastern india," *Quaternary International*, 2016.

[3] S. Garg, B. Chandra, **V. Sinha**, R. Sarda-Esteve, V. Gros, and **B. Sinha**, "Limitation of the use of the absorption angstrom exponent for source apportionment of equivalent black carbon: A case study from the north west indo-gangetic plain," *Environmental Science and Technology*, vol. 50, no. 2, pp. 814–824, 2016.

[4] C. Sarkar, **V. Sinha**, V. Kumar, A. Panday, M. Rupakheti, and M. Lawrence, "Source apportionment of nmvocs in the kathmandu valley during the suskat-abc international field campaign using positive matrix factorization," *Atmospheric Chemistry and Physics*, vol. 17, no. 13, pp. 8129–8156, 2017.

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[8] S. Ghude, . . . , **V. Sinha**, . . . , et al, "Winter fog experiment over the indo-gangetic plains of India," *Current Science*, vol. 112, no. 4, pp. 767–784, 2017.

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

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[11] C. Sarkar, **V. Sinha**, V. Kumar, M. Rupakheti, A. Panday, K. S Mahata, D. Rupakheti, B. Kathayat, and M. G Lawrence, "Overview of voc emissions and chemistry from ptr-tof-ms measurements during the suskat-abc campaign: High acetaldehyde, isoprene and isocyanic acid in wintertime air of the Kathmandu valley," *Atmospheric Chemistry and Physics*, vol. 16, no. 6, pp. 3979–4003, 2016.

[12] **V. Narayanan**, S. Gurubaran, and K. Shiokawa, "Direct observational evidence for the merging of equatorial plasma bubbles," *Journal of Geophysical Research A: Space Physics*, vol. 121, no. 8, pp. 7923–7931, 2016.

[13] **V. Narayanan**, S. Gurubaran, K. Shiokawa, and K. Emperumal, "Shrinking equatorial plasma bubbles," *Journal of Geophysical Research A: Space Physics*, vol. 121, no. 7, pp. 6924–6935, 2016.

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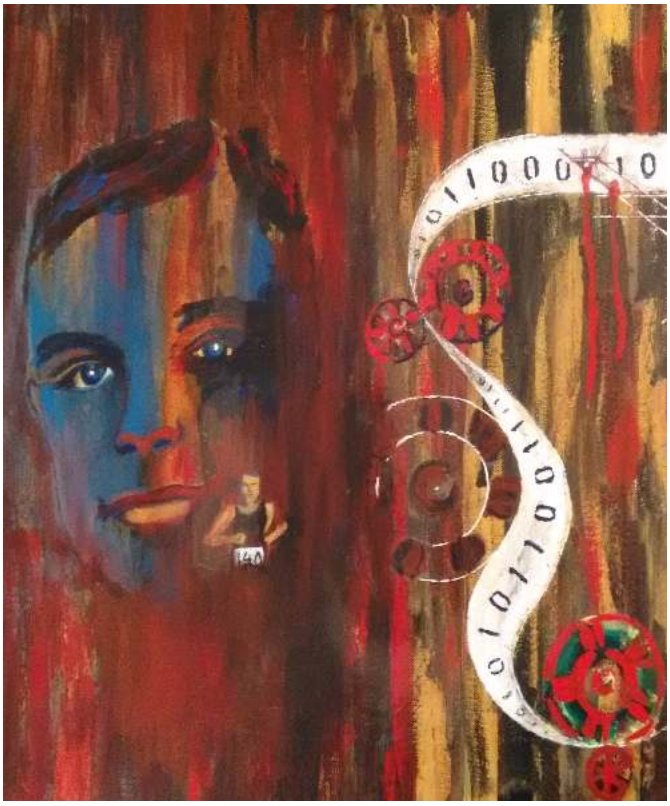


8.4 Department of Humanities & Social Sciences

8.4.1 Summary of the research work

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

Parth R. Chauhan : I continued my archaeological and paleontological surveys in the central Narmada Basin in Madhya Pradesh. I have initiated a similar project in the Siwalik Hills and the Himalayan zone in Himachal Pradesh. In Madhya Pradesh, we discovered new Paleolithic and Mesolithic stone tool sites, rock art sites of various periods and several new vertebrate fossil occurrences. These occurrences include both surface occurrences

as well as buried primary context ones, some of in which we placed small trenches to obtain spatial and geological information as well as for the collection of sediments for different types of analyses. This work is generally carried out during the summers and includes student interns from IISER Mohali and other institutions. In Himachal Pradesh, we discovered and collected vertebrate fossil remains up to 3 million years old and younger Paleolithic evidence belonging to the Soanian industry/tradition. This work is being done in the nearby Siwalik Hills on weekends and in interior Himalayan ranges during longer semester breaks. In Siwalik Hills, we are looking for evidence of human occupation in Early Pleistocene contexts and in the interior mountain zones, we are looking for Middle/Late Pleistocene sites representing high altitude prehistoric adaptations. Future work will involve a strong experimental archaeology component which will entail the replication of various 'primitive' or ancient technologies to test their efficiency on a variety of materials including meat, bone, wood and so forth.

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

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

Meera Nanda : I work in the general space where history and philosophy of modern science meet, and often conflict with history and philosophy of Indian sciences and religions. My doctoral dissertation in Science and Technology Studies was a defense of objectivity and universality of modern scientific knowledge against postmodernist critics who view all knowledge as a social construct of power and ideology. I have published original historical research on the reception and reinterpretation of Darwinism by modern Hindu reformers in the 19th century India. In addition, I have examined the influence of Theosophy on modern Hindu interpretation of the Vedic worldview as scientific. I am currently at work on a social and intellectual history of the idea of scientific tempera as it is understood in the Indian context.

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

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

- *Constructing the Nation*: An Ethnographic Account of Migrant Road Construction Labour in the Upper Himalayas I have been conducting ethnographic research in Lahaul-Spiti, Ladakh and Jharkhand since 2010 to understand the dynamics of seasonal labour migration and its relationship to national development. This project uses social theory to engage with themes of national borders, infrastructure development and defense as they intersect with the lives of the migrant labour. Migration studies within population geography

and studies of nationalism in several disciplines (including geography, sociology and anthropology) have produced a plethora of literature over the past few decades. However, both migration studies and studies on nationalism have moved parallel to each other with little or no overlaps for the most part, especially on internal migration. In fact, until recently most studies on migration looked at either economic factors or mobility behavior but did not address issues of identity. On the other hand, most studies on nationalism have tended to focus on the scale of the nation-state. My work moves beyond a nested understanding of scale and shows how migrant bodies are constructed by (and in turn construct) the nation-state (materially and discursively).

- *Chandigarh: Shifting Paradigms* : "Let this be a new town, unfettered by the traditions of the past." Nehru proclaimed for the new city of Chandigarh in the early years of Independence. Chandigarh was planned and designed by Le Corbusier in the modernist idiom complete with wide roads, concrete structures and large plazas. My project explores the mutual construction of identity and place in Chandigarh with particular emphasis on gender and class. I investigate both the public and private spaces of Chandigarh as well as the in-between spaces such as sector parks, apartment terraces and service lanes. Each of these spaces has stories to tell - stories that inform us about the production, reproduction and negotiation of gendered national identities in modern urban space. Does the 'modern' city of Chandigarh, create a new kind of citizen for India? Does the modernity apparent in the planning translate into a more democratic and inclusive space or does it recreate similar gender dynamics to those that exist in other parts of urban India and elsewhere? I have been conducting ethnographic work in the city now for over 5 years and also integrate this research with my course on 'Urban theory and Laboratory.' The narrative that emerges weaves in themes of nationalism, 'respectability' and economic liberalization to discuss the mutual construction of gender and place in the context of Chandigarh.

8.4.2 Visits of faculty members

- **V. Rajesh**
  - visited *Indian Institute of Technology Madras (India)* during May 24-26, 2016.
  - visited *St. Xavier's College, Palayamkottai (India)* during December 19-21, 2016.
  - visited *Shiv Nadar University, Greater Noida (India)* during February 24-25, 2017.

8.4.3 Talks delivered

1. Ankit: Molecular distribution and carbon isotope of n-alkanes from Ashtamudi estuary, South India: Assessment of organic matter sources and paleoclimate implications: Wadia Institute of Himalayan Geology: May 17-20, 2017
2. V. Rajesh: A Possible Literary History in Tamil? Some Historiographical Considerations: Shiv Nadar University, Greater Noida: February 24, 2017

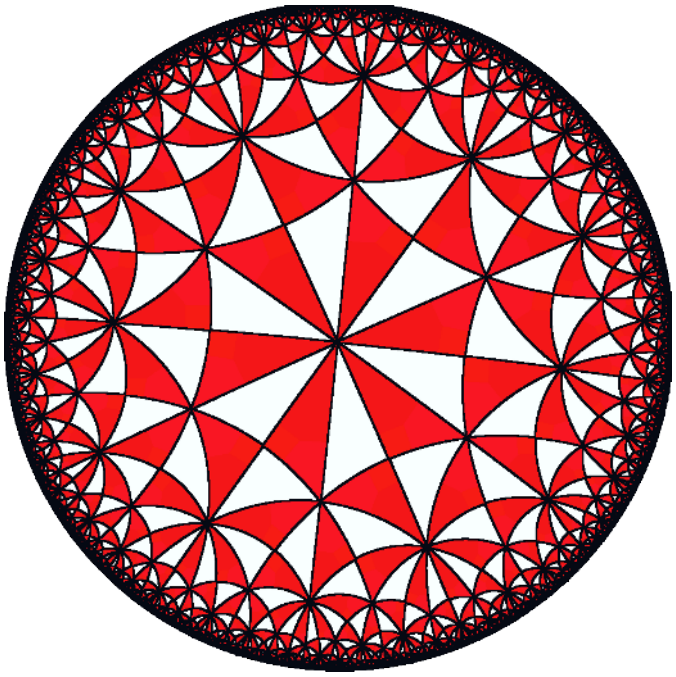
8.4.4 Conferences attended by researchers

- **V. Rajesh**
  - Time Frames: Questioning Chronologies in South Asia's Pasts: February 24-25, 2017: The Department of History, Shiv Nadar University, Greater Noida

8.4.5 Publications : Humanities & Social Sciences

[1] **P. Chauhan** et al, "Fluvial deposits as an archive of early human activity: Progress during the 20 years of the fluvial archives group," *Quaternary Science Reviews*, 2016.

[2] **P. Chauhan** and N. Gupta, "Insight into microbial mannosidases: a review," *Critical Reviews in Biotechnology*, vol. 37, no. 2, pp. 190–201, 2017.



8.5 Department of Mathematical Sciences

8.5.1 Summary of the research work

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

Anandam Banerjee : My interests are in the fields of Algebraic Geometry and Algebraic K-Theory. I focus on the study of the triangulated categories of motives, algebraic cobordism and motivic homotopy theory. Higher Chow groups were defined by Bloch in the 80's as an integral cohomology theory that rationally recovers the weight-graded pieces of algebraic K-theory, extending the Chern character isomorphism on rational Chow groups. For a smooth variety over complex numbers C, Bloch also constructed a higher cycle-class map from higher Chow groups to Deligne cohomology extending the usual cycle class map from Chow groups to singular cohomology. In a well-known work, Totaro showed that the usual cycle class map factors through complex cobordism quotiented by the coefficients of the Lazard ring. Jointly with Amit Hogadi, I am working on the problem of generalizing Totaro's construction to Bloch's higher cycle class map to Deligne cohomology. The right context to state this problem is at the level of motivic stable homotopy theory, where instead of bigraded cohomology theories, we consider the

P1-spectrum of motivic spaces over C. Using the Morel-Hopkins isomorphism, we show that the higher cycle class map is in fact induced by a map of ring spectra between the P1-spectra representing the respective cohomology theories. Also, the map factors through a quotient of the Hodge-filtered cobordism spectrum defined by Hopkins and Quick as a cobordism analogue of Deligne cohomology. In another project, I am studying the nature of the functor from modules over algebraic cobordism to Voevodsky's triangulated category of motives over a perfect field.

Krishnendu Gongopadhyay :

- With Bardakov and Bryukhanov, We prove that the nilpotent product of a set of groups $A_1, \ldots, A_s$ has finite palindromic width if and only if the palindromic widths of $A_i, i = 1, \ldots, s$ are finite. We give a new proof that the commutator width of $F_n \wr K$ is infinite, where F_n is a free group of rank $n \geq 2$ and K is a finite group.

- With Bardakov, Singh and Neshchadim, we initiate the study of palindromic automorphisms of groups that are free in some variety. More specifically, we define palindromic automorphisms of free nilpotent groups and show that the set of such automorphisms is a group. We find a generating set for the group of palindromic automorphisms of free nilpotent groups of step 2 and 3 and also for the subgroup of central palindromic automorphisms.

- With Cigole Thomas, we prove that a holomorphic isometry of $\mathrm{H}^n_{\mathbb{C}}$ is a product of at most four involutions and a complex k-reflection, $k \leq 2$. We gave a short proof of the well-known result that every holomorphic isometry of $\mathrm{H}^n_{\mathbb{C}}$ is a product of two anti-holomorphic involutions.

  We also show that every element in $\mathrm{SU}(n)$ is a product of four or five involutions according as $n \not\equiv 2\mathrm{mod}4$ or $n \equiv 2\mathrm{mod}4$. This answered a question raised in section 4.5.2 of the book *Reversibility in dynamics and group theory* by A. G. O'Farrell and I. Short (Cambridge Univ Press, 2015).

Sudesh Kaur Khanduja : During this period I published three papers on the topic of project jointly with my research students Anuj Jakhar and Neeraj Sangwan. Paper at serial number 3 extends the well known theorem of Index of Ore to valued fields of arbitrary rank. Paper II besides being of independent interest is needed for the main result of the third paper. It extends a classical result regarding discriminant of extensions of algebraic number fields to finite extensions of valued fields. In the first paper, we characterize those primes which divide the discriminant of an irreducible trinomial of the type $F(x) = x^{mt+u} + ax^m + b$ belonging to $\mathbb{Z}[x]$ with $u = 0$ or $u > 0$ dividing m but do not divide $[A_K : Z[\theta]]$, where A_K is the ring of algebraic integers of $K = \mathbb{Q}(\theta)$, θ is a root of $F(x)$; such primes p are important for explicitly determining the decomposition of pA_K into a product of prime ideals of A_K in view of the well known Dedekind theorem. As a consequence, we obtain some necessary and sufficient conditions involving only $a; b; m; n$ for A_K to be equal to $\mathbb{Z}[\theta]$ss.

Amit Kulshrestha : My research interests lie in the theory of Central Simple Algebras and related structures such as Quadratic Forms and Algebraic Groups. Recently have also studied strong reality and total orthogonality of groups using quadratic forms over fields of characteristic 2. Currently in collaboration with Varadharaj Srinivasan I am working on Differential Central Simple Algebras. The plan is to explore the field extensions which split Differential Crossed Product Algebras. I am also studying power maps and word maps on algebraic groups.

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

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.

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.

I. B. S. Passi : Main focus of my research work has been (i) central units in integral group rings and (ii) homological methods for investigation of normal subgroups determined by ideals in group rings.

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

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

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

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

8.5.2 Visits of faculty members

- **Krishnendu Gongopadhyay**
  - visited *International Centre for Theoretical Physics (Italy)* during May 23 - June 3, 2016
  - visited *University of Liverpool (UK)* during June 5 - 19, 2016
  - visited *University of Maryland (USA)* during June 20 - 29, 2016
  - visited *IISER Pune (India) & TIFR Mumbai (India)* during June 30 - July 10, 2016.
  - visited *MNIT Jaipur, Jaipur (India)* during October 6 - 8, 2016
  - visited *Central University of Punjab, Bhatinda (India)* during October 25, 2016.

- visited *Banaras Hindu University, Varanasi (India)* during December 13 - 17, 2016.
- visited *Jadavpur University, Kolkata (India)* during December 18 -21, 2016
- visited *Punjabi University, Patiala (India)* on February 6, 2017.
- visited *Raiganj University, Raiganj (India)* on March 21, 2017.

- **Satyajit Guin**
  - visited *The Institute of Mathematical Sciences, Chennai (India)* during July 13 - 29, 2016.

- **Sudesh Kaur Khanduja**
  - visited *Indian Institute of Science, Bangalore (India)* during March 6-11, 2017.
  - visited *Tata Institute of Fundamental Research, Center for Applicable Mathematics, Bangalore (India)* on March 9, 2017.

- **Shobha Madan**
  - visited *Indian Institute of Technology Kanpur* in December 2016.
  - visited *Punjab University, Chandigarh* in December 2016.
  - visited *Indian Institute of Science Education and Research, Bhopal* in January 2017.
  - visited *Thappar University* in February 2017.
  - visited *DAV College, Amritsar* in February 2017.
  - visited *Ashoka University, Sonepat* in April 2017.

- **Inder Bir Singh Passi**
  - visited *International Centre for Theoretical Sciences, Bangalore (India)* during 11 - 14 November 2016.
  - visited *Harish-Chandra Research Institute, Allahabad* during 14 - 20 February 2017

- **Mahender Singh**
  - visited *Harish-Chandra Research Institute, Allahabad (India)* during May 11 - 21, 2016.
  - visited *Fields Institute for Research in Mathematical Sciences, Toronto (Canada)* during June 11 - 18, 2016.
  - visited *Harish-Chandra Research Institute, Allahabad (India)* during July 03 - 20, 2016.
  - visited *ICTS, Bangalore (India)* during November 05 -14, 2016.
  - visited *Tata Institute of Fundamental Research, Mumbai (India)* during December 15 - 30, 2016.

8.5.3 Talks delivered

1. Chandrakant Aribam: Solving Diophantine equations using elliptic curves:Theoretical and computational Aspects of Elliptic Curves: December 12-22, 2016

2. Abhik Ganguli: Serre weights in the totally ramified case: IIIM, IISER Pune: May 12, 2017.

3. I. B. S. Passi: Mathematics: a glimpse into how it evolves, Shivalik Public School, Sector 41, Chandigarh (organized by Local Chapter National Academy of Sciences, India), 23 August 2016.

4. I. B. S. Passi: Group Rings and Jordan decomposition, International Centre for Theoretical Sciences, Bangalore, 11 November 2016.

5. I. B. S. Passi: Group Rings, Harish-Chandra Research Institute, Allahabad, 17 February 2017.

6. I. B. S. Passi: Mathematics: aadhar for our knowledge and human development, Arya College, Panipat, (organized by Society for Promotion of Science and Technology in India), 11 March 2017.

7. Kapil Hari Paranjape : Computational Number Theory and Algebra : Science Academies Workshop on Algebra and Number Theory, Central University of Jammu, Jammu: 24-25 March 2017.

8. Kapil Hari Paranjape : Growth : Colloquium at Indian Institute of Science Education and Research, Tirupathi (India) : March 10, 2017.

9. Kapil Hari Paranjape : Hodge Conjecture : Bhagavatula Rama Murthy and Bhagavatula Saradamba Memorial Lecture at Central University of Hyderabad, Hyderabad (India) : March 9, 2017.

10. Krishnendu Gongopadhyay: Introduction to hyperbolic geometry, MNIT Jaipur, October 25, 2016.

11. Krishnendu Gongopadhyay: Introduction to hyperbolic geometry, MNIT Jaipur, October 7, 2016.

12. Krishnendu Gongopadhyay: Palindromic width in groups, Punjabi University Patiala: March 6, 2017.

13. Krishnendu Gongopadhyay: Palindromic width in groups, Raiganj University Patiala: March 20, 2017.

14. P Sardar: Graphs of hyperbolic groups and a limit set intersection theorem: Banaras Hindu University: December 15, 2016.

15. P Sardar: Graphs of hyperbolic groups and a limit set intersection theorem: IISER Pune: May 11, 2017.

16. S. K. Khanduja : Irreducible polynomials : Tata Institute of Fundamental Research, Center for Applicable Mathematics, Bangalore (India) : March 9, 2017

17. S. K. Khanduja : Origin and Development of Valuation Theory : ICTS Bangalore : August 29, 2016.

18. S. K. Khanduja : Some Generalizations of Eisenstein - Schonemann Irreducibility Criteria : Indian Institute of Science, Bangalore (India) : March 7, 2017.

19. S. K. Khanduja : Some Generalizations of Eisenstein Irreducibility Criterion : Punjabi University, Patiala : February 6, 2017.

20. S. K. Khanduja : When is $R[\theta]$ integrally closed ? : Indian Institute of Science, Bangalore (India) : March 10, 2017.

21. S. K. Khanduja :History and development of Eisenstein-Schonemann Irreducibility criteria : Aligarh Muslim University, Aligarh : November 13, 2016.

22. Suman Ahmed: Root Numbers and Parity of Local Iwasawa invariants: Theoretical and computational Aspects of Elliptic Curves: December 12-22, 2016

8.5.4 Conferences attended by researchers

- **Chandrakant S Aribam**
  - Neha Kwatra: Theoretical and computational Aspects of Elliptic Curves: December 12-22, 2016
  - Suman Ahmed: Theoretical and computational Aspects of Elliptic Curves: December 12-22, 2016
  - Mishty Ray: Theoretical and computational Aspects of Elliptic Curves: December 12-22, 2016
- **Abhik Ganguli**
  - IIMM: May 11-12, 2017: IISER Pune
- **Krishnendu Gongopadhyay**

- Advanced School on Geometric Group Theory and Low-Dimensional Topology: Recent Connections and Advances, May 23–June 3, 2017, ICTP Trieste: ICTP Trieste (Italy)
- Geometries, Surfaces and Representations of Fundamental Groups, June 22–24, 2017, University of Maryland: University of Maryland.
- Connections for Women: Geometric Group Theory, August 17–19, 2017, MSRI: Berkeley.
- Introductory Workshop: Geometric Group Theory, August 22–26, 2017, MSRI: Berkeley.
- Geometry of mapping class groups and Out(Fn), October 25–28, 2017, MSRI: Berkeley.
- TIMC-BHU Annual conference, December 14–17, 2017, TIMC & BHU: Varanasi.

- **Sudesh Kaur Khanduja**
  - Discussion meeting on The Legacy of Emmy Noether : August 29-30, 2016 : ICTS Bangalore.
  - 4th Heidelberg Laureate Forum, Heidelberg : September 18-23, 2016 : University of Heidelberg, Germany
  - National Conference on Commutative Algebra and Algebraic Geometry : October 11-15, 2016, IISER Mohali.
  - International Conference on Algebra and its applications : November 12-14, 2016 : Aligarh Muslim University, Aligarh.
  - Indian Women in Mathematics (IWM) regional workshop : February 6-7, 2017 : Punjabi University, Patiala.
- **Alok Maharana**
  - Commutative Algebra and Algebraic Geometry : October 11-15, 2016 : IISER Mohali.
- **Inder Bir Singh Passi**
  - Discussion Meeting on Groups Theory Computational Methods, International Centre for Theoretical Sciences, Bangalore, 11- 14 November 2016.
- **Pranab Sardar**
  - International Conference of the AMS and TIMC: Dec 14-17, 2017: AMS and TIMC: Banaras Hindu University, India.
  - Inter IISER Mathematics Meet 2017: May 11-12, 2017: IISER: IISER Pune, India.
- **Mahender Singh**
  - Workshop on Group Actions - Classical and Derived: June 13 - 17, 2016: The Fields Institute, Canada.
  - Discussion Meeting on Topology and Groups: October 15 - 17, 2016: IISER Mohali.
  - Group Theory and Computational Methods: November 05 - 14, 2016: Ramanujan Lecture Hall: ICTS Bangalore.

8.5.5 Publications : Mathematical Sciences

[1] **S. Ahmed**, **C. Aribam** and **S. Shekhar**, "Root numbers and parity of local Iwasawa invariants,' *Journal of Number Theory*, vol. 177, pp. 285–306, 2017.

[2] **S. Anand**, "On a conjecture on linear systems," *Proceedings-Mathematical Sciences*, vol. 127, no. 3, pp. 431–448, 2017.

[3] **A. Ganguli**, "On the reduction modulo p of certain modular p-adic galois representations," *Journal of Number Theory*, vol. 172, pp. 392–412, 2017.

[4] **P. Ghosh**, "Applications of weak attraction theory in $Our(F_n)$," *Geometriae Dedicata*, vol. 181, no. 1, 2016.

[5] V. Bardakov, **K. Gongopadhyay**, M. Neshchadim, and **M. Singh**, "Palindromic automorphisms of free nilpotent groups," *Journal of Pure and Applied Algebra*, vol. 221, no. 2, pp. 316–338, 2017.

[6] **K. Gongopadhyay** and C. Thomas, "Decomposition of complex hyperbolic isometries by involutions," *Linear Algebra and Its Applications*, vol. 500, pp. 63–76, 2016.

[7] A. Jakhar, **S. K. Khanduja**, and N. Sangwan, "On prime divisors of the index of an algebraic integer," *Journal of Number Theory*, vol. 166, pp. 47–61, 2016.

[8] B. Jhorar and **S. K. Khanduja**, "On the index theorem of Ore," *Manuscripta Mathematica*, vol. 153, no. 1-2, pp. 299–313, 2017.

[9] B. Jhorar and **S. K. Khanduja**, "Reformulation of Hensel's lemma and extension of a theorem of ore," *Manuscripta Mathematica*, vol. 151, no. 1-2, pp. 223–241, 2016.

[10] B. Jhorar and **S. K. Khanduja**, "On power basis of a class of algebraic number fields," *International Journal of Number Theory*, vol. 12, no. 8, pp. 2317–2321, 2016.

[11] **S. K. Khanduja** and B. Jhorar, "When is $R[\theta]$ integrally closed?," *Journal of Algebra and its Applications*, vol. 15, no. 5, 2016.

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

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

[14] G. Bakshi, S. Maheshwary, and **I. B. S. Passi**, "Integral group rings with all central units trivial," *Journal of Pure and Applied Algebra*, vol. 221, no. 8, pp. 1955–1965, 2017.

[15] **I. B. S. Passi** and T. Sicking, "Dimension quotients of metabelian Lie rings," *International Journal of Algebra and Computation*, vol. 27, no. 2, pp. 251–258, 2017.

[16] **M. Singh**, "Classification of flat connected quandles," *Journal of Knot Theory and Its Ramifications*, vol. 25, no. 13, p. 1650071, 2016.

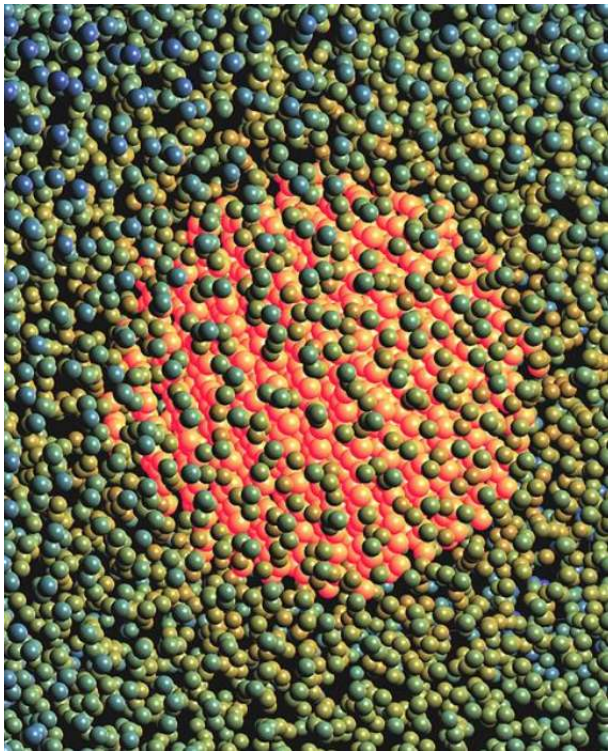
[17] D. de Mattos, P. Pergher, E. dos Santos, and **M. Singh**, "Zero sets of equivariant maps from products of spheres to euclidean spaces," *Topology and its Applications*, vol. 202, pp. 7–20, 2016.

[18] V. Bardakov, P. Dey, and **M. Singh**, "Automorphism groups of quandles arising from groups," *Monatshefte für Mathematik*, pp. 1–12, 2016.

[19] V. Bardakov and **M. Singh**, "Extensions and automorphisms of Lie algebras," *Journal of Algebra and Its Applications*, p. 1750162, 2017.

[20] R. Preeti and **A. Soman**, "Adjoint groups over $\mathbb{Q}_p(x)$ and R-equivalence – revisited," *Proceedings of the American Mathematical Society*, vol. 145, no. 3, pp. 1019–1029, 2017.

[21] **V. R. Srinivasan**, "Liouvillian solutions of first order nonlinear differential equations," *J. Pure Appl. Algebra*, vol. 221, no. 2, pp. 411–421, 2017.



8.6 Department of Physical Sciences

8.6.1 Summary of the research work

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

Charanjit Singh Aulakh : We are developing a scheme for matching the Minimal Supersymmetric Standard Model derived from our realistic SO(10) Minimal Susy Grand Unified theory to the Standard model data by computing the off diagonal threshold corrections due to sparticles. We have also extracted the effective superpotential that describes exotic effects such as B and l violation predicted by this GUT upto sextic order.

Jasjeet Singh Bagla : My current research is on use of hyperfine transition of neutral Hydrogen as a probe of galaxy properties at high redshifts.

Part of the work is theoretical in that we try to estimate the expected signal for specific radio telescopes. A comparison of upcoming surveys for the stage when the universe was roughly a third of the present age suggests that the Ooty Wide Field Array (OWFA) is one of the most promising instruments for detecting neutral Hydrogen from this epoch in the next five years. This work was done with Bharat Gehlot, a former student at IISER Mohali.

We were awarded 125 hours for a pilot survey with the upgraded GMRT. The goal of this survey is to characterize the uGMRT for deep surveys as these will be first such observations in the 1000-1420 MHz band. Our expectation is to carry out a deep survey and observe evolution of the neutral Hydrogen content of galaxies using emission up to the stage when the universe was 75$\%$ of its present size. Observations have been started and are expected to be completed in April 2017. A region with existing observations of distant galaxies in the optical wavelengths has been chosen for this work. This work is being done in collaboration with Jayaram Chenigalur (NCRA-TIFR), Nissim Kanekar (NCRA-TIFR) and Sandeep Rana, a PhD student at IISER Mohali.

Vishal Bhardwaj : We worked on search of new physics using up-down asymmetry of $B \to K\pi\pi\gamma$ and D_s decays. We also studied the $X(3872) \to J/\psi\omega$ decay. In order to understand the nature of $Y(4260)$, we are searching for its B decays. I am working on Belle I and Belle II experiments situated at KEK, Tsukuba, Japan.

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

Abhishek Chaudhuri : The aim of our group is to understand the physical properties of biological and soft condensed matter systems that are driven out of equilibrium. 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.

Kavita Dorai : I am an NMR spectroscopist whose research is poised at the interface of Physics and Biology. My current research interests include NMR Quantum Computing, NMR Metabolomics as applied to human disease, plant circadian rhythms and Drosophila melanogaster metabolome, Diffusion Studies using Gradient NMR, NMR of Nanomaterials, NMR Methodology Development, Nuclear Spin Relaxation and Application to Drug Binding, and Biomolecular Structure and Dynamics Determination.

Sandeep Kumar Goyal : We design schemes to simulate quantum protocols such as quantum walks and Deutsch-Jozsa algorithm using classical light. These schemes can be used to simulate macroscopic cat states and quantum topological phases, which is important to understand the quantum effects on macroscopic scales.

We are exploring the possibility of high temperature photonic quantum memories which are essential to bring the quantum technology on commercial scale. Beside these, we are also working in quantum effects in biological processes, and quantum computing using superconducting qubits and trapped ions.

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

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

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

Rajeev Kapri : We study the 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 semi-flexible 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 hetero-polymer made up of alternating flexible and stiff segments can be accurately detected by passing it through multiple pores of different types arranged in series. We also study the translocation of a polymer through a conical pore and the role of hydrodynamics in the translocation process.

Sanjeev Kumar : My recent research focus has been on the following topics: (i) Understanding the mechanisms for simultaneous presence of long-range magnetic order and ferroelectric order in materials. Such materials are

famous as multiferroics and hold promise for applications in data storage and processing devices. (ii) Understanding the influence of disorder on superconductivity. Here we are exploring the competition between different kind of superconducting orders, for example, s-wave, p-wave and d-wave, and the manner in which impurities effect these orderings. (iii) The problem on which we have got some interesting results during the last few years is the study of coupled spin-charge systems on geometrically frustrated lattices. These problems have provided some nice illustrations of the 'emergent' phenomena in many-body physics, where unusual ordering emerges from simple pairwise interactions.

Smriti Mahajan : I have been working on understanding star formation in nearby gaalxies. By bringing together multi-wavelength data (radio to ultraviolet) we are trying to understand the relation between the rate 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.

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

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

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

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

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

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

Yogesh Singh : Our group specialises in the synthesis and discovery of new or improved materials which have the potential to show novel physical behaviours. Below I briefly describe the progress made on different research

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

Sudeshna Sinha : This research group focuses on dynamics and pattern formation in complex systems. In particular, we investigate nonlinear systems and time-varying networks. We explore phenomena ranging from amplitude death and synchronization, to chimera states and spatiotemporal chaos. We study 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 non-linear damping phenomena in these systems. In a collaborative project with INST we measured magneto-transport of quasi 2-D electron gases on the surface of KTaO3 and modeled its behaviour based on ab-intio calculations. We are making nano-scale versions of these devices. We repaired our dilution fridge system and are starting some

new experiments on the system.

8.6.2 Visits of faculty members

- **Jasjeet Bagla**
  - visited *NCRA-TIFR, Pune (India)* during July 10-26, 2016.
- **Vishal Bhardwaj**
  - visited *Tata Institute of Fundamental Research, Mumbai* during November 28 - December 7, 2016.
  - visited *High Energy Accelerator Research Organization (KEK), Tsukuba (Japan)* during February 1-15, 2017.
- **Samir Kumar Biswas**
  - visited *PGIMER, Chandigarh* on July 7, 2016.
  - visited *INMAS, DRDO Hospital, New Delhi* on July 29, 2016.
  - visited *SN Bose National Center for Basic Sciences, Calcutta* during November 08-10, 2016.
- **Kavita Dorai**
  - visited *National Institute of Chemistry Ljubljana (Slovenia)* during November 27 - December 8, 2016.
- **Sandeep Kumar Goyal**
  - visited *Institute of Mathematical Sciences, Chennai (India)* during July 17-24, 2016.
  - visited *State Key Laboratory of Networking and Switching Technology, Beijing University of Posts and Telecommunications, Beijing (Chine)* during December 6-10, 2016.
  - visited *Institute of Theoretical Physics, Shanxi University, Taiyuan (China)* during December 11-14, 2016.
  - visited *University of Science and Technology of China, Hefei (China)* during December 15-27, (2016).
  - visited *Physical Research Laboratory, Ahmedabad (India)* during March 20-25, 2017.
- **Satyajit Jena**
  - visited *Tata Institute of Fundamental Research, Mumbai (India)* during July 4-10, 2016.
  - visited *Panjab University, Chandigarh (India)* on August 4, 2016.
  - visited *Variable Energy Cyclotron Centre, Kolkata (India)* during October 6-15, 2016.
- **Ketan Patel**
  - visited *National Institute of Science Education and Research, Bhubaneshwar (India)* during December 05 - 09, 2016.
  - visited *Indian Institute of Science, Bangalore (India)* during December 20 - 25, 2016.

8.6.3 Talks delivered

1. Abhishek Chaudhuri : Passive polymer dynamics on an active substrate : 4th Indian Statistical Physics Community Meeting, ICTS Bangalore : February 17-19, 2017
2. Ashish Thampi : B -> (J/psi omega) K study:, Post-CKM school TIFR, Mumbai : Dec 4, 2016
3. Chandrakala Meena: Chimera States in Star Networks: Perspectives in Nonlinear Dynamics 2016 (PNLD 2016): Potsdam: July 29, 2016
4. Deepanshu : Sensitivity study for NP search using Ds decay at Belle, Post-CKM school TIFR, Mumbai : Dec5, 2016
5. J S Bagla: A deep survey for gas-rich galaxies with the uGMRT: PHISCC-2017, NCRA-TIFR, Pune: Feb.8, 2017
6. J S Bagla: Astronomy with hyperfine transition of Hydrogen: Science Day, GNDU Amritsar, Feb.28, 2017
7. J S Bagla: Dark Energy Perturbations beyond the perturbative regime: Aspects of Gravity and Cosmology, IUCAA, Pune: March 9, 2017
8. J S Bagla: Discovery of Gravitational Waves: Ishan-Vikas program, IISER Mohali: June 9, 2016
9. J S Bagla: Discovery of Gravitational Waves: Refresher course on basic and applied science, Panjab University: June 8, 2016
10. J S Bagla: Why is it important to study astronomy?: Faculty Development Program on A look into the future, Panjab University: Oct.28, 2016
11. Kavita Dorai: Characterizing, detecting and preserving quantum correlations on an NMR quantum information processor: NMRS Conference IISc Bangalore: February 18, 2017
12. Kavita Dorai: NMR in Physics and Biology: Ishaan Vikaas Science Camp IISER Mohali: July 08, 2016
13. Kavita Dorai: NMR-based Metabolomics: Perspectives and Case Studies: IISER Pune: January 09, 2017
14. Kavita Dorai: Quantum Computing with Nuclear Spin Qubits: National Institute of Chemistry Ljubljana Slovenia: December 02, 2016
15. Ketan Patel : Fixing a column in PMNS matrix using Discrete Flavour Symmetry : Indian Institute of Science : Dec 21, 2016
16. R. Kapri: Sequencing of semiflexible polymers through patterned pores: BITS Pilani, India: March 09, 2017.
17. R. Kapri: Unzipping DNA by Force: BBK DAV College for Women, Amritsar, Punjab: September 10, 2016.
18. R. Kapri: Unzipping DNA by Force: HBN University Srinagar Garhwal: January 29, 2017.
19. S K Biswas: Advance Medical Devices with Optics +Ultrasound: PGIMER, DST-PGIMER Workshop, Chandigarh: July 7, 2016
20. S K Biswas: Diagnosing Soft Matter by Listening to the Sound of Light: SN Bose National Center for Basic Sciences, Calcutta:, Nov 9, 2016
21. S. Kalyan: Monte Carlo study of periodically driven DNA, BITS Pilani, India: March 10, 2017.
22. Sanjeev Kumar: Carrier driven coupling in ferromagnetic oxide heterostructures: IIT Roorkee: February 08, 2017

23. Sudhanshu Shekhar Chaurasia: Dynamical effects of switching coupling forms: Conference on Nonlinear Systems and Dynamics (CNSD-2016): IISER Kolkata: December 17, 2016

24. Vishal Bhardwaj: Charmonium and Exotic states, Post-CKM School TIFR, Mumbai : Dec 6, 2016

25. Vishal Bhardwaj: Latest results on mixing and CPV in the charm decays at the B-factories, 9th International Workshop on the CKM Unitarity Triangle TIFR, Mumbai : Nov 29, 2016

26. Vishal Bhardwaj: Charm and Hadron Physics : 11th Belle Program Advisory Committee (BPAC) review:, KEK, Tsukuba (Japan): Feb 12, 2017

27. Vishal Bhardwaj: Study of B -> K pi pi gamma : 73rd Belle General Meeting, KEK, Tsukuba (Japan): Feb 3, 2017

28. Sudeshna Sinha: Balance of interactions determines optimal survival in multiÂspecies communities: Conference on Nonlinear Systems and Dynamics (CNSD-2016): IISER Kolkata: December 18, 2016

29. Sudeshna Sinha: Dynamics of Rewired Networks: Evolving Networks and Collective Behaviour Analysis, Algorithms and Applications Workshop: Yau Mathematical Sciences Center: Sanya, China: January 10, 2017

8.6.4 Conferences attended by researchers

- **Jasjeet Bagla**
  - Annual Meeting of the Astronomical Society of India, May 9-13, 2016: Kashmir University, Srinagar
  - PHISCC-2017, Feb.6-8, 2017: NCRA-TIFR, Pune
  - Aspects of Gravity and Cosmology, March 7-9, 2017: IUCAA, Pune
- **Vishal Bhardwaj**
  - Vishal Bhardwaj : 9th International Workshop on the CKM Unitarity Triangle : Nov 28-Dec 2, 2016 : CKM/HFAG Group/ TIFR : Mumbai
  - Vishal Bhardwaj : Post-CKM Retrospection School : Dec 3- 7, 2016 : TIFR : Mumbai
  - Ashish Thampi : Post-CKM Retrospection School : Dec 3- 7, 2016 : TIFR : Mumbai
  - Deepanshu : Post-CKM Retrospection School : Dec 3- 7, 2016 : TIFR : Mumbai
  - Vishal Bhardwaj : 73rd Belle General Meeting : Feb 2-3, 2017 : Belle Collaboration (KEK) : KEK, Tsukuba (Japan)
  - Vishal Bhardwaj :29th Belle2 General Meeting : Feb 5-9, 2017 : Belle2 Collaboration (KEK) : KEK, Tsukuba (Japan)
  - Vishal Bhardwaj : 11th Belle Program Advisory Committee (BPAC) review: Feb 12-14, 2017 : Belle Collaboration (KEK) : KEK, Tsukuba (Japan)
- **Samir Kumar Biswas**
  - DST-PGIMER Workshop on Innovation in Biomedical Instruments and Devices 2016: PGIMER, Chandigarh
  - National Symposium on Ultrasonics (NSU 2016) in November 2016: S N Bose National Center for Basic Sciences, Calcutta
- **Abhishek Chaudhuri**
  - Abhishek Chaudhuri : Passive polymer dynamics on an active substrate : 4th Indian Statistical Physics Community Meeting, ICTS Bangalore : February 17-19, 2017

- Abhishek Chaudhuri : Soft Matter Young Investigators Meet 2016 : December 16-18, 2016 : SMYIM : International Center Goa
- Nisha Gupta : 2nd International Conference on Soft Materials (ICSM) : December 12-16, 2016 : MNIT Jaipur : Jaipur
- Nisha Gupta : Experimental and Theoretical Approaches to Cell Mechanics : April 23-30, 2017 : RRI Bangalore : Bangalore

- **Rajeev Kapri**
  - Conference on DNA Physics: 09 - 11 March 2017: BITS Pilani, India.

- **Sanjeev Kumar**
  - Sanjeev Kumar: Recent Advances in Strongly Correlated Electronic Materials: February 08-10, 2017: Department of Physics: IIT Roorkee

- **Smriti Mahajan**
  - Group Monitoring Workshop (GMW) on SERB/DST Young Scientist (YS) Scheme in Physics and Mathematics Sciences : March 8-9, 2017, Pondicherry University, Puducherry (India).

- **Ketan Patel**
  - Ketan Patel : Looking for BSM Physics : December 20-22, 2016 : Centre for High Energy Physics : IISc Bengaluru

- **Sudeshna Sinha**
  - Sudeshna Sinha: Evolving Networks and Collective Behaviour Analysis, Algorithms and Applications Workshop: January 9-13, 2017: Yau Mathematical Sciences Center: Sanya, China
  - Chandrakala Meena: Perspectives in Nonlinear Dynamics 2016 (PNLD 2016): July 24-29, 2016: Potsdam
  - Sudhanshu Shekhar Chaurasia: Conference on Nonlinear Systems and Dynamics (CNSD-2016): December 16-18, 2016: IISER Kolkata
  - Sudeshna Sinha: Conference on Nonlinear Systems and Dynamics (CNSD-2016): December 16-18, 2016: IISER Kolkata

8.6.5 Publications : Physical Sciences

[1] **D. Das**, and **Arvind**, "Weak measurement-based state estimation of Gaussian states of one-variable quantum systems," *Journal of Physics A: Mathematical and Theoretical*, vol. 50, pp. 145307, 2017.

[2] **Arvind**, S. Chaturvedi, and N. Mukunda, "A classical optical approach to the non-local Pancharatnam-like phases in Hanbury-Brown-Twiss correlations," *Physics Letters A*, vol. 381, pp. 1272, 2017.

[3] **S. Dogra**, **K. Dorai**, and **Arvind**, "Experimental demonstration of quantum contextuality on an NMR qutrit," *Physics Letters, Section A: General, Atomic and Solid State Physics*, vol. 380, no. 22-23, pp. 1941–1946, 2016.

[4] **H. Singh**, **Arvind**, and **K. Dorai**, "Constructing valid density matrices on an nmr quantum information processor via maximum likelihood estimation," *Physics Letters, Section A: General, Atomic and Solid State Physics*, vol. 380, no. 38, pp. 3051–3056, 2016.

[5] **A. Singh**, **Arvind**, and **K. Dorai**, "Entanglement detection on an nmr quantum-information processor using random local measurements," *Physical Review A - Atomic, Molecular, and Optical Physics*, vol. 94, no. 6, 2016.

[6] **C. Aulakh**, "New minimal so(10) gut: A theory for all epochs," *Pramana - Journal of Physics*, vol. 86, no. 2, pp. 207–221, 2016.

[7] B. Gehlot and **J. S. Bagla**, "Prospects of detecting hi using redshifted 21-cm radiation at z∼3," *Journal of Astrophysics and Astronomy*, vol. 38, no. 1, 2017.

[8] P. Singh, S. Rana, **J. S. Bagla**, and B. Nath, "Suppression of galactic outflows by cosmological infall and circumgalactic medium," *Monthly Notices of the Royal Astronomical Society*, vol. 459, no. 1, pp. 2–8, 2016.

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[10] Y. Kato, ..., **V. Bhardwaj**, ... et al, "Studies of charmed strange baryons in the Λd final state at belle," *Physical Review D - Particles, Fields, Gravitation and Cosmology*, vol. 94, no. 3, 2016.

[11] T. Nanut, ..., **V. Bhardwaj**, ... et al, "Observation of d0 $\rightarrow \rho 0\gamma$ and search for cp violation in radiative charm decays," *Physical Review Letters*, vol. 118, no. 5, 2017.

[12] Y. Sato, ..., **V. Bhardwaj**, ... et al, "Measurement of the branching ratio of b 0 $\rightarrow d* + \tau - \nu\tau$ relative to b 0 $\rightarrow d* + \nu$ decays with a semileptonic tagging method measurement of the branching ratio of ... y. sato et al.," *Physical Review D - Particles, Fields, Gravitation and Cosmology*, vol. 94, no. 7, 2016.

[13] C. Shen, ..., **V. Bhardwaj**, ... et al, "Search for xyz states in μ (1s) inclusive decays," *Physical Review D - Particles, Fields, Gravitation and Cosmology*, vol. 93, no. 11, 2016.

[14] C. Shen, ..., **V. Bhardwaj**, ... et al, "First observation of $\gamma\gamma \rightarrow ppk + k-$ and search for exotic baryons in pk systems," *Physical Review D - Particles, Fields, Gravitation and Cosmology*, vol. 93, no. 11, 2016.

[15] D. Kondrashova, A. Lauerer, D. Mehlhorn, H. Jobic, A. Feldhoff, M. Thommes, **D. Chakraborty**, C. Gommes, J. Zecevic, P. De Jongh, A. Bunde, J. Kärger, and R. Valiullin, "Scale-dependent diffusion anisotropy in nanoporous silicon," *Scientific Reports*, vol. 7, 2017.

[16] K. Kroy, **D. Chakraborty**, and F. Cichos, "Hot microswimmers," *European Physical Journal: Special Topics*, vol. 225, no. 11-12, pp. 2207–2225, 2016.

[17] **A. Chaudhuri** and D. Chaudhuri, "Forced desorption of semiflexible polymers, adsorbed and driven by molecular motors," *Soft Matter*, vol. 12, no. 7, pp. 2157–2165, 2016. Chau

[18] A. Nair, S. Chandel, M. K. Mitra, S. Muhuri, and **A. Chaudhuri**, "Effect of catch bonding on transport of cellular cargo by dynein motors," *Phys. Rev. E*, vol. 94, p. 032403, Sep 2016.

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[20] **S. K. Goyal**, A. H. Ibrahim, F. S. Roux, T. Konrad, and A. Forbes, "The effect of turbulence on entanglement-based free-space quantum key distribution with photonic orbital angular momentum," *Journal of Optics*, vol. 18, no. 6, p. 064002, 2016.

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[23] **R. S. Johal**, "Optimal performance of heat engines with a finite source or sink and inequalities between means," *Physical Review E - Statistical, Nonlinear, and Soft Matter Physics*, vol. 94, no. 1, 2016.

[24] **R. S. Johal** and R. Rai, "Near-equilibrium universality and bounds on efficiency in quasi-static regime with finite source and sink," *EPL*, vol. 113, no. 1, 2016.

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[28] K. Pasrija, P. Chakraborty, and **S. Kumar**, "Effective hamiltonian based monte carlo for the bcs to bec crossover in the attractive hubbard model," *Physical Review B - Condensed Matter and Materials Physics*, vol. 94, no. 16, 2016.

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[30] R. Ray and **S. Kumar**, "Switchable multiple spin states in the kondo description of doped molecular magnets," *Scientific Reports*, vol. 7, p. 42255, 2017.

[31] L. Cortese, ..., **S. Mahajan** ... et al, "The sami galaxy survey: The link between angular momentum and optical morphology," *Monthly Notices of the Royal Astronomical Society*, vol. 463, no. 1, pp. 170–184, 2016.

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9 Patents

Following patent was granted to a faculty member of IISER Mohali.

1. Nanoprocessing and heterostructuring of silk : **Kamal P. Singh** : PCT/IB2017/051252.2015/092777A2

10 Awards and Honours

10.1 Awards won by the faculty

1. **N. Sathyamurthy**: Sir C. V. Raman Medal 2016 by Indian National Science Academy.
2. **Mahak Sharma**: SERB-Women Excellence Award: 2017
3. **M. Sharma**: Young Investigator Travel Award: 2016: for attending YIM 2016 at Manesar, Gurugram.
4. **Krishnendu Gongopadhyay**: Royal Society Commonwealth Science Conference Follow on Grant to visit University of Liverpool during June, 2016.
5. **Krishnendu Gongopadhyay**: University of Maryland travel fund, to cover return airfare from University of Maryland to New Delhi, India.
6. **Kapil Hari Paranjape**: Advisory Board of arXiv.org : 2002-2017 : Member
7. **Kapil Hari Paranjape**: Programme Advisory Committee for Mathematical Sciences, SERB : 2015-2017 : Chairperson
8. **Kapil Hari Paranjape**: Council of the Indian Academy of Sciences, Bangalore : 2015-2017 : Member
9. **Kapil Hari Paranjape**: CSIR/UGC-NET for Mathematical Sciences, CSIR-HRDG : 2016-2017 : Convenor
10. **Kapil Hari Paranjape**: Editorial Board, 'Resonance' A Journal of Science Education : 2014-2017 : Member
11. **S. K. Khanduja**: The fellowship of World Academy of Sciences (TWAS) : 2016 : for contributions in the field of Mathematics.
12. **S. K. Khanduja**: INSA Senior Scientistship from Indian National Science Academy : 2016 : for research in Mathematics.
13. **Sudeshna Sinha**: Editor of 'Chaos' (AIP)
14. **Sudeshna Sinha**: core member of SERB Expert Committee for Young Scientists in the area of Physical & Mathematical Sciences
15. **Sudeshna Sinha**: Member of the Board of Governors of MNNIT Allahabad
16. **I.B.S. Passi**: Felicitated by The Indian Mathematics Consortium at Banaras Hindu University, Varanasi on 15 December 2016 for contribution to mathematics
17. **Vinayak Sinha**: NASI-SCOPUS Young Scientist Award : 2016: For Research Excellence in the Field of Earth, Oceanic and Atmospheric Sciences
18. **Vinayak Sinha**: NASI-SCOPUS Young Scientist Award : 2016: For Research Excellence in the Field of Earth, Oceanic and Atmospheric Sciences
19. **Somdatta Sinha**: International Visiting Research Scholar, Peter Wall Institute for Advanced Studies, University of British Columbia, Vancouver (CANADA) : 2017 : to get outstanding international scholars to UBC for extended visits, in partnership with UBC's faculties, departments and research centres.

20. **S.S.V. Ramasastry**: Admitted as a Member of the Royal Society of Chemistry (MRSC): 2016

21. **S.S.V. Ramasastry**: Received the young scientist award from the organizing committee of 'Chemical Frontiers-2016'

10.2 Awards won by the students

1. **Abhishek Kumar Mishra**: Travel and participation award : Max Planck Institute for Chemistry, Mainz : for attending WMO co-sponsored CINDY-2 DOAS Measurement Campaign, Cabauw, Holland: September 2016

2. **Bhishem Thakur**: Annual Symposium of the Indian Biophysical Society : March 23 - 25, 2017 (Best Poster award)

3. **Chandrakala Meena**: SERB Travel Award: 2016 : for giving a talk in the conference Perspectives in Nonlinear Dynamics 2016 (PNLD 2016), held in Potsdam, Germany in July 24-29, 2016.

4. **Chinmoy Sarkar**: Fulbright-Kalam Climate Fellowship 2016 : For carrying out Postdoctoral Studies at University of California Irvine, USA

5. **Divya Khatter**: ASCB International Travel Award: 2016: Research work presentation at the annual ASCB conference during December 03-07, 2016.

6. **Hema Swasthi**: DST International Travel Award for attending Gordon Research Conference

7. **Kanchan Jaswal**: Attendance grant: ESCMID: 2016: for attending EMBO conference on Bacterial Morphogenesis, Survival and Virulence- Regulation in 4D: November 27-December 1, 2016.

8. **Kanchan Jaswal**: EMBO conference on Bacterial Morphogenesis, Survival and Virulence- Regulation in 4D: November 27-December 1, 2016: Ubiquinone combats oxidative stress generated by long chain fatty acid degradation in Escherichia coli (Poster award)

9. **Lata Kalra**: YETI 2017: jaunary 4-7, 2017: Examining Audience effects in intersexual aggression in male field cricket Acanthogryllus asiaticus. Best Poster Award.

10. **Neeraj Sangwan**: Heidelberg Laureate Forum Foundation : 2016 : for attending 4th Heidelberg Laureate Forum at University of Heidelberg, Germany during September 18-23,

11. **Nidhi Kundu**: Annual Symposium of the Indian Biophysical Society : March 23 - 25, 2017 (Best Poster award)

12. **Nitika Kandhari** : National Symposium on Bioinformatics and Computational Systems Biology (NSBCSB-2016) : 12-14 Nov, 2016 : A Complex Network Approach to Understand the Structural Basis of Thermostability in Lipase A(Poster award)

13. **Pallavi Kaila**: Bioprocessing India 2016 : December 15 - 17, 2016 (Best Poster award)

14. **Prafulla Chandra**: Full Early Career Travel and Participation Grant : International Global Atmospheric Chemistry (IGAC) Secretariat, USA: For Presenting a Poster at the IGAC Open Science Conference held in Colorado, USA: September 26-30, 2016

15. **Prafulla Chandra**: Travel Grant : Institute of Advanced Sustainability Studies, Potsdam : to present talk at the European Geophysical Union Meeting, Vienna, Austria: April 17-22, 2016

16. **Prafulla Chandra**: Travel Grant : Institute of Advanced Sustainability Studies, Potsdam : to present talk at the European Geophysical Union Meeting, Vienna, Austria: April 17-22, 2016

17. **Ranjana Jaiswara**: OSF Travel Award: Orthoptera Species File: 2017: To visit MNHN (MusÃ©um national d'Histoire naturelle), Paris (France) for taxonomic work on crickets for a period of one month.

18. **Ravinder Gulia**: IBRO-SFN travel award: 2017: for attending the Society for Neuroscience meeting in Washington DC, USA during November 11-15, 2017.

19. **Ravinder Gulia**: International Brain Research Organization meeting: December 14-22, 2016: Role of ubiquitination in group I metabotropic glutamate receptor (mGluR) trafficking. (Poster award)

20. **Reema Kathuria**: 85th Annual Meeting of SBC (I) : November 21 - 24, 2016. (Poster award)

21. **Richa Singh**: YETI 2017: January 4-7, 2017: Spacing pattern and acoustic interactions in a field cricket species. Best Oral Presentation Award.

22. **Richa Singh**: YETI 2017: January 4-7, 2017: Spacing pattern and acoustic interactions in a field cricket species. Best Oral Presentation Award.

23. **Soumya Dey**: ICTP (Trieste, Italy) travel funding to participate in ICTP program Advanced School on Geometric Group Theory and Low-Dimensional Topology: Recent Connections and Advances during May 23–June 3, 2016.

24. **Soumya Dey**: SERB Travel reward, SERB, Department of Science and Technology: 2016 for visiting MSRI Berkeley (USA) during October 25–29, 2016.

25. **Swathi Krishna**: MSRI Berkeley (USA) Travel grant for participating in two of their workshops during the semester program on Geometric Group Theory, August 17–26, 2016.

26. **Vinod Kumar**: Travel and participation award : Max Planck Institute for Chemistry, Mainz for attending WMO co-sponsored CINDY-2 DOAS Measurement Campaign, Cabauw, Holland : September 2016

27. **Y. Dahiya**: C. elegans Topics Meeting: Neuronal Development, Synaptic function and behaviour, Japan (Awarded by the conference organisers) : 2016 : Partial aid to attend the C. elegans Topics Meeting: Neuronal Development, Synaptic function and behaviour that was held in Nagoya, Japan

11 Major Facilities Procured

Scanning Tunneling Microscope

A new ultra-high vaccuum and ultra-low temperature scanning tunneling microscope (STM) has been set up for atomic resolution imaging and spectroscopy on complex electronic systems. The system is also equipped with a high-field superconducting magnet (11 Tesla) and several tools for in-situ fabrication and characterization, e.g., reflection high-energy electron diffraction (RHEED) and low-energy electron diffraction (LEED). The system is housed in a building specially designed for low mechanical vibration and high radio frequency (RF) noise isolation. It was made fully functional during the year, and multiple crystals with non-trivial topological band-structure(s) have already been studied. The entire facility was funded mainly by DST-Nano-Mission and also partially by IISER Mohali. It was inaugurated on September 27, 2016, by Professor Ashutosh Sharma, Secretary, Department of Science and Technology, Government of India, and has been functional ever since.

12 Current projects and fellowships

S.No.	Project No.	Project Title	Principal Investigator	Funding Agency	Duration	Sanctioned Cost
1	MAX-011-0023	Tropospheric OH reactivity and VOC measurement within India	Vinayak Sinha	DST-MPG	2011-2016	₹ 11,841,716
2	JCB-12-0033	J. C. Bose Fellowship	Somdatta Sinha	DST	2012-2017	₹ 6,800,000
3	INSPIRE-12-0034	INSPIRE Faculty Award	Mahender Singh	DST	2012-2017	₹ 1,180,000
4	DST-12-0035	Liquid Crystal Nanocrystal – A New Resource Of Functional Soft Materials For Nanosciences	Santanu Kumar Pal	DST	2012-2015	₹ 2,655,000
5	JCB-12-0036	J. C. Bose Fellowship	Anand K. Bachhawat	DST	2012-2017	₹ 6,800,000
6	DBT-12-0037	Identification And Characterization Of Cell Type Specific Transcription Factors From Arabidopsis Stem Cell Niche To Construct A Gene Regulatory Network	Ram Kishor Yadav	DBT	2012-2015	₹ 4,181,000
7	DBT-12-0038	Deciphering The Function Of Claudins In The Nervous System	Kavita Babu	DBT	2012-2015	₹ 4,119,000
8	RJN-12-0039	Ramanujan Fellowship	Goutam Sheet	DST	2012-2017	₹ 7,300,000
9	DBT-12-0040	Identification Of Transcriptional Gene Networks Using Genomic Approaches	Ram Kishor Yadav	DBT	2012-2017	₹ 7,450,000
10	DBT-12-0041	Cell Type-Specific Role Of Homer Proteins In Synaptic Plasticity	Samarjit Bhattacharyya	DBT	2012-2014	₹ 5,419,800
11	DBT-12-0042	Towards Understanding The Mechanism Of Antigenicity.	Kavita Babu	Wellcome DBT	2012-2017	₹ 34,326,491
12	DBT-12-0043	Role Of Small GTP-Binding Proteins In Regulating Lysosomal Trafficking And Microbial Killing	Mahak Sharma	Wellcome DBT	2012-2018	₹ 32,711,140
13	DAE-12-0044	Passive Sensor Materials Based On Crystals	Santanu Kumar Pal	DAE	2012-2015	₹ 1,650,000
14	DST-12-0045	Logical Approaches To The Enantioselective Synthesis O Biologically Active Compounds	S. S. V. Rama Sastry	DST	2012-2015	₹ 2,525,000

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

S.No.	Project No.	Project Title	Principal Investigator	Funding Agency	Duration	Sanctioned Cost
30	CRFS-14-0061	Genetic And Biochemical Investigations On The Cystinocin Trasporter Using A Novel Genetic Screen	Anand K. Bachhawat	CRFS	2014-2016	$82,500
31	INSPIRE-14-0062	INSPIRE Faculty Award	Sudhanshu Shekhar	DST	2014-2019	₹ 1,900,000
32	DST-14-0063	Nanoscale Biophysics Of Protein Amyloids Creating Nanoparticle Based Bsuperstructures	Mily Bhattacharya	DST	2014-2017	₹ 2,480,000
33	MHRD-14-0064	Establishment Of Centres Of Excellance For Training And Research In Frontier Areas Of Science And Technology (Fast)	Purnananda Guptasarma	MHRD	2014-2018	₹ 40,000,000
34	DST-14-0065	Investigating The Links Between Glutathione Depletion And Calcium Homeostasis In Yeast Apoptosis Using The Cha C1 Proteins	Anand K. Bachhawat	DST	2014-2017	₹ 5,282,000
35	DST-14-0066	Sepctroscopy And Imaging Down To Subnanometer Length Scales On Novel Electronic Systems And Their Nanostructured Devices	Goutam Sheet	DST	2014-2017	₹ 45,633,200
36	DBT-14-0067	Dop-2 Modulates Acetylcholine And Gaba Singaling In Caenorhabidities Elegans	Pratima Pandey	DBT	2014-2017	₹ 3,870,000
37	DST-14-0068	India-Japan Research Project Knot Invariants And Geomertric Manifolds	K. Gongopadhyay	DST	2014-2016	₹ 452,000
38	CSIR-14-0069	Invertigating The Role Of Novel Regulator Marb. In The Regulation Of The Chromosomally Encoded Multiple Antibiotic Resistance (Mar) In Enteric Bacteria	Rachna Chaba	CSIR	2014-2017	₹ 2,200,000
39	DST-14-0070	Self-Propulsive Mechanisms Of Automous Microswimmers	Dipanjan Chakraborty	DST	2014-2017	₹ 3,610,000
40	INSPIRE-14-0071	INSPIRE Faculty Award	Anandam Banarjee	DST	2014-2019	₹ 1,900,000
41	INSPIRE-14-0072	INSPIRE Faculty Award	V. Lakshmi Narayanan	DST	2014-2019	₹ 1,900,000
42	DBT-14-0073	Structural And Molecular Insights Into Initiation, Propagation And Regulation Of A Yeast Prion Determinant	S. Mukhopadhyay	DBT	2014-2017	₹ 8,557,200
43	INSPIRE-15-0074	INSPIRE Faculty Award	Manimala Mitra	DST	2015-2020	₹ 1,900,000

S.No.	Project No.	Project Title	Principal Investigator	Funding Agency	Duration	Sanctioned Cost
44	INSPIRE-15-0075	INSPIRE Faculty Award	Monkia Sharma	DST	2015-2020	₹ 1,900,000
45	DST-15-0076	Inverstigation Of Protein-Dna G- Quadruplex Spin Relaxation And Novel Numerically Optimised Pilses	Kavita Dorai	DST	2015-2018	₹ 782,250
46	ICHR-15-0077	Sanskrit And The British Empire	Rajesh Kochhar	ICHR	2015-2017	₹ 150,000
47	JCB-15-0078	J. C. Bose Fellowship	P. S. Ahuja	DST	2015-2018	₹ 4,380,000
48	DST-15-0079	Exploring The Quantum Measurement Problem In The Context Of Weak Quantum Measurements	Arvind	DST	2015-2018	₹ 2,473,600
49	CSIR-15-0080	Stereoselective C-H Functionalzation Route Toward Libraries Of Biactive Sugar And Iminosugar Moieties Fused Spirooxindoles And Spirobrassinin Elacomine, Formosanine Anticancer And Antimalarial Biological Activities	S. Arulananda Babu	CSIR	2015-2018	₹ 3,080,000
50	DST-15-0081	Phenomenlogy Cosmology Of The New Minimal Supersymunetric So(10) Gut	C. S. Aulakh	DST	2015-2018	₹ 2,857,920
51	RSCSC-15-0082	The Impact Of Rock Variability On Hominin Technological Adaptations In India	Parth R. Chauhan	RSCSC	2015-2018	£3,000
52	DST-15-0083	Chemical Reactions In High Frequency, Strong Oscillating Fields	P. Balanarayan	DST	2015-2018	₹ 1,500,000
53	DST-15-0084	Collective Dynamics Of Activ Polymers Implication For Sytoskeletal Structure And Dynamics	Abhishek Chaudhuri	DST	2015-2018	₹ 1,000,000
54	DST-15-0085	Photoswitchable Reversible Molecular Transport Developing Model Systems	Sugumar Venkataramani	DST	2015-2018	₹ 1,400,000
55	DBT-15-0086	Deciphering The Mechano-Responsive Behavior Of Cadherins In Hearing	Sabyasachi Rakshit	Wellcome DBT	2015-2020	₹ 32,732,260
56	INSPIRE-15-0087	INSPIRE Faculty Award	Anoop Aambili	DST	2015-2020	₹ 3,500,000
57	INSPIRE-15-0088	INSPIRE Faculty Award	Ketan Patel	DST	2015-2020	₹ 3,500,000
58	DWF-15-0089	Delhi Winter Fog	Vinayak Sinha	IITM Pune	2015-2016	₹ 215,000

S.No.	Project No.	Project Title	Principal Investigator	Funding Agency	Duration	Sanctioned Cost
59	DST-15-0090	Chiral Bis (Amino) Cyclopropenylidenes And Bis (Amino Cyclopropenimines Catalysed Enantioselective Organ Catalytic Transformations)	R. Vijaya Anand	DST	2015-2018	₹ 4,923,000
60	JCB-15-0091	J. C. Bose Fellowship	Sudeshna Sinha	DST	2015-2020	₹ 6,800,000
61	DST-15-0092	Enhancement Of Immune Memory By Transient Treatment With Puromycin	Sharvan Sehrawat	DST	2016-2019	₹ 5,015,890
62	DBT-15-0093	Understanding The Molecular Mechanisms Of Epigenetically Regulated Genes Dureing Muller Glia Dedifferentiation And Retina Regeneration In Zebrafish	Rajesh Ramachandran / K. S. Sandhu	DBT	2016-2019	₹ 6,584,600
63	DBT-15-0094	Inver=Stigating The Role Of A Novel Transcriptional Regulator Dgor In The Regulation Of Long Chain Fatty Acid (Lcfa) Metabolism In Escherichia Coli	Rachna Chaba	DBT	2016-2019	₹ 7,129,600
64	INSPIRE-15-0095	INSPIRE Faculty Award	Vishal Bhardwaj	DST	2016-2021	₹ 8,300,000
65	DBT-15-0096	Structure-function studies on Vibrio parahaemolyticus thermostable direct hemolysin, a membrane-damaging pore-forming toxin	Kausik Chattopadhyay	DBT	2016-2019	₹ 6,815,600
66	INSPIRE-15-0097	INSPIRE Faculty Award	Satyajit Guin	DST	2016-2021	₹ 8,300,000
67	ICHR5-0098	Learning From The Utopian City: An International Network On Alternative Histories Of India'S Urban Futures	Anu Sabhlok	ICHR	2015-2016	₹ 225,000
68	INSPIRE-15-0099	INSPIRE Faculty Award	Divya Srivastava	DST	2016-2021	₹ 8,300,000
69	DST-15-0100	L-Functions And Iwasawa Theory	A. Chandrakant Sharma	DST	2016-2019	₹ 384,000
70	NACP-15-0101	National Carbonaceous Aerosols Programme	Baerbel Sinha	NACP	2015-2021	₹ 10,608,000
71	INSPIRE-16-0102	INSPIRE Faculty Award	Smriti Mahajan	DST	2016-2021	₹ 8,300,000
72	DST-16-0103	Optical Spectroscopy Of Trapped (And Patterned) Nano-Particles And (Macro) Molecules In Solution	Arijit Kumar De	DST	2016-2019	₹ 4,644,000
73	DBT-16-0104	Metabolic Engineering For The Production Of Carotenoid Torularhodin In Saccharomyces Cerevisiae And The	Anand K. Bachhawat	DBT	2016-2019	₹ 6,228,200

S.No.	Project No.	Project Title	Principal Investigator	Funding Agency	Duration	Sanctioned Cost
		Isolation Of Mutants For Increasing Flux In The Pathway				
74	DST-16-0105	Experimental Investigation Of Quantum Decoherence On An Nmr Quantum Information Processor	Kavita Dorai	DST	2016-2019	₹ 1,870,000
75	DST-16-0106	Functional And Trans- Regulatory Constraints Of Long-Rang Spatial Cross –Talk Among Genes	Kuljeet Singh Sandhu	DST	2016-2019	₹ 2,503,000
76	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	2016-2019	₹ 22,82,000
77	MAX-16-0108	Investigating Sub-Fs Electronic Process With Shaped Xuv And Ir Pulses	Kamal P Singh	DST-MPG	2016-2021	€ 20,000
78	INSPIRE-16-0109	Inspire Faculty Award	Debrina Jana	DST	2016-2021	₹ 95,00,000
79	DST-16-0110	High Filed Magneto-Transport & Spectroscopic Studies On Topologically Non-Trivial Systems At Kelvin Temperatures	Goutam Sheet	DST	2016-2019	₹ 435,64,573
80	DST-16-0111	Modern Problem In Low Dimensional Topology In Crossroad With Geometry And Algebra	Mahender Singh	DST	2016-2019	₹ 40,88,040
81	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
82	WFE-16-0113	Winter Fog Experiments	Vinayak Sinha	IITM Pune	2016-14	₹ 6,50,000
83	INSPIRE-16-0114	Inspire Faculty Award	Bimalendu Adhikari	DST	2016-2020	₹ 83,00,000
84	DST-16-0115	Central Simple Algebras With Derivations	Varadharaj R. Srinivasan & Amit Kulshrestha	DST	2016-2019	₹ 7,59,000
85	DST-16-0116	Molecular Structure And Supramolecular Packing Of Misfolded Proteins Within The Amyloid Nanostructures	S. Mukhopadhyay	DST	2016-2019	₹ 95,86,790
86	DBT-16-0117	Investigating The Role Of Local Auxin Biosynthesis In Stem Cell Differentiation	Ram Kishore Yadav	DBT	2016-2019	₹ 60,23,200

13 Opportunities Cell

Activities in the Opportunity Cell at IISER Mohali continued with new student recruits. The cell provided support for connecting interested students with external summer internships, job opportunities in companies like Sun Pharma, JD Pharma, and others. Dr. T. Ramasami, former Secretary DST, continued to interact with students. The cell also invited Dr. Pradip, Director, TRDC, Pune, to deliver a talk and spend time with students to explain possible opportunities and openings in industry. As was done last year, this year too, Prof. Sanjay Mandal, faculty-in-charge, held interactive sessions for discussing PhD programs in various countries, job opportunities and resume-writing. Further, students who obtained admission into PhD programs abroad starting in the fall of 2017 shared their experience for the important homework necessary for admissions. They talked about when to take the exams for proficiency in English, as well as how to shortlist institutions and communicate with institutes and universities. It appeared that about 25 percent of the students of BS-MS Batch 2012, graduating in the summer of 2017, obtained opportunities to pursue higher studies in different countries outside India like USA, Germany, UK, Singapore, etc.

14 Institute Library

An inner view of IISER Mohali library

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

The library provides access to essential and specialized resources which aid in teaching, learning, and research activities. In tune with recent advancements in the fields of Information and Communication Technology (ICT), IISER Mohali has set up a library with state of the art technology and world class infrastructure.

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

Library Services

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

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

Library Facilities

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

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

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

Library Resources

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

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

15 Computer Centre

Computer centre manages two computer teaching labs that double up as a general computer lab. In the two semesters during 2016 – 17, computer labs were used for eight courses with more than 400 students in all. This

is apart from the usage of labs by students at other times. Computer labs are open on all days. During semesters, labs are open for up to eleven hours on working days.

Computer centre completed the task of installation and testing of the institute wide network. Now computers in any part of the institute can connect with each other with data transfer rates of up to 10 Gbps. The networking setup has been designed with redundancy so that minor faults do not lead to a breakdown of services. There is also a network management system that makes the task of managing the system easy. Automated alarms are raised via e-mail or SMS in case of a failure.

The Internet connectivity has been upgraded from 64 Mbps to 100 Mbps for the BSNL network, and 100 Mbps to 1 Gbps for the NKN network in this year.

A review of the network services was undertaken with the help of external experts and an agenda was drawn up for improvement of the Wifi network and network services in the coming years.

A workshop on system administration and network services on Linux was organized by the computer centre. The workshop was arranged with help from CDAC Pune during April 4 - April 15, 2016.

A code modernization workshop was held during September 6 - 7, 2016. This workshop was sponsored by Intel.

16 National Institutional Ranking Framework (NIRF) rank

In 2017, IISER Mohali ranked 52 in the overall category, in the NIRF rankings. The results were declared in the spring of 2017. The ceremony in which the rank and plaque (shown above) were awarded to IISER Mohali was attended by Professor N. Sathyamurthy, Director, and Professor Sanjay Mandal, Nodal Officer. To systematically submit enormous amounts of data to the NIRF in the required format, Professor Mandal worked hard with different sections of the institute, to collect, analyze and compile data regarding faculty and student

strength, publications during the last three years, external funding received, money spent for infrastructure and equipment, placement of students, fellowships being drawn by students, and other factors. 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 was considered under the overall category, which included all Universities/Institutes/Colleges.

17 Lectures by Visitors

17.1 Public Lectures

1. October 27, 2016 : **Professor Rajesh S. Gokhale**, CSIR-Institute of Genomics & Integrative Biology, New Delhi : *Renewing the romance in a love-lost marriage: Bioentrepreneurship in India*

2. September 27, 2016 : **Professor Ashutosh Sharma**, Secretary, Department of Science and Technology, New Delhi : *Delights of Doing Research: Some Personal Lessons from Translational Sciences*

3. August 13, 2016 : **Professor Mriganka Sur**, Paul E. and Lilah Newton Professor of Neuroscience, Director of the Simons Center for the Social Brain, & Investigator, Picower Institute for Learning and Memory, Massachusetts Institute of Technology (MIT) : *The Neural Architechure of Cognition*

4. May 12, 2016 : **Professor Indranil Manna**, J.C. Bose Fellow & Director, Indian Institute of Technology, Kanpur, Vice President, Indian National Academy of Engineering, Vice President, Indian Institute of Metals, Coordinator IMPRINT-India *Materials Science & Engineering & Technology : Challenges & Opportunities*

17.2 Institute Colloquia

1. March 29, 2017 : **Kalidas Sen**, School of Chemistry, University of Hyderabad : *Energy-Density relationship and scaling properties of net information measures for quantum spherical model potentials*.

2. March 14, 2017 : **Debabrata Goswami**, Department of Chemistry, IIT Kanpur : *Towards controlling the dynamics of complex systems: vibrating molecules, colloidal clusters and mixed liquids*.

3. March 08, 2017 : **Harbans Mukhia** : *Evolving Contours of Indian History: A Retrospective*.

4. March 07, 2017 : **Srihari Keshavamurthy**, Department of Chemistry, IIT Kanpur : *Chemical reaction dynamics - a postmodern view*.

5. March 01, 2017 : **K. B. Sinha**, JNCASR Bangalore : *Theories of Integration, Statistical Mechanics and Tomita-Takesaki's Theorem*.

6. February 22, 2017 : **Anil Koul**, Director, Institute of Microbial Technology, Chandigarh : *Discovery and development of a novel TB drug Bedaquiline: The Value of Innovation for Neglected Diseases*.

7. February 15, 2017 : **Sushanta Dattagupta**, Former Director, IISER Kolkata : *Diffusion*.

8. February 02, 2017 : **Ira A. Levine**, University of Southern Maine, USA and USIEF Nehru Fulbright Distinguished Chair : *Microalgae cultivation, education, bioproducts, biofuel and biotechnology*.

9. February 01, 2017 : **Gaiti Hasan**, National Centre for Biological Sciences (NCBS), TIFR, Bangalore : *Modulation of neuronal function by intracellular calcium signaling*.

10. January 30, 2017 : **Richard Zare**, Stanford University, Stanford, California, USA : *Microdroplet Chemistry: From Accelerating Reactions to Cancer Diagnostics*.

11. Decemeber 09, 2016 : **R. J. Dwayne Miller**, The Max Planck Institute for the Structure and Dynamics of Matter, The Hamburg Centre for Ultrafast Imaging and Departments of Chemistry and Physics, University of Toronto : *Mapping Atomic Motions with Ultrabright Electrons: Realization of the Chemists Gedanken Experiment*.

12. November 24, 2016 : **Partha Ghose**, Honorary Scientist of the National Academy of Sciences, India : *The birth of wave-particle duality, quantum statistics and wave mechanics*.

13. November 02, 2016 : **Jean Paul Thiery**, Toh Chin Chye Visiting Professor, Yong Loo Lin School of Medicine, National University of Singapore Research Director CNRS Emeritus CNRS, Matter and Complex Systems University Paris Denis Diderot, Paris, France Research Director Emeritus Inserm and Comprehensive Cancer Center Institut Gustave Roussy, Villejuif, France : *Mechanobiology of cadherin-mediated adhesion; impact on liver organogenesis*.

14. August 29, 2016 : **Seiichiro Nakabayashi**, Vice-Rector, Saitama University, Japan : *Nano -Biomechanics for Preventing Cancer Metastasis*.

15. August 03, 2016 : **Alex Ibhadon**, Department of Chemical Engineering and Chemistry, The University of Hull, UK : *People, Planet, Earth Sustainable Synthesis of Fine Chemicals*.

17.3 Institute Seminars

1. March 31, 2017 : Nitin Nitsure, TIFR Mumbai: *Euclidean Geometry Revisited*

2. March 31, 2017 : Shalini Bhattacharya, Bar-Ilan University, Israel: *On the reduction of Galois representations*

3. March 31, 2017 : J.B.P. More : *Geopolitical and Strategic Implications of the Partition of India*

4. March 30, 2017 : Aloka Parasher-Sen, Department of History, University of Hyderabad : *Documenting Tangible and Intangible Heritage of Small Localities*

5. March 29, 2017 : : Shalini Bhattacharya, Bar-Ilan University, Israel : *Certain mod p representations of* $GL_{n+1}(F_q)$

6. March 28, 2017 : Ling-Kang Liu, Institute of Chemistry, Academia Sinica, Nangang, Taipei : *Structural chemistry of classical compound (2,2'-bipyridine)*$PtBr_2$ *and its novel derivatives with a fluorous side chain*

7. March 27, 2017 : N. G. Roy, Amity University Noida : *Hydro-geomorphic characterisation and Late Quaternary Stratigraphy of the western Ganga Plains: Rhythmic Sequences and Monsoonal Forcing*

8. March 24, 2017 : Prabeer Barpanda, Indian Institute of Science Bangalore : *Developing Fe-based Battery Electrode Materials: Few Case Studies*

9. March 24, 2017 : Bhargava Ram Niraghatam, Indian Institute of Science Education and Research Bhopal : *Imaging chirality in molecules with ultrashort UV and VUV light sources*

10. March 23, 2017 : Subhadip Ghosh, IOP Bhubaneshwar : *Dynamics of filaments and motor protein complexes*

11. March 23, 2017 : Atikur Rahman, IISER Pune : *3D nanopatterning and applications of block copolymer*

12. March 20, 2017 : Sanjay Premi, Yale University School of Medicine, USA : *Shedding Light on dark side of the melanin: Uv-Signature DNA Damage Without UV*

13. March 17, 2017 : Sreeramaiah Gangappa, Department of Cell & Developmental Biology, John Innes Centre Norwich, UK : *Temperature mediated regulation of plant growth and immunity*

14. March 16, 2017 : Suratna Das : *Cosmology as a testing ground of Quantum Mechanics*

15. March 16, 2017 Ritesh Kumar, Texas A & M, Health Science Center, Houston, Texas, USA : *Microbes meet cancer: Role of Streptococcus gallolyticus in colorectal tumor development*

16. March 15, 2017 : Prasad Kasturi, Max-Planck Institute for Biochemistry, Martinsried, Germany : *Proteostasis during stress and aging in C.elegans*

17. March 14, 2017 Shane D'Mello, IISER Pune : *Some results in the topology of real algebraic varieties*

18. March 14, 2017 : Neeraja Sahasrabudhe, IIT Bombay : *Interacting Urn Processes and applications*

19. March 10, 2017 : Anirban Bose, IMSc Chennai : *Real elements in groups of type* F_4

20. March 09, 2017 : Sivaram Arepalli, Department of Chemical and Biomolecular Engineering, Rice University, USA : *Nanostructures for Energy Storage*

21. March 07, 2017 : Diganta Das, PRL Ahmedabad : *Search for physics beyond the Standard Model in b-quark to s-quark plusdi-lepton and b-quark to s-quark plus di-neutrino transitions: Overcoming hadronic and background uncertainties*

22. March 06, 2017 : Srinivas Bikkina, Bolin Center for Climate Research, Stockholm University, Sweden : *Atmospheric Carbonaceous aerosols & Nutrients over the Northern Indian Ocean: Sources, transport & biogeochemical significance*

23. March 06, 2017 : Srihari Keshavamurthy, Department of Chemistry, IIT Kanpur : *Anatomy of a rare trajectory*

24. March 03, 2017 : Sunil Patil, Institute of Environmental and Sustainable Chemistry, Technische Universität Braunschweig, Germany : *Electrifying the environmental biotechnology*

25. March 03, 2017 : Jugal K. Verma, IIT Bombay : *Counting Zeros of Multivariate Laurent Polynomials and Mixed Volumes of Polytopes*

26. March 03, 2017 : Kankan Bhattacharyy, IISER Bhopal : *Physical Chemistry in Single Live Cells*

27. February 23, 2017 : Laboratory for Surface Science and Technology, Department of Materials, ETH Zurich : *Tuning tribological and mechanical properties of surfaces by gradient and graded fabrication*

28. February 17, 2017 : Kush Saha, MPI for the Physics of Complex Systems, Dresden, Germany : *Band topology and interaction-driven phase transition*

29. February 17, 2017 : Krishna Maddaly, Ashoka University New Delhi : *Point processes associated with random operators*

30. February 17, 2017 : Gauhar Abbas, IISc Bangalore : *Spontaneous breakdown of parity in a class of gauge theories*

31. February 14, 2017 : V. Pavan Kumar, Fritz Haber Institute, Berlin, Germany: *Frontier molecular orbitals of* CO_2 *on ZnO surfaces: Time-resolved photoelectron spectroscopy*

32. February 10, 2017 : Souradeep Majumder, ISI Bangalore : *Bundles on Root Stacks*

33. February 10, 2017 : Pramod Kumar, LMEE, Université d'Evry-Val d'Essonne, Evry Cedex, France : *Atmospheric Dispersion and Retrieval of the Unknown Emissions in Urban and Non-Urban Environments*

34. February 09, 2017 : Pavan K. Kancharla, : California Institute of Technology, California, USA : *Glycochemistry enroute to Glycobiology*

35. February 09, 2017 : Anoop Ambili, Indian Institute of Science Education and Research Mohali : *Inverse relation between summer and winter monsoon strength during late Holocene: continental molecular isotopic record from the Indian subcontinent*

36. February 03, 2017 : Samrith Ram, Harish-Chandra Research Institute, Allahabad : *Splitting Subspaces of Linear Transformations over Finite Fields*

37. February 03, 2017 : Sangeeta Thakur, Elettra Beam Line, Trieste Italy : *Electronic structure: High resolution and angle resolve photoemission Spectroscopy*

38. February 01, 2017 : Gopakumar Ramakrishnan, University of Glasgow, UK : *Probing ultrafast dynamics using terahertz spectroscopy*

39. January 27, 2017 : Arnab Mitra, Technion-Israel Institute of Technology : *On local symplectic periods on general and unitary groups*

40. January 27, 2017 : Ashis Biswas, Bayreuth Center of Ecology and Environmental Research (BayCEER), University of Bayreuth, Germany : *Geochemistry of Arsenic in Natural and Mining Impacted Aquatic Environments*

41. January 24, 2017 : Krishanu Ray Department of Biological Sciences, Tata Institute of Fundamental Research Mumbai : *Tale of Tails and some Collaborators of Kinesin-2*

42. January 23, 2017 : Prem Lama, Department of Chemistry and Polymer Science, Stellenbosch University, South Africa : *Anomalous Thermal Expansion Behaviour in Thermo Responsive Compounds*

43. January 19, 2017 : Suryadeep Dash Robarts Research Institute, Western University, Ontario, Canada : *How the brain commits to an action: perspectives from primate oculomotor system*

44. January 19, 2017 : Satya Prakash, The City University of New York, NY, USA : *Satellite-based Precipitation Estimation and Evaluation: An Indian Perspective*

45. January 18, 2017 : Dr Jino George, University of Strasbourg, France : *Fundamentals and Applications of Strong Light-Molecule Interactions*

46. January 18, 2017 : Jogender S Tushir, University of Virginia School of medicine, Charlottsville Virginia, USA : *A Novel Symbiotic Approach For Targeted Ovarian Cancer Therapy*

47. January 17, 2017 : Ramaswamy Murugavel, Department of Chemistry, IIT Bombay : *Framework Zinc Phosphates and 4f Single Ion Magnets*

48. January 16, 2017 : Jose Sebastian, Carnegie Institution for Science, Stanford University, USA : *Dealing with stress: crop roots enact austerity measures during drought to bank water*

49. January 13, 2017 : C.P. Anil Kumar, ISI Bangalore : *Permutation Representations of the Orbits of the Automorphism Group of a Finite Module over Discrete Valuation Ring*

50. January 12, 2017 : Rudra Sekhar Manna, Augsburg University, Germany : *Low-dimensional frustrated quantum magnets in honeycomb and triangular lattices*

51. January 12, 2017 : Manoj B. Gawande, Department of Physical Chemistry, Palacky University, Olomouc, Czech Republic : *Advanced Nanomaterials – Synthesis and Applications in Catalysis and Organic transformations*

52. January 06, 2017 : Jyotirmoy Bhattacharya, TIFR Mumbai : *Some geometrical aspects of quantum field theories at strong coupling*

53. January 06, 2017 : Soma Maity, Ramakrishna Mission, Belur : *On the stability of L^p-Norms of Riemannian Curvature*

54. January 05, 2017 : Venkat Venkataraman, John A. Paulson School of Engineering and Applied Sciences, Harvard University : *Nonlinear photonics in confined media*

55. January 05, 2017 : Sunita Vatuk : *Kolam-Makers: Mathematical Thinking in a Women's Art*

56. January 04, 2017 : Arindam Banerjee, Purdue University, USA : *Homological Algebra of Ideals Related to Finite Simple Graphs*

57. January 02, 2017 : Rahul Jain, University of Southern California, LA, USA : *A Random Operator Approach to Stochastic Control and Optimization*

58. December 29, 2016 : Ajit Chande, Laboratory of Virus-Cell Interaction Centre for Integrative Biology (CIBIO), University of Trento : *A novel family of antiretroviral genes*.

59. Decemeber 14, 2016 : Jagdish K Vij, School of Engineering, Department of Electronic Engineering, Trinity College Dublin : *Electro-optical effects in bent-core orthogonal smectic phases and spontaneous helix formation in a tilted B2 Smectic phase of an achiral BC system with fast linear electro-optic effect*.

60. Decemeber 12, 2016 : Mridusmita Saikia, The Baker Institute for Animal Health, College of Veterinary Medicine, Cornell University, USA : *Exploring Gene Expression at High Resolution*.

61. Decemeber 09, 2016 : Todd Drumm, Howard University, USA : *Lorentzian Geometries*.

62. Decemeber 01, 2016 : Arghya Mondal, IMSc Chennai : *Cohomology of compact locally symmetric spaces*.

63. Decemeber 01, 2016 : Sourav Chatterjee, University of Florida, USA : *Star Cluster Dynamics and Merging Black Hole Binaries*.

64. November 25, 2016 : Hena Das, University of California, Berkeley, USA : *Origin of multiferroicity in the hexagonal manganite and ferrite systems*.

65. November 25, 2016 : Santanu Bakshi, Iowa State University, USA : *Biochar for Environmental Management*.

66. November 22, 2016 : Vikrant Saxena, Center for Free-Electron Laser Science, DESY, Hamburg, Germany : *Simulating laser matter interactions*.

67. November 22, 2016 : Pankaj Kumar, Senior Researcher with Geodesy and Navigation Department of the Centre Tecnologic de Telecomunicacions de Catalunya (CTTC) : *Automated Approaches for Information Modelling from 3D LiDAR Point Cloud Data*.

68. November 18, 2016 : Amit Samanta, IIT Kanpur : *Wiener Tauberian Theorem for rank one semisimple Lie groups*.

69. November 16, 2016 : Radha Kessar, City University of London : *Blocks of finite reductive groups and local-global conjectures is representation theory*.

70. November 15, 2016 : S. R. C. Vivek Chand, Founder & CEO, Sensal Technologies : *Switchable Plasmonic Nanostructures*.

71. November 15, 2016 : Farooq Azam, Water Resources Systems Division, National Institute of Hydrology Roorkee : *Status of Himalayan glaciers: A case study of Chhota Shigri Glacier*.

72. November 11, 2016 : Vikas Vikram Singh, University of Paris Sud : *Existence and Characterization of Nash Equilibrium for Chance-Constrained Games*.

73. November 11, 2016 : Nayanjot Lahiri, Ashoka University : *Heritage at the Intersection of Politics and People – India's Archaeological Heritage since Independence*.

74. November 10, 2016 : Mithun Biswas, Biomolecular Dynamics, University of Freiburg, Germany : *Molecular Dynamics Simulations of Biomolecules: from Structural Dynamics to Protein Folding*.

75. November 10, 2016 : Nayanjot Lahiri, Ashoka University : *Ashoka as a Universal Indian – Biography and Archaeology*.

76. November 10, 2016 : Srimonta Gayen, Department of Human Genetics, University of Michigan Medical School : *Epigenetic regulation by long non-coding RNAs and histone modifiers through the lens of X-chromosome inactivation*.

77. November 10, 2016 : Ratheesh Kumar, Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences, Urumqi, China : *Earth Scope Experiment of integrating geophysical and geological techniques to explore the structure and tectonic evolution of the terrestrial lithospheric provinces*.

78. November 10, 2016 : Binay Panda, Ganit Labs, Institute of Bioinformatics and Applied Biotechnology (IBAB), Bangalore : *The devil is in the detail: How data integration can help understand key facets of cancer better*.

79. November 09, 2016 : Ms. Pallavi Kaila : *An 'unusually versatile' glucanotransferase from P. furiosus*.

80. November 08, 2016 : Debashree Ghosh, Physical and Materials Chemistry Division, CSIR-NCL, Pune : *Understanding electron transfer processes in complex environments - Hybrid QM/EFP approach*.

81. November 07, 2016 : Ajay K. Singh, Center of Applied Microfluidic Chemistry, POSTECH, South Korea : *Flask to smart micro-total process machine (u-TPM) for on demand chemical synthesis*.

82. November 04, 2016 : Sandeep Sukumaran, Center for Prototype Climate Modeling, New York University Abu Dhabi, UAE : *Response of Monsoon Low Pressure Systems to a Warming Environment*.

83. November 04, 2016 : Abhishek Srivastava, Hong Kong University of Science and Technology, Hong Kong : *Photo Alignment of Nano-Materials (Anisotropic): A New Dimension*.

84. October 31–November 03, 2016 : T. Padmanabhan, IUCAA, Pune : *Geometry of Space-Time*.

85. November 03, 2016 : Tulasi Parashar, University of Delaware : *Kinetic Physics of Turbulent Collisionless Astrophysical Plasmas*.

86. November 03, 2016 : Panchmi Prabhakaran, Chemistry Department NIT Calicut, Kerala : *Peptides, Proteins and DNA: Inspiring systems to the development of synthetic biomimetic molecules*.

87. November 03, 2016 : Manish Joshi, Indian Institute of Tropical Meteorology, Pune : *Climate Variability and its Teleconnections with Indian monsoon: An Observational and Modeling Approach*.

88. November 02, 2016 : Partha Chatterjee : *The Rights and Wrongs of Azaadi*.

89. October 28, 2016 : Suman Ahmed, IISER Mohali : *Root numbers and parity of local Iwasawa invariants*.

90. October 28, 2016 : Vrinda Nabar, Goa University : *Unveiling the Purdah of the Mind: The Anxieties of Indian Feminism*

91. October 27, 2016 : Samarendra Maji, Department of Organic and Macromolecular Chemistry, UGent, Ghent, Belgium : *State of the art polymer architecture design: from industrial to biomedical applications*

92. October 27, 2016 : Vrinda Nabar, Goa University : *Revisiting Mahabharat: An Individual Perspective*

93. October 24, 2016 : Amal Kumar Mandal, University of Namur, Belgium : *Organic-Inorganic Nano-Hybrid for Bio-imaging and Optoelectric application*

94. October 24, 2016 : Viji V. Subramanian, New York University : *Control of DNA Breakage and Repair During Meiosis*

95. October 21, 2016 : Shilpa Gondhali, University of Haifa : *Higher Toda brackets*

96. October 21, 2016 : P. K. Madhu, TIFR Mumbai and TIFR Centre for Interdisciplinary Sciences, Hyderabad : *Structural Reorganization Accompanying Aggregation*

97. October 21, 2016 : Nisha Kapoor, School of Biotechnology, University of Jammu : *Studies on signaling events in Mycobacterium bovis BCG infected macrophages*

98. October 20, 2016 : Sudipta Kanungo, Max Planck Institute for Chemical Physics of Solid : *Interplay of spin, lattice and orbitals in the 5d oxides: microscopic insight from first principles approach*

99. October 20, 2016 : Pankaj Kumar, Johns Hopkins School of Medicine, Baltimore : *Structure-Based Drug Designing against Infectious Diseases*

100. October 19, 2016 : Pritam Ganguly, Department of Chemistry and Biochemistry, University of California at Santa Barbara, USA : *Understanding the stability and the conformational changes of proteins in mixed osmolytes*

101. October 19, 2016 : T.R. Govindarajan, Chennai Mathematical Institute : *Quantum black hole and Hydrogen atom*

102. October 18, 2016 : Sandeep Gautam, Universidade Estadual Paulista, Sao Paulo : *Phase Separation and Bright Solitons in Spin-Orbit Coupled Spinor Condensates*

103. October 14, 2016 : Swadheenanada Pattanayak, Institute of Mathematics and Applications, Bhubneswar : *Stochastic Fourier Series*

104. October 14, 2016 : Kinjalk Lochan, IUCAA Pune : *Exploring Quantum Correlations in Curved Spacetime*

105. October 14, 2016 : Johannes Kofler, Max Plank Institute for Quantum Optics (MPQ), Germany : *Loophole-free test of Bell's theorem with entangled photons*

106. October 13, 2016 : Subhanker Bedanta, NISER Bhubaneswar : *Effect of anisotropy, interactions and interface on domains and domain walls in ferromagnetic films*.

107. October 07, 2016 : Anuradha Gupta, IUCAA Pune : *Gravitational waves from black hole binaries*

108. October 06, 2016 : Ajit Singh, Department of Earth Sciences and Engineering, Imperial College London, UK : *Chron-stratigraphy, sediment provenance and geochemistry based approaches and their implications in river sciences*

109. September 29, 2016 : Shubhabrata Das, Presidency University, Kolkata : *Controlled Floyd Separation and a Non-Relatively Hyperbolic Group*

110. September 28, 2016 : V. Srinivas, TIFR Mumbai : *Introduction to Algebraic K-Theory*

111. September 26, 2016 : Viswesh Marthi, NCRA-TIFR : *Towards detecting redshifted HI with the Ooty Wide Field Array*

112. September 23, 2016 : N. Mukunda, Honorary Professor, IISER Mohali : *The nature of scientific knowledge-some reflections*

113. September 22, 2016 : N. Mukunda, Honorary Professor, IISER Mohali : *On Noether's Theorem in Classical Dynamics Continuous Symmetries and Conservation Laws for physical systems*

114. September 22, 2016 : Suchi Goel, Karolinska Institutet, Sweden : *Molecular switching in Plasmodium: Is it the key to its success?*

115. September 22, 2016 : Syamal Roy, Vice Chancellor, Cooch Behar Panchanan Barma University, West Bengal : *Anxiety and creativity: tuberculosis as a metaphor*

116. September 15, 2016 : Mainak Guha Roy, VIB Structural Biology Research Center, Vrije Universiteit Brussel, Belgium : *Disordered regions regulate protein degradation by the ubiquitin proteasome pathway*

117. September 09, 2016 : Anilatmaja Aryasomayajula, IISER Tirupati : *Estimates of automorphic forms and the QUE conjecture*

118. September 08, 2016 : Amitava Bhattacharya, Rutherford Appleton Lab, UK : *Experimental CMP*

119. Spetember 02, 2016 : Shameek Paul, CBS Mumbai : *On the fundamental group of hyperelliptic fibrations*

120. August 26, 2016 : Buddhananda Banerjee, IISER Kolkata : *Linear Increment in Efficiency with the Inclusion of Surrogate Endpoint*

121. August 25, 2016 : Chetan Choithani, University of Sydney : *Understanding the linkages between migration and household food security in India*

122. August 22, 2016 : Ashutosh Kumar Mishra : *The multifaceted genetic material: A journey through nucleobases to DNA*

123. August 19, 2016 : Rajendra Pant, VNIT Nagpur : *Metric Fixed Point Theory And Some Recent Developments*

124. August 18, 2016 : Peter Wong, Bates College, Maine, USA : *What are torus homotopy groups?*

125. August 18, 2016 : Raj Kumar Roy, Department of Molecular Design and Engineering Graduate School of Engineering, Nagoya University, Japan : *Design, Synthesis and Folding of Sequence-Controlled Polymer Chain*

126. August 17, 2016 : Abhay Sagade, University of Cambridge : *Interaction between moisture and graphene: permeation encapsulation For the graphene and From the graphene*

127. August 16, 2016 : Rajeev Kumar Jain, University of Southern Denmark : *Cosmological Inflation and Primordial Magnetic Fields*

128. August 12, 2016 : Santosh Kumar Das, University of Catania : *Probing Quark Gluon Plasma by Heavy Quarks*

129. August 12, 2016 : Sutanu Roy, ISI Kolkata : *Semidirect product of compact quantum groups*

130. August 10, 2016 : Saikat Das, Rutgers University : *Relative hyperbolicity of* $Out(A_1 * A_2 * A_3 * A_4)$

131. August 09, 2016 : Ram Mohan, Department of Chemistry, Illinois Wesleyan University, Bloomington, USA : *Ethics in Research*

132. August 09, 2016 : Sumedha Chinnari, Malkolak Institute if Marine Studies, Goa : *Peri-vitelline fluid of the fertilized eggs of horseshoe crab - a potential source of bioactive compound*

133. August 08, 2016 : Anil Chatterji, Malkolak Institute if Marine Studies, Goa : *Importance of marine organisms in biomedical research*

134. August 04, 2016 : Sanchita Sengupta, Interdisciplinary Centre for Energy Research (ICER), Indian Institute of Science, Bangalore : *Molecular and Supramolecular Engineering of Organic Pigments for Optoelectronic Applications*

135. July 22, 2016 : Mr. Yuji Nishikawa, India Liaison Representative, Japan Science and Technology Society : *JST activities and the Sakura Science Plan (SSP)*

136. July 22, 2016 : Dipankar Nandi, IISc Bangalore : *Infection-induced thymic atrophy*

137. June 24, 2016 : Pooja Singla, IISc Bangalore : *Regular characters of general linear groups over principal ideal local rings*

138. June 14, 2016 : Indranil Banerjee, Friedrich Miescher Institute Basel and Novartis, Switzerland : *Influenza virus capsid disassembly: how a hard nut cracks itself to infect cells by carjacking molecular motors*

139. June 08, 2016 : Ritobrata Goswami, Division of Biological & Life Sciences, Ahmedabad University : *The Nine (IL-9) lives on: Transcriptional regulation of IL-9-secreting T cells and beyond*

140. June 03, 2016 : Anurag P. Sunda, Central University of Haryana, Haryana : *Atomistic Simulations of Protic Ionic Liquids and their Nafion Composite as Anhydrous Fuel Cell Electrolytes*

141. June 02, 2016 : Debrina Jana, Indian Institute of Science Education and Research Pune : *Nanostructured materials and films for functional applications: catalysis, biosensing, plasmonics*

142. May 27, 2016 : Vikram Singh, Department of Chemical Engineering, POSTECH, South Korea : *Surface-confined heteroleptic Cu(II)-polypyridyl complexes as photonucleases*

143. May 20, 2016 : Bimalendu Adhikari, Chiba University : *Supramolecular Polymers of Small Building Blocks: From Molecules to Materials*

144. May 16, 2016 : Sandeep Kumar, Raman Research Institute, Bangalore : *Playing with Discs*

145. May 13, 2016 : Sarthok Sircar, University of Adelaide : *Multi-scale modeling in particulate suspensions and biofluids*

146. May 12, 2016 : Jagdish K. Vij, Trinity College Dublin, the University of Dublin, Ireland : *Electro-optical effects in bent-core LC systems*

147. May 12, 2016 : N. C. Mondal, CSIR-National Geophysical Research Institute : *Development of scientific methodologies for assessing groundwater dynamics in a tannery belt, Southern India*

148. May 06, 2016 : Ajay Singh Thakur, ISI Bangalore : *A Construction of non-Kahler complex manifolds*

149. May 06, 2016 : Ashima Bhattacharjee, S. N. Pradhan Centre For Neurosciences, University Of Calcutta : *Cellular Redox Perturbations-Implications in Copper Homeostasis Disorders*

150. April 29, 2016 : Prabhakar Sharma, Nalanda University, Rajgir, Nalanda : *Nanomaterials in Soil Environment*

151. April 29, 2016 : V. Chandrasekhar, Director, NISER Bhubaneswar : *New Families of Single-Molecule and Single-Ion Magnets*

152. April 25, 2016 : Atin Pal, Weizmann Institute of Science, Israel : *Noise in graphene and nonlocal transport in InAs/GaSb composite quantum well*

153. April 25, 2016 : Bhaskar Bhadra, Industrial Biotechnology (Cell Factory Engineer), Hyderabad : *Technology commercialization with special emphasis on Microbial Cell Factory*

154. April 22, 2016 : K. L. N. Deepak, University of Ottawa, Canada : *3D Micro/nano-structuring of materials using ultrafast lasers towards photonic applications*

155. April 21, 2016 : Jaivardhan Sinha, S. N. Bose National Centre for Basic Sciences, Kolkata : *Magnetization Dynamics of Materials for Spintronics and Magnonic Devices : Investigation Using Current and Light*

156. April 18, 2016 : George John, Department of Chemistry and Biochemistry, The City College of the City University of New York, USA : *Functional Materials - Biomass as A Platform for Molecular*

157. April 15, 2016 : Srimanta Middey, Department of Physics, University of Arkansas, USA : *Artificial quantum materials with correlated electrons*

158. April 15, 2016 : Lakshmi Arya, Jawaharlal Nehru University, New Delhi : *The Five Blind Men and the Elephant: On the Question of Truth in the Sciences of the West*

159. April 13, 2016 : Arvind Singh, Physical Research Laboratory : *Bioavailable Nitrogen fluxes in the Northern Indian Ocean*

160. April 12, 2016 : Rajendra Prasad Pandey, National Institute of Hydrology, Roorkee : *Relationship of Regional Climatic Parameters with Drought Characteristics*

161. April 11, 2016 : Rajneesh Bhutani, Department of Earth Sciences, Pondicherry University : *Mantle differentiation during early Earth history: constraints from 146-147Sm-142-143Nd studies*

162. April 08, 2016 : Niranjan Uppoor, IIT Kanpur : *Event Representation in Causative Constructions: Figure-ground Alignment of Cause and Effect*

163. April 08, 2016 : Souvik Chatterjee, Guest Research Associate, Institute of Advanced Energy, Kyoto University : *Ultrashort laser induced manipulation of atoms and molecules*

164. April 05, 2016 : Manimala Mitra, IISER Mohali : *Probing the Origin of Neutrino Mass with Experimental Searches*

165. April 04, 2016 : Sandeep Kumar, Central University Rajasthan : *Highly Mn ion doped GaAs nanowires and their transport properties*

166. April 01, 2016 : Ketan Patel, IISER Mohali : *The Flavour Puzzle and Grand Unification*

167. April 01, 2016 : K. Paradesi, IIT Madras : *The Fiscal Performance of the Indian States*

18 Postdoctoral fellows at the Institute

1. **Anupa Majumdar** (*Biology*)
2. **Arpana Kumari** (*Biology*)
3. **Banani Chattopadhyay** (*Biology*)
4. **Monika Mahajan** (*Biology*)
5. **Nidhi Kumari** (*Biology*)
6. **Poonam Sharma** (*Biology*)
7. **Pratima Pandey** (*Biology*)
8. **Rajinder Kumar** (*Biology*)
9. **Ranjai Kumar** (*Biology*)
10. **Ranjana Jaiswara** (*Biology*)
11. **Rochishnu Dutta** (*Biology*)
12. **Sourav Singha Roy** (*Biology*)
13. **Tripti Negi** (*Biology*)
14. **V. Mahandran** (*Biology*)
15. **Yogesh Dahiya** (*Biology*)
16. **Anamika Mukhopadhyay** (*Chemistry*)
17. **Ankita Bose** (*Chemistry*)
18. **Debadutta Deb** (*Chemistry*)
19. **Dilip K Palunu** (*Chemistry*)
20. **Gaganpreet** (*Chemistry*)
21. **Gowri Jayamurugan** (*Chemistry*)
22. **Jagdeep Grover** (*Chemistry*)
23. **Jesse Sebastian Samuel** (*Chemistry*)
24. **P. Esakki Karthik** (*Chemistry*)
25. **Prasanta Bhowmik** (*Chemistry*)
26. **Prinka Singla** (*Chemistry*)
27. **Rajib Kumar Nandi** (*Chemistry*)
28. **Rishu Dhiman** (*Chemistry*)
29. **Santosh Prasad Gupta** (*Chemistry*)
30. **Shivendra Singh** (*Chemistry*)
31. **Somrita Mondal** (*Chemistry*)
32. **Navpreet Kaur** (*Humanities & Social Sciences*)
33. **Saleem Shaik** (*Humanities & Social Sciences*)
34. **Shilpi Rajpal** (*Humanities & Social Sciences*)
35. **Abhay Soman** (*Mathematics*)
36. **Charu Goel** (*Mathematics*)
37. **Dishari Chaudhuri** (*Mathematics*)
38. **Kalyan Banerjee** (*Mathematics*)
39. **Makoto Sakagaito** (*Mathematics*)
40. **Pritam Ghosh** (*Mathematics*)
41. **Sugandha Maheshwary** (*Mathematics*)
42. **Suman Ahmed** (*Mathematics*)
43. **Ajaydeep Kachhvah** (*Physics*)
44. **Ankan Mukherjee** (*Physics*)
45. **Arun** (*Physics*)
46. **Jayanta Dutta** (*Physics*)
47. **M. Suman Kalyan** (*Physics*)
48. **Mamta Gulati** (*Physics*)
49. **Manabendra Sharma** (*Physics*)
50. **Mehra Singh Sidhu** (*Physics*)
51. **Minaxi Sharma** (*Physics*)
52. **Neetika** (*Physics*)
53. **Ram Lal Awasthi** (*Physics*)
54. **Shilpa Sanwlani** (*Physics*)
55. **Shri Krishna** (*Physics*)
56. **Sirshendu Gayen** (*Physics*)
57. **Yogyata Pathania** (*Physics*)

19 Graduates of 2016

19.1 BS-MS Graduates

S.No.	Name	Reg. No.	Major
1	Devender Kumar	MS09049	Chemistry
2	Gursharanjeet Sandhu	MS09055	Chemistry
3	Shahanaz Nazar	MS10010	Biology
4	Geetananda Thingujam	MS10022	Chemistry
5	Shivam Umarvaishya	MS10044	Physics
6	Aniket Gaur	MS10050	Mathematics
7	Vikram Sharma	MS10055	Physics
8	Sekhar. M. A	MS10058	Biology
9	Samant Manas Arun	MS10064	Biology
10	Tara George	MS10076	Physics
11	Arul Ganesh. S. S	MS10096	Mathematics
12	Ravinder Singh	MS10103	Chemistry
13	Bangal Yogesh Manga	MS10114	Biology
14	Athira J. Nair	MS11001	Biology
15	Arpit Porwal	MS11002	Mathematics
16	Atul Singh Arora	MS11003	Physics
17	Biplob Kumar Nandy	MS11004	Physics
18	Saumya Gupta	MS11005	Biology
19	Srijit Mukherjee	MS11006	Chemistry
20	Abhishek	MS11009	Mathematics
21	Joydeep Chakravarthy	MS11010	Physics
22	Love Grover	MS11011	Physics
23	Garima Singh	MS11012	Physics
24	Neha Sharma	MS11014	Mathematics
25	Kishor Bharti	MS11016	Physics
26	Vivek Sagar	MS11017	Physics
27	Rajendra Singh Bhati	MS11019	Physics
28	Prashansa Gupta	MS11021	Physics
29	Diksha Jain	MS11022	Physics
30	Shiven Dhiman	MS11023	Biology
31	Akshey Sandhu	MS11024	Chemistry
32	Ritu Roy Chowdhury	MS11025	Biology
33	Abhinav Kala	MS11026	Physics
34	Jopaul Mathew	MS11027	Chemistry
35	Akhilrag K	MS11028	Chemistry
36	Athira T. John	MS11029	Chemistry
37	Akhil Francis	MS11030	Physics
38	Anooja Jayaraj	MS11031	Physics

S.No.	Name	Reg. No.	Major
39	Shubham Chauhan	MS11032	Biology
40	Manu J	MS11033	Mathematics
41	Sruthi Mohan	MS11034	Chemistry
42	Evelyn Abraham	MS11035	Biology
43	Manisha	MS11036	Chemistry
44	Amritha Sreekumar	MS11037	Biology
45	Sandhya Singh	MS11038	Chemistry
46	Justin K. Thomas	MS11039	Chemistry
47	Aakanksha Rawat	MS11040	Biology
48	Varun Kumar	MS11041	Biology
49	Yashpal Singh	MS11042	Biology
50	Gaikwad Akshay Ramdas	MS11043	Physics
51	Manvendra Singh	MS11044	Physics
52	Shwetha S	MS11045	Chemistry
53	Tess George	MS11046	Mathematics
54	Gobbilla. Sai Kumar	MS11047	Chemistry
55	Thapasya Vijayan	MS11048	Biology
56	Partha Sankar R.P.S.	MS11049	Biology
57	Priyanka Sudheendra Jamadagni	MS11050	Biology
58	Raminder Singh	MS11052	Biology
59	Saurabh Thapliyal	MS11053	Biology
60	Sabari V R	MS11054	Chemistry
61	Nakul Kushabhau Teke	MS11055	Chemistry
62	Abhinay Vardhan	MS11057	Chemistry
63	Gyanendra Yadav	MS11058	Physics
64	Rashmi Jain	MS11059	Mathematics
65	Yosman Bapat Dhar	MS11060	Biology
66	Jagdeep Singh	MS11061	Mathematics
67	Rohit Kumar Patidar	MS11062	Chemistry
68	Aiswarya Joy M	MS11063	Biology
69	Lakshmi Bhai N V	MS11064	Chemistry
70	Deepthi Krishna.P	MS11065	Biology
71	Arsila Ashraf P.K	MS11068	Biology
72	Aman Kumar Bhonsle	MS11071	Chemistry
73	Vaishali	MS11074	Chemistry
74	Santosh Kumari	MS11076	Biology
75	Anjali Mahadevan	MS11077	Chemistry
76	Manmohan	MS11078	Chemistry
77	Ruchika Choudhury	MS11079	Biology
78	Manvendra Pratap Rajvanshi	MS11080	Physics

S.No.	Name	Reg. No.	Major
79	Ankita Verma	MS11082	Biology
80	Rashmi Sinha	MS11084	Chemistry
81	Yengkhom Sunanda	MS11085	Chemistry
82	Manu S	MS11086	Biology

19.2 MS Graduates

S.No.	Name	Reg. No.	Supervisor	Title of the thesis
1	**Mulani Imrankhan Bashir**	MP12001	J. S. Bagla	*Review of Discrete Newtonian Cosmology*
2	**Ashish Thakur**	MP12009	M. M. Gupta	*Quark Mass Matrices & Textures*
3	**Ankit Verma**	MP13002	Sharvan Sehrawat	*Exploring zebrafish as an immunological model organism for investigating celiac disease and identification of viral MHC-I specific peptides*
4	**Surender Goyal**	MP13004	N. Sathyamurthy	*Temporal Oscillations in Flowering in Passiflora Incarnata*
5	**Bhaskar Vashishth**	MP13006	I. B. S. Passi	*The Normalizer Problem in Integral Group Rings*
6	**Mrityunjay Pandey**	MP13010	Goutam Sheet	*Electro-mechanical and Electrical Characterization of* Cu_2-Cd *nano structures using AFM*
7	**Hemanshu Dua**	MP13016	Rajeev Kapri	*Dynamic Transitions in Unzipping of an Adsorbed Polymer*
8	**Shivam Arora**	MP13017	K. Gongopadhyay	z*-Classes in Finite* p*-Groups*
9	**Arun Kumar**	MP13020	K. Gongopadhyay	*Ratner's Theorem on Unipotent Flow*

19.3 PhD Graduates

S.No.	Name	Reg. No.	Supervisor	Title of the thesis
1	**C. Jebarathinam**	PH08003	Sudeshna Sinha	*Characterizing quantum correlations in the* nonsignaling framework
2	**Sukhdeep Kumar**	PH08006	P. Guptasarma	*Studies on selected biomolecules & their roles in cell proliferation, cytotoxicity and disease*
3	**Debmalya Das**	PH08012	Arvind	*Quantum state estimation using weak measurements and entanglement manipulation with local filters*
4	**Kusum Lata**	PH08013	K. Chattopadhyay	*Structure-function studies on TlyA hemolysin*
5	**Zeba Qadri**	PH08019	R. Ramachandran	*Understanding Crosspolarization NMR Experiments using Multi-mode Floquet Theory*
6	**Preety**	PH09024	Ramandeep S. Johal	*Prior information in the inference of performance in constrained thermodynamic processes*
7	**Vanika Gupta**	PH09027	N. G. Prasad	*In sickness and in health: Exploring the evolution of immune response using Drosophila melanogaster*
8	**Bhupesh Kumar**	PH09030	Kamal Priya Singh	*A study of Torsional Super-elasticity and in Spider Silks*
9	**T. Ramanjaneyulu Bandaru**	PH09031	R. Vijaya Anand	*Nucleophilic Carbene Catalysis in Chemoselective & Aerobic Oxidation Reactions*
10	**Nayyar Ahmad Aslam**	PH09033	S. A. Babu	*Diastereoselective Synthesis of Unnatural Amino Acid Derivatives*
11	**Vinesh Shenoi N.**	PH09038	N. G. Prasad	*Density - dependent natural selection: Evolution of adult traits in Drosophila melanogaster*
12	**Anand Kumar Rai**	PH10040	K. Chattopadhyay	*Structure-function mechanism of Vibrio cholerae cytolysin*
13	**Dominic Narang**	PH10044	Samrat Mukhopadhyay	*Biophysical Studies on Protein Misfolding and Aggregation*
14	**Kanika Arora**	PH10045	P. Guptasarma	*Folding, stability and DNA binding of E. coli HU and its engineered variants*
15	**Karan Singh**	PH10046	N. G. Prasad	*Adaptation to cold stress: The evolution of life-history and reproductive traits in Drosophila melanogaster*

S.No.	Name	Reg. No.	Supervisor	Title of the thesis
16	**Navnita Kumar**	PH10048	Sanjay Mandal	*Strategic Design of Amino Acid Based Ligands and Their Self-assembled Homochiral Coordination Architectures: Structural Diversity and Sensing Applications*
17	**Shruti Dogra**	PH10055	Kavita Dorai and Arvind	*Multiqubit entanglement and qudit computing on an NMR quantum computer*
18	**Vijit Dalal**	PH10058	Samrat Mukhopadhyay	*Molecular Insights into the Prions and Amyloids*
19	**Billa Prashanth**	PH10062	Sanjay Singh	*Complexes of Group 13 and 14 Elements for Synthetic and Reactivity studies*
20	**Sonica**	PH10072	Kapil H. Paranjape	*On a Conjecture on Linear Systems*
21	**Anshul Choudhary**	PH11078	Sudeshna Sinha	*Dynamics on Complex Networks*
22	**Shilpa Setia**	PH11082	Santanu K Pal	*Discotic liquid crystals for Optoelectronic Applications*
23	**Sumyra Sidiq**	PH11084	Santanu K Pal	*New Approaches to the Design of Liquid Crystal-based Biosensors*
24	**Kuldeep Jaiswal**	PH11087	Sanjay Singh	*Bis(phosphinimino)amide boron complexes for Synthesis and reactivity studies*
25	**Chinmoy Sarkar**	PH11098	Vinayak Sinha	*Measurement and Source Apportionment of Reactive (VOCs) in South Asia*

20 Account Statement

20.1 Plan Grant

The Institute received a sum of Rs. 72.00 crores as Grant-in-Aid from the Ministry of Human Resource Development in the Year 2016-17. There is an opening balance of Rs. 21.69 crores from the previous year. Thus out of the total amount of Rs. 93.69 crores available under plan grant, the following expenditure has been made under different budget heads in 2016-17.

S.No.	Budget Head	(Rs., in crores)
I.	Salary Component	21.48
II.	Non-Salary Component	31.98
III.	Purchase of Equipments	22.03
IV.	Purchase of Furniture	3.43
V.	Construction of Building (*including deposit money*)	0.41
VI.	Library Books	0.20
VII.	Computer Accessories & Peripherals	0.98
	Total	Rs. 80.51 crores

That leaves a closing balance of Rs. 13.18 crore.

20.2 Research & Development Grant

In addition to the Plan Grant, the Institute also received a sum of Rs. 23.34 crore (in 2016-17) under Research & Development Account (with an opening balance of Rs. 4.16 crore carried over from the year 2015-16). The details of this account are as follows:

Grant received

S.No.	Details	(Rs., in crores)
I.	Opening Balance as on 01.04.2016	4.16
II.	Grant received in 2016-17	23.34
	Total	Rs. 27.50 crores

Expenditure

S.No.	Details	(Rs., in crores)
I.	Pay and Allowances	1.14
II.	TA	0.32
III.	Scholarship	7.94
IV.	Purchase of Equipment	2.85
V.	Contingency	0.60

VI.	Consumables	3.38
VII.	Overheads	0.77
VIII.	Other Expenditure	1.11
	Total	Rs. 18.10 crores

This leaves a closing balance of Rs. 9.39 crore

20.3 Endowment Fund

The balance available under this account is Rs. 26.63 crores as on 31.03.2017.

20.4 Student Welfare Account

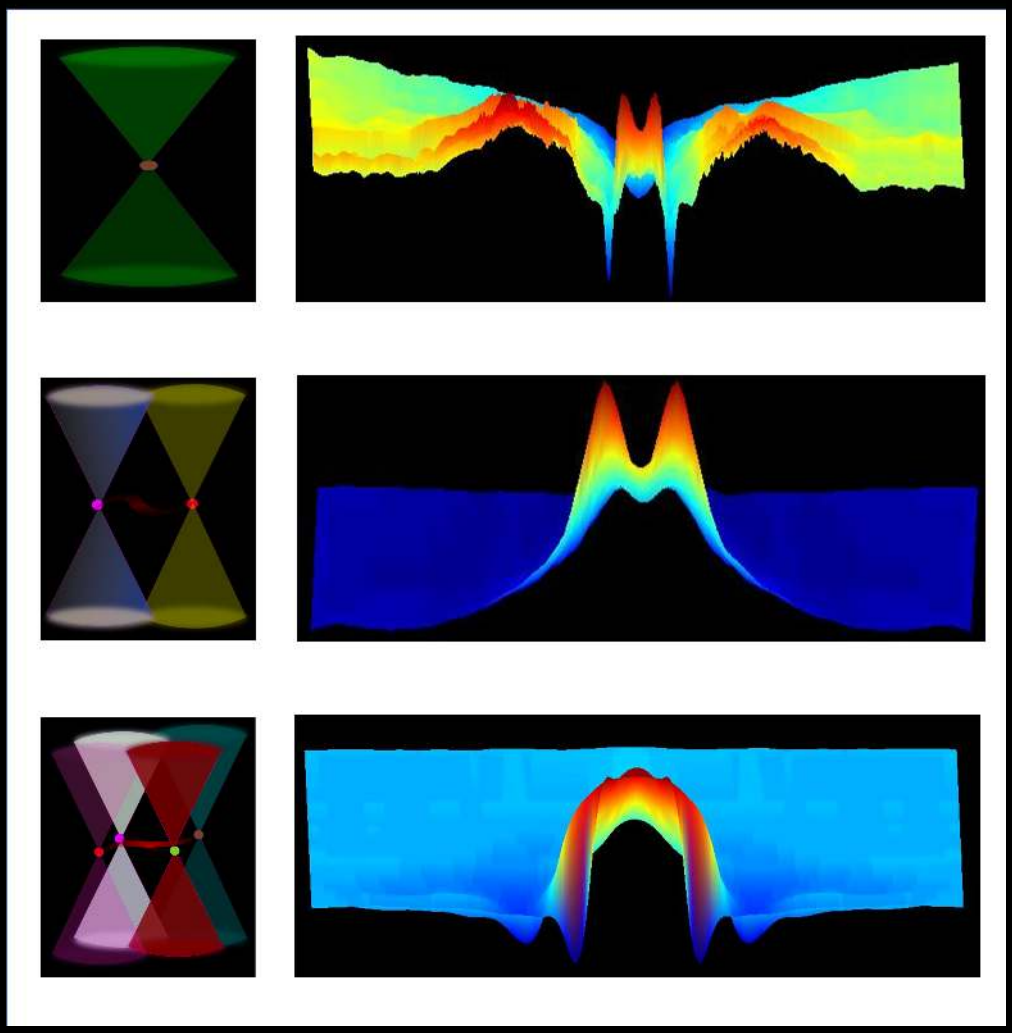
The balance available under this account is Rs. 1.49 crore as on 31.03.2017.

Moods of Insomnia

A night view of hostels

Panoramic view of Academic and Research Block II

A view from within the library



Spectra and schematics from a paper in *Nature Communications* : Goutam Sheet's lab

Indian Institute of Science Education and Research Mohali
Knowledge City, Sector-81, SAS Nagar, PO Manauli (Punjab) - 140 306