



# Poornaprajna Institute of Scientific Research

Bengaluru

Promoted and managed by ADMAR MUTT EDUCATION FOUNDATION  
Recognized by DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH and MANIPAL UNIVERSITY

## ANNUAL REPORT



# P P I S R

# 2016 - 17



Bharat Ratna Prof. C N R Rao, FRS, National Research Professor, and Linus Pauling Research Professor, Hon. President, JNCASR, Bengaluru had presided over the Founder's Day Celebrations held at PPSR, Bidalur Campus on 28<sup>th</sup> July, 2016.



Research scholars and project students working in the Laboratory of Materials Science at Bidalur Campus.

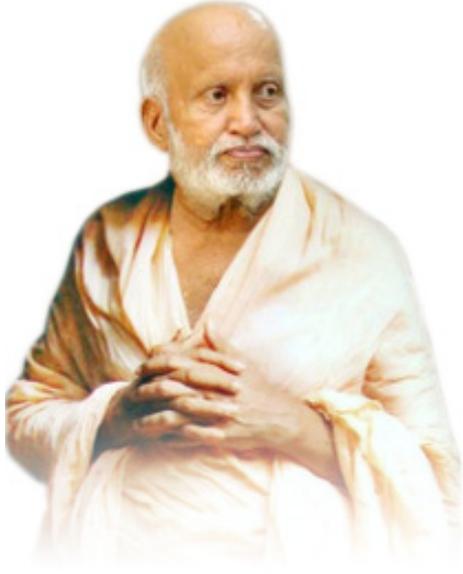


A Dialog Across Traditions: Modern Science and Ancient Insights on Reality (Oct 25-27, 2016), was held at PPEC premises, Sadashivanagar brought together scientists and traditional scholars.



Dr. A B Halgeri, Director, PPSR, addressing the gathering

## Founder's Message



**PPISR's motto:** *Immortality through Knowledge!*

**PPISR's vision:** To promote and nurture excellence in the fundamental and applied sciences for the advancement of scientific knowledge and benefit of mankind.

To follow our vision in the spirit of our motto, providing facilities to do research in the Pure Sciences has become very necessary. Our brilliant youth go outside the country to do research and settle there. Until we check this trend, India can't make real progress in any field. Hence, an attempt is made to establish the Poornaprajna Institute of Scientific Research (PPISR) under the guidance of many eminent scientists of this country. More the investment by the nation in science and technology, stronger the country will evolve. All well wishers of this country are approached hereby for all possible assistance to this project, so that India may better serve the world. I pray for divine guidance. May the Lord grant the necessary strength to develop this institute for the benefit of the nation and the world.

H H Sri Vibudhesha Theertha Swamiji,  
Founder, PPISR

## Chairman's Message



The Poornaprajna Institute of Scientific Research (PPISR) is called the crest jewel among the Poornaprajna family of schools and institutes founded by my beloved Guruji and illustrious predecessor, HH Sri Vibudhesha Theertha Swamiji. It was his dream that world-class research into the physical, material and biological sciences should be undertaken here with the same zeal and spirit of curiosity, as was undertaken by the ancient Indian sages into the spiritual sciences. Based on the progress that I have witnessed in the past years, in terms of vigorous research activities undertaken, the ten students who have obtained their PhD, the recruitment of quality students and faculty, and upgradation of infrastructure and equipment, I have every reason to believe that the stewardship of the institute is in the hands of truly dedicated people who are well poised to deliver Swamiji's vision for Indian science and the community of Indian students. May Lord Sri Krishna bless and guide the members of PPISR!

H H Sri Vishwapriya Theertha Swamiji  
Chairman, PPISR

## 1 Message from Hon. Secretary, AMEC & AMEF



As the Pontiff of Sri Admar Mutt, Udipi, His Holiness Sri Vibudhesha Theertha Swamiji, fulfilling his religious duties, simultaneously maintained– unusually for the head of a spiritual organization keen interest in promoting science, in interacting with scientists and sometimes even attending classes and lectures. He was keen on bridging the two systems of scientific and spiritual knowledge. Even though he founded about 30 Poorna Prajna Institutions or schools all over the Country, Poorna Prajna Institute of Scientific Research established in Bidalur, Bangalore during 1998 was considered as a crest jewel among them, as the tangible symbol of love of a Saint for the Science. He envisioned PPISR as a forum for Scientists to pursue uninterrupted research and to provide training to young researchers.

When H.H. Sri Vibudhesha Theertha Swamiji attained the Lotus Feet of Lord Sri Krishna, H.H. Sri Vishwapriya Theertha Swamiji, the present Pontiff of Sri Admar Mutt, Udupi, the President of AMEC and Chairman of AMEF, took up the task of guiding us through this journey that is simultaneously sacred and scientific. This current year witnessed many milestones, which include PPISR crossing the 178 publications in peer-reviewed journals of international repute, an achievement that is especially significant considering that it was achieved in a shorter time and with fewer faculty members when compared to many other better known institutes. In PPISR's journey in pursuit of the noble vision set forth by H. H. Sri Vibudhesha Theertha Swamiji and guided by H. H. Sri Vishwapriya Theertha Swamiji, all activities of PPISR are being funded mainly by AMEF. It is our fond hope that more members from the Corporate World and the General Public would come forward to contribute their mite to furthering this noble cause of research in the fundamental and applied sciences. Bengaluru.

Dr. K. Srihari  
Professor (Rtd), UAS, Bengaluru  
Hon. Secretary, AMEC and AMEF

31st March 2017

## 2 Foreword from the Director



I have great pleasure in presenting the seventh Annual Report on account of research and academic activities of Poornaprajna Institute of Scientific Research (PPISR) for the year 2016-17. The Institute has made significant progress in terms of research programmes, research grants, and scientific meetings with eminent scientists for the year 2016-17.

PPISR is climbing the ladder of success steadily in a highly competitive scientific research and is coming into limelight on the national and international stage by maintaining the uniqueness in the research field. The Institute has chosen contemporary frontier areas of research in the fields of Materials science and Catalysis, Biological Science and Theoretical Sciences. PPISR is successfully forging ahead a fruitful academia-industry partnership by innovating, designing and developing novel multifunctional materials that have wide-ranging applications in catalysis, nanotechnology, etc. Several new research projects have been initiated with sponsorship from industry and also Government agencies like VGST, DST, DBT, BRNS, DRDO, etc. Currently, 21 doctoral students, 3 postdoctoral fellows, 3 project assistants are actively involved in many sponsored projects both from Government agencies as well as industry.

Based on our earlier successful completion of the projects, HPCL R&D has sponsored two more projects for the development of novel polymeric materials as well as development of novel catalysts for light naphtha volarization. M/s GTC Technology USA has generously continued to support for a new collaborative project on Natural gas conversion to value added chemicals.

During this period, the Institute has published 28 research papers in all areas of sciences. Overall, PPISR has crossed 178 publications in international peer reviewed journals which itself is a great achievement.

Based on our ongoing research projects, many of our students and faculty members have presented research papers at various National and International Conferences and have won best presentation awards. Several distinguished Professors and scientists from both India and abroad visited our Institute and have given lectures.

During this tenure, a three day Thematic Workshop on “Diffraction Methods for Structural Analysis in Materials Science, a three day Symposia on Dialog across Traditions: Modern Science and Ancient Insights on Reality”, a Five-Day Workshop on Instrumental Methods of Chemical Analysis at Poornaprajna Institute of Scientific Research and H H Sri Vibudhesha Theertha Swamiji Memorial Endowment Lecture were organized at PPISR.

The Institute is helping the external graduate and post graduate students to carry out their short term projects or by giving them training in research. Eight MTech and MSc students are doing their project work under the guidance of the faculty members of PPISR .

The science outreach programmes with an aim of Today’s Science for Tomorrow’s scientist have been successfully conducted with our Poorna Prajna School students in Bangalore in order to create interest in basic science in young minds. We have

taken several collaborations with reputed institutions both India and abroad.

The infrastructure is being constantly upgraded to meet the academic requirement for carrying out scientific activities and this year H H Sri Vishwipriya Theertha Swamiji had inaugurated the newly constructed Bharat Ratna Prof C. N. R. Rao Materials Science Laboratory at the Bidalur campus during the Founder's Day Celebrations.

On the whole the entire year 2016-17 was much more productive and successful with the unstinted support and blessings from H H Sri Vishwapriya Theertha Swamiji and also enthusiastic support from the management of Admar Mutt Education Foundation and Trustee members, and also with the support of all faculty members, students, and staff of PPISR.

Prof. A. B. Halgeri  
PPISR

31st March 2017

# Contents

<b>1</b>	<b>Message from Hon. Secretary, AMEC &amp; AMEF</b>	
<b>2</b>	<b>Foreword from the Director</b>	
<b>3</b>	<b>Board of Trustees</b>	<b>2</b>
<b>4</b>	<b>Research Advisory Committee</b>	<b>2</b>
<b>5</b>	<b>Doctoral Advisory Committee</b>	<b>3</b>
<b>6</b>	<b>Organization</b>	<b>4</b>
<b>7</b>	<b>About the institute</b>	<b>5</b>
<b>8</b>	<b>Mission</b>	<b>6</b>
<b>9</b>	<b>Sponsored projects</b>	<b>7</b>
	9.1 Government sponsored . . . . .	7
	9.2 Industry sponsored . . . . .	7
<b>10</b>	<b>Materials Science Department</b>	<b>9</b>
	10.1 Mission and research progress . . . . .	9
	10.2 Faculty Profile . . . . .	11
<b>11</b>	<b>Biological Sciences Department</b>	<b>30</b>
	11.1 Mission and research progress . . . . .	30
	11.2 Faculty profile . . . . .	31
<b>12</b>	<b>Theoretical Sciences Department</b>	<b>35</b>
	12.1 Mission and research progress . . . . .	35
	12.2 Faculty profile . . . . .	36
<b>13</b>	<b>PPISR Publications</b>	<b>40</b>
<b>14</b>	<b>New Research Students</b>	<b>41</b>
<b>15</b>	<b>Highlights of Research Activities</b>	<b>43</b>
<b>16</b>	<b>Other Research Activities:</b>	<b>46</b>
<b>17</b>	<b>Invited Lectures at PPISR</b>	<b>47</b>
<b>18</b>	<b>In-house Seminars:</b>	<b>48</b>
<b>19</b>	<b>Events and meetings</b>	<b>50</b>
	19.1 Founder's Day Celebration . . . . .	50
	19.1.1 Inauguration of Bharat Ratna Prof. C. N. R. Rao Laboratory . . . . .	50
	19.1.2 Scientific Programmes on Founder's Day Celebration . . . . .	50
	19.2 Workshop on Diffraction Methods for Structural Analysis in Materials Science . . .	51
	19.3 Dialogue Across Traditions: Modern Science And Ancient Insights On Reality . . .	51
	19.4 Winter School 2016 . . . . .	52
	19.5 Skill Development Programme . . . . .	52
	19.6 Workshop on Instrumental Methods of Chemical Analysis: . . . . .	52
	19.7 H H Sri Vibudhesha Theertha Swamiji Memorial Endowment Lecture . . . . .	53
	19.8 Outreach Programme . . . . .	53
<b>20</b>	<b>Visitors' views</b>	<b>53</b>

### 3 Board of Trustees

#### Chair

H. H. Sri Vishwapriya Theertha Swamiji (Chairman) Head of Admar Mutt

#### Special Advisors

- Padma Vibhushan Prof. P. Rama Rao FASc, FNA, FNASc, Ex. Secretary, Ministry of S & T, GOI.
- Sri K. R. Prasad, Advocate, Bengaluru.

#### Members

- Padma Vibhushan Prof. U.R. Rao, Former Chairman, Space Commission & Secretary, Dept. of Space.
- Prof V Nagaraja, President, Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru
- Sri Rajendra J. Hinduja, Industrialist, Bengaluru.
- Sri V. V. Bhat, IAS, (Retd), Former Secretary to the Govt. of India.
- Sri B.R. Prabhakara, IAS, Former Chief Secretary Govt. of Karnataka.
- Sri Laxmisha G. Acharya, Industrialist, Mumbai.
- Dr. U. Shankar Rao, Medical Director, National Hospital, Chennai.
- Padma Shri Dr. V.R. Prahalada, Former Vice Chancellor, Defence Institute of Advanced Technology, Pune
- Dr. K. Srihari (Hon. Secretary), Professor (Rtd), UAS, Bengaluru.

### 4 Research Advisory Committee

1. Padma Shri Dr. V. R. Prahalada, Former Vice Chancellor, Defense Institute of Advanced Technology, Pune
2. Prof. C. Sivaram, Professor, Indian Institute of Astrophysics, Bengaluru
3. Prof. K.R. Krishnamurthy, Chair Professor, National Centre for Catalysis Research, IIT Madras, Chennai
4. Prof. G. U. Kulkarni, Professor, JNCASR, Bengaluru
5. Padma Shri Prof. N. Kumar, Emeritus Professor, Raman Research Institute, Bengaluru
6. Prof. A Jagannadha Rao, Professor, Raja Ramanna Fellow; DST, Department of Biochemistry, IISc, Bengaluru
7. Prof. T.N. Guru Row, Professor, SSCU, IISc, Bengaluru
8. Prof. S. Ramakumar, Professor, Bioinformatics Centre, IISc, Bengaluru
9. Prof. T. M. Aminabhavi, CSIR Emeritus Scientist, Visiting Professor, Cambridge University, U.K
10. Prof. A. B. Halgeri, (Member Secretary) Director, PPISR

## 5 Doctoral Advisory Committee

1. Prof. Y. S. Bhat, HoD, Chemistry Dept, Bangalore Institute of Technology (BIT) Bengaluru.
2. Prof. B. S. Chandrasekhar, HoD, Chemistry Dept. Central University, Gulbarga.
3. Prof. T. N. Guru Row, SSCU, IISc, Bengaluru.
4. Prof. B. S. Jai Prakash, Director, IEHMM, BIT campus, Bengaluru.
5. Prof. N. Kumar, Homi Bhabha Distinguished Professor, RRI, Bengaluru.
6. Prof. H. G. Nagendra, MVIT Engg. College, Bengaluru.
7. Prof. S. Ramakumar, Physics Dept., IISc, Bengaluru.
8. Dr. Raman Ravishankar, HPCL, Bengaluru.
9. Prof. A. J. Rao, Biochemistry Dept., IISc, Bengaluru.
10. Dr. N. S. Raviraja, Stempeutics Pvt. Ltd., Manipal.
11. Prof. S. A. Shivashankar, Materials Research Center (MRC), IISc, Bengaluru.
12. Prof. C. Sivaram, IIA, Bangalore University, Bengaluru.
13. Prof. A. M. Umarji, SSCU, IISc, Bengaluru.
14. Prof. Rajeev Joshi, Central University Karnataka, Kalaburagi.
15. Prof. Udupi Ramagopal, PPISR, Bengaluru.
16. Prof. N. Nagaraju, St. Joseph College, Bengaluru
17. Dr. Sebastian C. Peter, JNCASR, Bengaluru
18. Dr. Shanti K.N., PES University, Bengaluru
19. Prof. S. K. Srivatsa, PES University, Bengaluru
20. Dr. Prabeer Barpanda., Materials Research Centre, IISc, Bengaluru
21. Dr. Rajeev Ranjan, Materials Engineering, IISc, Bengaluru
22. Prof. Anjali A Karande, Dept of Biochemistry, IISc, Bengaluru
23. Prof. Dipankar Nandi, Dept of Biochemistry, IISc, Bengaluru
24. Dr. Govindaraju, T, New Chemistry Unit, JNCASR, Bengaluru
25. Dr. Meher K. Prakash, Biophysics group, JNCASR, Bengaluru
26. Dr. Dinesh A Nagegowda, Molecular Plant Biology and Biotechnology group, GKVK, Bengaluru
27. Prof. Jagirdar, IPC Dept, IISc, Bengaluru
28. Prof. S Natarajan, SSCU, IISc, Bengaluru
29. Prof. Chandrabas Narayana, JNCASR. Bengaluru
30. Prof. Giridhar Madras, Chemical Engg. Dept, IISc., Bengaluru
31. Dr. P. Manikandan, Senior Manager, SABIC Research Centre, Bengaluru

## 6 Organization

**Director:** Dr. Anand B. Halgeri

**Financial Advisor:** Sri P.Sreenivasa Rao

**Faculty:** Dr. Udipi Ramagopal

Dr. Sujit Sarkar

Dr. Srikanth R

Dr. Ananda K

Dr. Ganapati V Shanbhag

Dr. Nalini G Sundaram

Dr. Sanjeev P Maradur

Dr. Suresh Babu

**Emeritus Faculty:** Dr. Y. S. Bhat

**Administration:**

Senior Administrative Officer: Mr. Kishore L Gaikwad

Accounts Officer: Mr. Nagarajan R

Administrative Secretary: Mrs. Latha Srinivasan

**Support staff:**

Mr. Vishwaprakash A

Mr. Praveen Kadam

Mr. Shashidara

Mr. Basavaraj

**Adjunct/ Honorary Faculty:**

Prof. S Asokan, IISc, Bengaluru (Glasses & Sensors)

Prof. T N Guru Row, IISc, Bengaluru (Crystallography)

Prof. K G Satyanarayana, Ex.Director, RRL (Polymers)

Prof. B S Jaiprakash, BIT/IEHMM, Bengaluru (Catalysis)

Prof. B S Ramchandra, CFRCE, Bengaluru (General relativity)

Prof. S K Srivatsa, PES University, Bengaluru (Liquid Crystals)

## 7 About the institute

Poornaprajna Institute of Scientific Research (PPISR), a unit of Admar Mutt Education Foundation (AMEF), is situated near Bengaluru International Airport on a sprawling campus spread over 32 acres. It was conceptualized and founded by the pontiff of Admar Mutt His Holiness late Sri Vibudhesha Theertha Swamiji. It was his vision to create a serene and congenial environment, where scientists would be inspired to carry out innovative and original research in fundamental and applied sciences. It is presently enthusiastically carried forward by the present Chairman HH Sri Vishwapriya Theertha Swamiji to make Poornaprajna Institute of Scientific Research a Centre of Excellence in order to realize the dreams of his Guruji H H Sri Vibudhesha Theertha Swamiji. H H Vishwapriya Theertha Swamiji has keen interest on the research activities of PPISR. The infrastructure is being constantly upgraded to meet the academic requirement and for scientific and student activities. In a short span of three years, H H Sri Vishwapriya Theertha Swamiji had inaugurated the New Biological Sciences laboratory, New Hostel building to accommodate 20 students and also Bharat Ratna Prof CNR Materials Science Laboratory at the Bidalur campus to carry out world class research at our Institute. The foundation stone for the research campus was laid in 1998 by the then Prime Minister of India Sri Atal Behari Vajpayee.

The institute is recognized by Department of Scientific and Industrial Research (DSIR), Govt. of India, New Delhi and Manipal University, Karnataka, as an R&D centre. Currently there are three departments at PPISR, consisting of Theoretical Sciences, Materials Science and Biological Sciences, where advanced research activities are being conducted. The Institute has nine core faculty members and twelve distinguished professors as adjunct and honorary professors and nearly 29 distinguished from various renowned institutions are guiding our doctoral students for carrying research activities .

So far, ten students has obtained their PhD degree with us. Presently, 21 doctoral students, two postdoctoral fellows and three project assistants are actively involved in research activities on many sponsored projects both from Government agencies and as well from industries. To date, the Institute has published more than 176 papers in National and International peer reviewed journals and two international patents have been filed. The combined average impact factor of our publications is 2.5, which is higher than that for several leading institutions in the country.

PPISR is supported by the Udupi Sri Admar Mutt Education Foundation (AMEF). It is part of a large family of sister institutions, which also includes the Poornaprajna Schools, the Poornaprajna Institute of Management and the Poornaprajna Institute of Faculty Improvement, governed by the Udupi Sri Admar Mutt Education Council (AMEC). PPISR All these developments would not have been possible without the guidance, support and blessings from H H Sri Vishwapriya Theertha Swamiji and also excellent support from the management of Admar Mutt Education Foundation and Trustee members, and also with the cooperation of all faculty members, students, and staff of PPISR.

## 8 Mission

1. To carry out research in the selected frontier areas of basic and applied sciences
2. To encourage and support sponsored research programmes by giving necessary infrastructure to them
3. To encourage collaborations with industries for focused and application oriented research
4. To promote collaborative research with scientists in academia in the country
5. To produce PhDs of highest caliber and to make them highly competitive for their future career
6. To provide a forum for scientific discussions on frontier scientific topics which are vital for the scientists of PPISR in particular and the institutes of the country in general
7. To organize periodic summer and winter schools for the young undergraduate and graduate students
8. To provide opportunities for talented young students to carry out short-term research projects
9. To provide facilities to visiting scholars and faculty from all over India and abroad to work with the faculty of the institute.
10. To publish research articles in reputed national/ international journals of high impact To file patents on research findings of potential commercial applications

## 9 Sponsored projects

### 9.1 Government sponsored

1. The infrastructure fund, "the Establishment of Center of Excellence in Science, Engineering and Medicine" (CESEE), Department of IT, BT and ST, VGST, Govt. of Karnataka was sanctioned to Dr. Ramagopal for the period of 3 years.
2. Chemical fixation of CO<sub>2</sub> by converting into value added chemicals using metal-modified ordered nanoporous silicate catalysts Sponsored to Dr. Ganapati Shanbhag, Centre of Excellence in Science, Engineering and Medicine (CESEM), VGST, Govt. of Karnataka.
3. Synthesis of Nanostructured p-type doped La-based Perovskites for Design of Selective Gas Sensors DST Govt of India to Dr. Nalini Sundaram
4. Phase Transitions in BiMWO<sub>6</sub> (M=Ce,Fe,Cr) Smart Functional Nanomaterials sponsored by UGC-DAE CSR Mumbai Centre, India for three years to Dr. Nalini Sundaram
5. Dr. Nalini G Sundarams project entitled Influence of Electron beam irradiation on the crystal structure and photoluminescence of rare earth doped tungstate nanophosphors. sponsored by Board of Research in Nuclear Sciences (BRNS).
6. Transformative Crystalline Hybrid Porous Materials: Chemical Synthesis and Applications, Sponsored by Department of Science and technology (DST), INSPIRE to Dr. Suresh Babu
7. Design and Development Stable Metal Organic Frameworks (MOFs) with Multiple Functional Sites for Catalysis, Department of Science and technology (DST), Early career research award, to Dr. Suresh Babu
8. BRNS project to study the effect of electron beam radiation on endophytic fungi producing ligninase enzyme sponsored by BRNS to Dr. Ananda
9. Geometric Phase and Quantum Phase Transition in Quantum Many Body System sponsored by DST to Dr. Sujit Sarkar
10. Entanglement, nonlocality and superluminal signaling in deterministic and indeterministic extensions of quantum mechanics sponsored by DST to Dr. R. Srikanth
11. Dr. Srikanth's project titled Computational speed-up in generalized probability theories sponsored by DST-SERB to Dr. Srikanth
12. Structural and evolutionary investigations on antibiotic resistant conferring RNA methyl transferases for designing novel strategies of drug development sponsored by DST to Dr. Ramagopal.

### 9.2 Industry sponsored

1. "Design and development of a catalyst and process for the conversion of C<sub>1</sub>-C<sub>3</sub> paraffins to value added hydrocarbons via halogen mediation" (Sponsored by: GTC Technology, USA)  
Principal Investigator: Dr. Ganapati V Shanbhag  
Co-Investigator: Dr. Sanjeev P Maradur  
Project fellows: Santosh Kumar, Saikiran M, Manjunath Doddamani
2. Development of novel catalysts for light naphtha valorization (Sponsored by: Hindustan Petroleum Green Research and Development Centre (HPGRDC), Hindustan Petroleum Corporation Ltd. (HPCL), Bangalore  
Principal Investigator: Dr. Ganapati V Shanbhag  
Co-Investigator: Dr. Sanjeev P Maradur  
Project fellows: Mr. Abhishek Jadhav, Dr. Subba Reddy Marri

3. Development of Novel Mesoporous Polymer Based Catalysts for Low Temperature Catalytic Applications Sponsored by HPCL Green R&D, Bangalore (Feb2016 Jan 2018)  
Principal Investigator: Dr. Sanjeev P. Maradur  
Co-Investigator: Dr. G. V. Shanbhag  
Reserach Students: Mr. Kempanna and Mr. Sathyapal

## 10 Materials Science Department

### 10.1 Mission and research progress

Established in May 2010 by the present Director, Prof. A. B. Halgeri, with the assistance of Prof. K. J. Rao, then Chair, Executive Committee of AMEF, the department now consists of a core of five faculty members hailing from diverse background as chemistry, industrial chemistry and biochemistry. A new materials synthesis laboratory, with several sophisticated equipment, has been established in the group. Bright students passionate for research were interviewed and inducted into Doctoral Programme in the Department.

#### **Mission of the department:**

1. To forge a fruitful academia-industry partnership by innovating, designing and developing novel multi-functional materials that have wide-ranging applications, in catalysis, nanotechnology, new materials design etc.
2. To develop a strong doctoral programme to train students by fostering excellence and original thinking. The department engages with other national academic institutions through collaborations, education training and outreach activities.

The broad areas of the research include: (1) Heterogeneous catalysis; (2) Novel micro/mesoporous materials for green chemical processes; (3) Biomass conversion to value added products; (4) X-ray crystallographic studies; (5) Functional nanomaterials, (6) Photocatalytic and photoluminescent materials (7) Mesoporous Polymers, (8) Metal organic frameworks

#### **Academic and sponsored research Highlights**

##### **Catalysis group:**

Catalysis is one of the important fields of research in the area of applied chemistry. Catalysts play a vital role in providing society fuels, commodity and fine chemicals, pharmaceuticals, polymers and means for protecting the environment. At PPISR, three research groups are working in the area of heterogeneous catalysis.

Dr. Ganapati Shanbhag and his group are working on frontier areas of research such as design of novel catalysts for green chemical processes such as catalytic conversion of CO<sub>2</sub> into value-added chemicals, conversion of biomass byproducts like glycerol and furfural to value-added chemicals, pore engineering of microporous materials for shape selective catalysis etc. The work on mesoporous metal oxides as the novel solid acid catalyst for alcoholysis of furfural alcohol and glycerol reaction is under progress. Till 2016, the group has published 20 research articles in internationally reputed journals and co-inventors in 2 world patents filed by HPCL. A project on Chemical fixation of CO<sub>2</sub> by converting into useful chemicals using modified nanoporous catalysts sponsored by VGST, Govt. of Karnataka has successfully completed one year with a research publication in ChemCatChem (Wiley) journal. 3 students obtained their PhD degree under Dr. Shanbhag.

Dr. Sanjeev Maradur and his group are working on novel mesoporous polymers, supported metal oxides, mesoporous zeolites for catalytic applications. His project on conversion of waste plastic to fuels sponsored by Thermax industries, Pune is successfully completed. A new project sponsored by HP Green R & D Centre on design and development of polymeric materials for catalytic applications was initiated in February 2016 with Dr. Sanjeev Maradur as PI and Dr. Shanbhag as Co-PI.

Currently, 4 sponsored projects are conducted by the Catalysis Group. A new project on Design and development of a catalyst and process for the conversion of C1-C3 paraffins to value

added hydrocarbons sponsored by PW Technology Inc, USA was initiated in January 2016. The previous industrial project sponsored by GTC Technology Inc USA successfully completed in November 2015 with the toluene methylation technology in the process of commercialization. A project sponsored by HPCL R & D Centre, Bengaluru on Catalytic valorization of hydrocarbons to value-added chemicals is currently underway with Dr. Shanbhag as the PI and Dr. Maradur as Co-PI.

**Functional Energy Nanomaterials Group:** Dr. Nalini Sundaram group works extensively in key energy areas such as photocatalysis, Photoluminescence, Gas sensing and Ferroelectrics. Research in the group is focussed on the structure-property relationship of functional materials. The group primarily employs low temperature, versatile, simple methods of nanoparticle synthesis coupled with X-ray and Neutron diffraction as tools to envisage a knowledge based design of materials. Current projects include, design of new bismuth based materials for visible light photocatalysis, rare earth complex photoluminescent oxides for theronastic applications, perovskite nanomaterials for low concentration gas sensing at low temperatures and Lead free materials for relaxor ferroelectric and magnetoelectric applications. In the last few years, the group has established many collaborations with various scientists working in many prestigious international as well as national institutes and laboratories such as ORNL, U.S.A, ANSTO, Australia, IISc and JNCASR, India. Currently three doctoral students are working in different areas and three sponsored projects are being implemented. The group also has published more than 10 publications in peer reviewed journals and the students have obtained awards in international and national conferences and workshops.

**Materials design group:**

Dr. Suresh Babu Kalidindi (DST-Inspire Faculty) and his students are involved in the designing of metal organic frameworks (MOFs) and boron nanomaterials for catalytic applications. A new DST-sponsored project titled Design and development of stable metal organic frameworks with multifunctional sites for catalysis has been initiated. The project aims at harnessing the superior tunability of MOFs to co-assemble different catalytic units (more than two) in a well-defined way for cooperative/tandem catalysis with the objective of forming high-value added products. One Ph.D student is working in this project.

## 10.2 Faculty Profile

### Prof. A. B. Halgeri

Director

Email: abhalgeri@gmail.com

Webpage: <http://www.ppisr.res.in/faculty/b-halgeri>

#### Brief CV:

Dr. Halgeri has received his Bachelors Degree and Masters Degree in Chemistry from Karnataka University, Dharwar and Ph.D. degree in Chemistry from Bangalore University. He carried out Post-Doctoral work under UNESCO fellowship on Industrial Catalysis at Chemical Engineering Department of Tokyo Institute of Technology during 1973-75.

On returning back to India, he joined in a newly established Research Centre of Indian Petrochemicals Corporation Ltd (IPCL), Baroda Gujarat in 1976. He was involved the development of first Petrochemical Catalyst for Xylene Isomerisation Process. Later, he has been credited for the development of several Petrochemical/Refinery Catalysts like ,Reforming of Naptha to produce BTX&Gasoline , Zeolite Catalyst for Toluene Methylation Process for Ms GTC Corporation USA, Development & Commercialization of Pore engineered Zeolite based Catalyst for Para diethyl benzene process, at Reliance Industry, which is still working at Hazira Complex . Dr. Halgeri has provided sustained leadership as Sr. Vice President and Head of R&D, Baroda, at Indian Petrochemicals Corporation Ltd and later Reliance Industries Ltd, led a team of 150 Scientists/Engineers and coordinated the entire research and development activities for Petrochemical/Refinery catalysts, Polymer Science and Technology, Materials Science and Applied Biology groups for all Reliance Industries at different locations.

#### Research Areas

1. Catalysis/ Materials science & Biological sciences.
2. Nano catalysis,
3. Heterogeneous catalysis,
4. mesoporous materials,
5. novel Zeolites,
6. Solid Acid/ Base Catalysts
7. Industrial Refinery/petrochemical processes, adsorption,
8. Eco-friendly processes,
9. Biodiesel/Biofuel, alternate energy feed stocks etc.

He has taken several industrial research projects both from India and abroad in the area of Zeolite Catalysis and Materials Science.

#### Recognitions

In recognition of his outstanding contribution in the area of heterogeneous catalysis for for three decades, he has received several National awards and Honors for his achievements in Chemical Technology.

- I.C.I. India Ltd Award of Indian Institute of Chemical Engineers has been conferred to him for Excellence in process/Product development for para-diethyl benzene.
- Hari Om Ashram Prerit- Prof.S.S. Bhatnagar Endowment Research Award for Excellence in Applied Catalysis.
- Lifetime Achievement Award Eminent Scientist in Catalysis by the Catalysis Society of India, Indian Institute of Technology, Madras.

- Elected as Fellow of Institute of Chemical Engineer by Indian Institute of Chemical Engineers, Kolkatta.
- Vividhalaxshi Audyogik Samshodhan Vikas Kendra, Mumbai, VASVIK Industrial National Award in Chemical Sciences and Technology - 2005.
- Prof. K.G. Naik Memorial Gold Award of M.S. University, Baroda 2007 for outstanding achievements in Chemical Sciences.
- Awarded as “Pride citizen of Baroda” in recognition of significant contribution for Science & Technology from Community Science Centre/Rotary Club of Baroda - 2008.

He has been advisory member of several professional bodies, various academic institutes, Department of Science & Technology, CSIR, IOCL (R&D) and Reliance Industry. He has traveled widely and presented several invited lectures in both National and International symposia.

#### **Publications**

He has published over 115 Research papers in peer reviewed national and international journals and has obtained 36 Indian/International patents. He has been life member of many scientific and professional bodies both in India and abroad.

## **Prof. Y. S. Bhat**

Emeritus Professor

Web: [ppisr.res.in/faculty/yajnavalkya-subray-bhat](http://ppisr.res.in/faculty/yajnavalkya-subray-bhat)

### **Brief CV:**

Born on March 8, 1956, Gudeangadi, Kumata Hobli, Uttara Kannada district, State of Karnataka. He received his Bachelors' Degree in Science from the Karnataka University, Dharwad (1976), Master of Science in Chemistry from the Karnataka University, Dharwad (1978) and Ph.D.(Chemistry-Heterogeneous Catalysis) from the Pune University, Pune (1984). The doctoral work was carried out at National Chemical Laboratory under the guidance of well known chemical engineer, Padmashri Dr. L.K. Doraiswamy, Director NCL. After the doctoral work he moved to Laboratory for Petrochemical Technology at Gent University, Belgium on post-doctoral assignment (1984-1986). He worked on AMOCO sponsored project on studying kinetics and modeling of ethylbenzene dehydrogenation to styrene. On returning back to India he joined research center of Indian Petrochemicals Limited, Baroda, Gujarat (1986). He worked on several zeolite based petrochemical catalysts. That has led to the development and commercialization of catalysts for two technologies viz. xylene isomerization and para-diethylbenzene synthesis. As a team member of the two projects he actively participated in designing and synthesis of laboratory scale catalysts and their screening, optimization of process parameters in both laboratory and pilot plant units. Further the best selected catalyst out of laboratory and pilot units was scaled up to commercial scale at catalyst and adsorbent manufacturing facility of IPCL at Thane (near Mumbai). He was closely involved in commercial manufacture of the catalyst which consisted of more than 36 stages. Further the performance of catalysts in commercial plants was monitored and suggestions were provided to the process team to optimize the process conditions as well as enhancing the stability/life of the catalyst. In addition to this several petrochemical reactions of importance to IPCL was studied and catalysts were developed. This has resulted in publication of several papers in peer reviewed international journals and also Indian and US patents. Also he has guided several master and doctoral level students of M.S. University of Baroda for their thesis work.

In 1996 the research activity was shifted to another place i.e. research and development unit of Saudi Basic Industries Corporation, Riyadh, Saudi Arabia. His job involved three aspects (i) carrying out research project of importance to SABIC, (ii) trouble shooting in petrochemical plants and (iii) coordinating sponsored projects at local universities. This opportunity gave a very good occasion to interact with technology suppliers and know the latest developments in the area of dehydrogenation, isomerization, MTBE synthesis, steam reforming, LPG aromatization etc. Almost 5 years he was deputed for trouble shooting in aromatization process and contributed significantly in the smooth functioning and extended health of the catalyst in the commercial plant. The research in the area of development of oxidation catalysts especially for C3 and C4 hydrocarbons has led to 10 US patents, 1 EU and 7 PCT. A lab scale technology was developed for propylene oxidation to acrylic acid via acraldehyde.

He came back in 2004 to India to settle down in Bangalore. He has worked from 2004 to 2016 in Bangalore Institute of Technology (BIT) as Professor and Head of Chemistry Department. He was involved in teaching engineering chemistry to undergraduate engineers in BIT and inorganic/physical chemistry related topics to post graduate chemistry students at Vishveshwarpura Science College. Also he has guiding five doctoral students for their Ph.D. degree from Visvesvaraya Technological University at Research Center BIT. He was the principal investigator for two sponsored projects one each from DST and VTU completed in the BIT research center.

### **Research interests**

- Chemistry of Heterogeneous Catalysis
- Development and commercialization of catalysts
- Zeolite based petrochemical catalysis
- Kinetics and modeling of catalytic processes (e.g., ethylbenzene dehydrogenation to styrene)

### **Publications and patents**

So far he has published more than 75 papers in peer reviewed national/international journals, 35 papers have been presented at national/international seminars /symposia/workshop. He has got 35 patents to his credit which includes 16 Indian, 11 US, 1EU and 7 PCT. During his course of stay in IPCL Baroda and SABIC Riyadh he has submitted more than 40 internal reports related to various projects handled. He was honoured with Innovation Award- 2003 during his research career in SABIC. His area of interest includes clays, zeolite, mixed metal oxides, petrochemicals, chemical kinetics, adsorption and catalysis. He is a member of Rotary Bangalore South Club since 2011.

He is presently working as Emeritus Professor at PPISR since June 2016.

## **Dr. Nalini G Sundaram**

Assistant Professor

Email: nalini.AT.poornaprajna.org

Webpage: <http://www.ppisr.res.in/nalinis.html>

Brief Curriculum vitae:

- 2010-Present: Asst. Professor, PPISR, Bangalore, India.
- 2005-2008: Postdoctoral Researcher , Dept. of Physics, University of California, Santa Cruz, USA.
- 2004-2005: Postdoctoral Reseacher, Los Alamos National Laboratory, New Mexico and Stanford Synchrotron Laboratory, Stanford, U.S.A
- 1997-2003: Ph.D. Solid State Chemistry , Indian Institute of Science, Bangalore, India, 2003

### **Research Areas:**

- Oxide nanoparticles, Nanocomposites and Thick films selective Gas Sensors
- Rare Earth Photoluminescent nano-oxides for Theronastic applications
- Ceramic Nanomaterials Photocatalysts for dye degradation and organic reactions
- Design and Structure of Lead free Ferroic Materials
- Structure-Property Relationships in Functional energy nanomaterials
- Synthesis, structural studies, polymorphism, local structure and phase transitions in multifunctional materials using Single Crystal, Powder X-ray as well as Neutron diffraction techniques

### **Awards and Scholarship:**

1. Awarded a project by DST, India for three years under the SERC- Fast Track Scheme For Young Scientists (FAST)
2. Senior Research Fellowship from Council of Scientific and Industrial Research (CSIR) Government of India
3. Recipient of the Joshi award for securing first rank in M.Sc. (Physical Chemistry)

### **Sponsored Projects at PPISR**

- Starter grant of \$1000 under the ICDD (International Centre for Diffraction Data) Grant-In-Aid program for the year 2016-2017.
- Sanctioned: Phase Transitions in BiMWO<sub>6</sub> (M=Ce, Fe, Cr) Smart Functional Nanomaterials by UGC-DAE CSR Mumbai Centre, India for three years (2016-2019)
- Ongoing: "Design and development of lanthanum based nanoparticles for Thick film gas Sensors.": Sponsored by DST-India, Under Extra Mural Research grant (April 2015-April 2018)
- Ongoing: Influence of Electron Beam Irradiation on the Crystal Structure and Photoluminescence of Rare Earth doped Tungstate Nanophosphors: Sponsored by BRNS, DAE, India for three years (April 2013-Apr 2016)
- Completed: Design and Development of Nanocrystalline Bismuth Oxychlorides for Degradation of dyes and Organic Pollutants: Sponsored by DST, India, under the Fast track scheme for Young Scientists for three years (Jan 2012- Jan 2015)

### **Publications 2016-2017**

1. Bi<sub>4</sub>TaO<sub>8</sub>Cl Nano-Photocatalyst: Influence of Local, Average and Band Structure, Swetha S. M. Bhat, Diptikanta Swain, Mikhail Feygenson, Joerg C. Neuefeind, Abhishek K. Misra, Janardhan L. Hodala, Chandrabhas Narayana, Ganapati V. Shanbhag and Nalini G. Sundaram, Inorganic Chemistry, DOI:10.1021/acs.inorgchem.6b01970
2. Investigation of Ca substitution on the Gas Sensing Potential of LaFeO<sub>3</sub> Nanoparticles Towards Low Concentration SO<sub>2</sub> Gas Sowmya Palimara, S. D Kaushikb, V. Siruguri, Diptikanta Swain, Alison E. Viegas, Chandrabhas Narayana , Nalini G. Sundaram, Dalton Transactions,2016,45, 13547-13555

Total Number of Publications in National and International Journals: 26

### **Research Group**

1. Pradeep P. Shanbogh (CSIR-SRF) Research Area: Band Gap Engineered rare earth doped Complex Bismuth oxide Nanoparticles for Photocatalytic Applications
2. Archana K.M. (JRF) Research Area: Design of Photoluminescent Complex Oxide Nanomaterials for Theranostic Applications

### **Past Ph.D Students:**

1. Dr. Swetha .S. M.: Presently post-doc at Seoul National University, South Korea Research Area:
2. Dr. Srinidhi. R : Presently post-doc at CeNSE, IISc

### **Past Post-Doctoral Associate:**

Dr. Sowmya Palimar: Presently Office Superintendent at IISER, Pune

### **Past B.Tech/M.Tech /Project Students:**

1. Mr. Bharath Velaga : Pursuing Ph.D at IIT Guwahati
2. Ms. Uma C.N.
3. Ms. Najiya.K.P.P: Research Fellow at NIIST Trivandrum
4. Mr, Bharathesh Kumar

### **International and National Collaborators**

Dr. Mikhail Feygenson, European Sphallation Source  
Dr. Joerg Neuefeind, ORNL  
Dr. Vasudeva Siruguri, UGC-DAE CRS Centre, Mumbai  
Dr. Ashfia Huq, ORNL  
Professor Chandrabhas Narayan, JNCASR  
Dr. Diptikanta Swain, IISc  
Dr. James Hester, ANSTO, Australia  
Dr. Andrea Lausi, Elettra, Trieste  
Dr. Abhishek Mishra, UPES, Dehradun  
Dr. Prabeer Barpanda, IISc  
Professor. Shivashankar, IISc  
Dr. A.K.Sinha, RRCAT, Indore

### **Membership of Professional bodies:**

1. Member of National crystallographic Association
2. Neutron Scattering Society of India

### Current Research Projects:

1. **Photocatalysis:** Average, Local and Band Structure of Rare earth Substituted Bi<sub>2</sub>WO<sub>6</sub> (RE = Nd, Eu, Tb) Nanoparticles: Implications on their Photocatalytic Activity  
PI: Dr. Nalini G Sundaram  
Research Fellow: Mr. Pradeep Shanbogh
2. **Photoluminescence:** Photoluminescent Nanomaterials for Solid State Lighting and Theranostic Applications:  
PI: Dr. Nalini G Sundaram  
Research Fellow: Ms. Archana.K.M
3. Design, Crystal structure and Photoluminescence of Lithium Rare Earth Tungstate Nanoparticle Polymorphs (RE=La,Ce,DyYb)  
PI: Dr. Nalini G Sundaram  
Research Fellow: Ms. Archana.K.M
4. **C. Gas Sensors:** Design of Lanthanum based Perovskite Nanoparticles for the Development of Thick Film Gas Sensor.  
PI: Dr. Nalini G Sundaram  
Research Fellow: Ms. Chethana Aranthady
5. **C. Gas Sensors:** Design of Transition Metal Oxide -SnO<sub>2</sub> Based Nanocomposites for Highly Selective Gas Sensors
6. **D. Ferroic Materials:** Design of Bismuth-based Nanomaterials for Magnetoelectric Properties  
PI: Dr. Nalini G Sundaram  
Research Fellows: Mr. Pradeep Shanbogh and Ms. Chethana Aranthady
7. **D. Ferroic Materials:** Structural Analysis of Lead Free Relaxor Dielectrics with TiO<sub>2</sub> Rutile Structure:  
PI: Dr. Nalini G Sundaram  
Co-PI: Dr. Diptikanta Swain, IISc, Bangalore

### Best Presentation awards:

**Best poster presentation award for two consecutive years** at the 13th and the 14th conference of the **Asian crystallographic Association (AsCA)** held at Kolkatta, India as well as Hanoi, Vietnam

### Research Highlights:

- Dr. Nalini was invited to deliver a talk at the DST-Synchrotron Meeting held from February 1-5th 2017 at Sinclair Retreat, Bagdogra, Kolkatta
- Dr. Nalini G Sundaram Co-Convened the UGC-DAE sponsored workshop on Thematic Workshop on Diffraction Methods in Materials Science at PPISR, in association with Bangalore University and UGC-DAE CSR Mumbai Centre.
- Ms. Archana has been selected for 8th AONSA Neutron School, BARC during 14th -19th November 2016 held at Mumbai.
- Dr. Nalini gave a talk titled Sunlight Driven Photocatalysis in Oxide Nanomaterials at the Founder's day Technical session conduction on July 7th 2016
- Mr. Pradeep presented seminar on Perovskites for Low Cost and High Efficiency Solar Cells at PPISR

- Mr. Bharath successfully finished his M.Tech thesis presentation at MIT, Manipal on the project titled : Design and Development of Multifunctional SnO<sub>2</sub>-Ta<sub>2</sub>O<sub>5</sub> Nanocomposite for Photocatalytic and Gas Sensing Applications at MIT manipal
- Dr. Nalini and Mr.Pradeep visited the National Institute of Materials Physics in Magurele/Bucharest, Romania on 29th and 30th March, 2016 to carry out HRTEM measurements for the proposal titled Evaluation of Micro structure and Phase Composition of Bi<sub>2-x</sub>GdxWO<sub>6</sub>(x = 0.2 to 1) Mixed phase Nano Photocatalysts. The accommodation and Flight tickets are funded by the Central European Research Infrastructure Consortium (CERIC) funding
- Ms. Archana Presented a poster at National conference on Luminescence and its Applications at IICT, Hyderabad.
- Ms. Archana presented a poster at the 8th AONSA Neutron School, BARC during 14th -19th November 2016, Mumbai.
- Dr. Nalini and her group actively participated in ICDD (International Centre for Diffraction Data) workshop held at IISc Bangalore during the IUMRS, Young Scientists conference in December 2016 Beam time awarded to many proposals submitted for Neutron and Synchrotron beam time at national and international laboratories such as BARC, Oakridge National Laboratory, USA, Elettra, Trieste, Italy, APS, Argonne, U.S.A. etc.. Periodic collaboration are in progress with the scientists in these laboratories
- Dr. Nalini G Sundaram is a reviewer of Journal of Applied Crystallography and Materials Research Bulletin

## **Dr. Ganapati V. Shanbhag**

Assistant Professor

E-mail:shanbhag@poornaprajna.org

### **BRIEF CV:**

- 2010-Present: Asst. Professor, PPISR, Bengaluru, India
- 2008-2010: Research Scientist, Dept. of Chemistry, Korea Advanced Institute of Science and technology (KAIST), South Korea
- 2002-2008: Ph.D. CSIR-National Chemical Laboratory, Pune India
- 2000-2001: Research Associate, ICI India Ltd (MNC), Mumbai, India
- 1999-2000: Lecturer, M.M Arts and Science College, Sirsi, Karnataka, India
- 1999: M.Sc. Organic Chemistry, Karnatak University, Dharwad, India

### **RESEARCH INTERESTS:**

1. Design and development of shape selective catalysts for commercially important organic transformations.
2. Novel multifunctional materials and their catalytic applications.
3. Studies on catalytic conversion of biomass and biorefinary byproducts into fuels and value added chemicals.
4. Chemical fixation of CO<sub>2</sub> into value added products using metal modified ordered nanoporous silicate catalysts.

### **ACHIEVEMENTS/RECOGNITIONS/AWARDS/MEMBERSHIP:**

- Guided 2 students for their PhD degree and 1 student as co-guide. Also guided 3 students for their MTech thesis as external guide.
- 17 research publications as corresponding author from PPISR in internationally reputed journals and 1 book chapter in last 6 years.
- Overall 40 publications in his research career H-index = 15 (Scopus).
- Co-inventor in the 2 World patent (PCT) applications filed by HPCL R & D Centre, Bengaluru evolved as a result of a collaborative project.
- Received a Meritorious Award for Excellence in Research from AMEF during Founder's day July 6, 2012 in recognition of contribution towards research and development at PPISR.
- Editorial board member of the journal Journal of Catalyst and Catalysis.
- Member of the Syllabus revision committee for Chemistry for Siddaganga Institute of Technology (SIT), Tumkur.
- Reviewer for international journals viz. Chemical Communications (RSC), Applied Catalysis A (Elsevier), Catalysis Science and Technology (RSC), Catalysis Communications (Elsevier) and Journal of Chemical Sciences (Elsevier), Biomass & Bioenergy (Elsevier), Springer Plus, Energy Technology (Wiley), ChemCatChem (Wiley).
- Resource person for Refresher Course Programme for PU college Lecturers sponsored by VGST, Govt of Karnataka.

- Three best oral/poster presentation awards to the group for the research papers presented at National symposiums/workshops, 1. Kuvempu University on Social Relevance of Chemical Sciences in March 2011 (student: Mrs. SwethaSandesh) 2. Manipal Institute of Technology , National Symposium on Chemistry and Humanity in Manipal, July, 2011 (Student: Mr. Janardhan H L) and 3. National Workshop on Catalysis, CSIR-NEERI, Nagpur, Maharashtra on 4-5, Feb 2014 (Student: Mr. VijaykumarMarakatti).
- Received plaques as a Principal Investigator of the sponsored project from GTC Technology Inc. USA in 2012, 2014 and 2015 in recognition of the milestones achieved by the group in developing a modified zeolite catalyst for aromatics technology.
- Life member of International Zeolite Association (IZA) and Catalysis Society of India (CSI) and member of American Chemical Society.
- Chemical Today magazine published an interview of Dr. Shanbhag in June 2016 issue.

**STUDENTS: PhD students:**

1. Manjunathan P.
2. Nagendra Kulal
3. Manjunath Doddamani

**Project Fellows:**

1. Santosh Kumar J.
2. Saikiran M.
3. Darshan Gaonkar
4. Abhishek Jadhav
5. Mahesh Kumar T.
6. Girish Kamath
7. Anusha R

**Past students:**

**Doctoral students:**

1. Vijaykumar Marakatti (Present: Post Doc, JNCASR, Bengaluru)
2. Janardhan H L (Present: Post Doc, KIST, South Korea)
3. Swetha Sandesh (Present: CEO, Nirathara Scientific Solutions Pvt Ltd)

**M.Tech. project students:**

1. Satish Burla (Present: Research Engineer, SABIC, Bengaluru)
2. Prashant Kumar (Present: Research Engineer, SABIC, Bengaluru)
3. Girish Kamath (Present: Doctoral student, at Univ. of Saskatchewan, Canada)

**NATIONAL AND INTERNATIONAL COLLABORATORS:**

1. Dr. Ding ZhongYi, Technology Manager, PWT Inc, USA
2. Prof. Shubhangi Umbarkar, Sr. Scientist, CSIR-NCL, Pune.
3. Prof. Rajendra Srivastava, Asst. Professor, IIT-Ropar, Punjab

## RESEARCH: SPONSORED PROJECTS:

1. **Design and development of a catalyst and process for C1-C3 hydrocarbon conversion to olefins and aromatics (Sponsored by: PW Technology, USA)**  
PI: Dr. Ganapati V Shanbhag; Co-PI: Dr. Sanjeev P Maradur  
Project fellows: Mr. Santosh Kumar, Mr. Saikiran, Mr. Manjunath D., Mr. Mahesh Kumar, Ms. Anusha R; Date: 2016-2017
2. **Design and development of a catalyst and process for selective methylation of benzene/ toluene to produce p-xylene**  
Sponsored by: GTC Technology, USA)  
PI: Dr. Ganapati V Shanbhag; Co-PI: Dr. Sanjeev P Maradur  
Research Fellows: Mr. Santosh Kumar, Mr. Saikiran and Mr. Kempanna  
Date: 2011-2017
3. **3. Development of novel catalysts for light naphtha valorization**  
(Sponsored by: Hindustan Petroleum Green Research and Development Centre (HPGRDC), Bengaluru  
PI: Dr. Ganapati V Shanbhag; Co-PI: Dr. Sanjeev P Maradur  
Project fellows: Mr. Girish Kamath, Mr. Darshan Gaonkar, Mr. Abhishek Jadhav  
Date: 2015-2017

## ACADEMIC PROJECTS:

1. **Chemical fixation of CO<sub>2</sub> by converting into value-added chemicals using metal modified nanoporous silicate catalysts.**  
(Sponsored by: Vision Group on Science & Technology, Govt. of Karnataka, 2014-2017)  
Center of Excellence in Science Engineering and Medicine (CESEM)  
PI: Dr. Ganapati V Shanbhag; Project fellow: Mr. Nagendra Kulal
2. **Versatile Mesoporous SnO<sub>2</sub> as an Efficient Catalyst with Multifarious Application in Oxidation and Acid Catalysis**  
PI: Dr. Ganapati V Shanbhag; Project fellow: Mr. Manjunathan P.
3. **Mesoporous tin phosphate as an efficient catalyst for transformation of bio-renewable feedstock into biofuels and chemicals**  
PI: Dr. Ganapati V Shanbhag; Project fellow: Mr. Manjunathan P.

## RESEARCH HIGHLIGHTS:

### A. Published papers (2016-2017)

1. The Synthesis of biodiesel and acetins by transesterification reactions using novel CaSn(OH)<sub>6</sub> heterogeneous base catalyst, catalyst. S. Sandesh, P. R. Kristachar, P. Manjunathan, A. B. Halgeri, G. V. Shanbhag\*, Applied Catalysis A: General (Elsevier), 523 (2016) 111.
2. Aromatization of C<sub>5</sub>-rich Light Naphtha Feedstock over Tailored Zeolite Catalysts: Comparison with Model Compounds (n-C<sub>5</sub> - n-C<sub>7</sub>), Janardhan L. Hodala,[a] Anand B. Halgeri,[a] Ganapati V. Shanbhag,\*[a] R. Sudarshan Reddy,[b]Nettem V. Choudary,[b]Peddy V.C. Rao,[b] Mr. GandhamSriGanesh,[b]Gitesh Shah[b]and Raman Ravishankar\*[b], ChemistrySelect (Wiley), 2016, 1, 2515-2521 [a] Materials Science Department, Poornaprajna Institute of Scientific Research, Bengaluru. [b] HP Green R & D Centre, HPCL, Bengaluru.
3. Enhancement in activity and shape selectivity of zeolite BEA by phosphate treatment for 2-methoxynaphthalene acylation Janardhan L. Hodala, Anand B. Halgeri and Ganapati V. Shanbhag\*, RSC Advances, 2016, 6, 90579-90586

### B. Papers presented in Conferences :

1. Mr. Manjunathan presented his research work as poster titled Mesoporous SnO<sub>2</sub>: An efficient catalyst with versatile applications in acid and oxidation catalysis in 17th National workshop on Challenges in catalysis science and technology held at IICT Hyderabad and won best presentation award shared with co-author Mr. Sathyapal.
2. Mr. Manjunathan P. presented his PhD research work as a poster in Research colloquium 2016 held at Manipal University, Manipal on April 4th 2016 and won best presentation award.
3. Mr. Manjunathan presented his research work by poster titled Mesoporous tin phosphate as an efficient catalyst for transformation of bio-renewable feedstock into biofuels and chemicals at International Conference on Energy Innovations- today and tomorrow at HP Green R & D Centre, Bengaluru on October 15-16, 2016.
4. Mr. Nagendra Kulal attended and presented a poster on my research work titled Novel metal composite catalysts for CO<sub>2</sub> valorization: Cycloaddition of CO<sub>2</sub> to epoxides for cyclic carbonate synthesis in 17th National workshop on Challenges in Catalyst CCST-2016 held at Hyderabad.
5. Mr. Nagendra Kulal presented a poster on Novel mixed metal oxide catalysts for CO<sub>2</sub> valorization: cycloaddition of CO<sub>2</sub> to epoxides for cyclic carbonate synthesis at International Conference on Energy Innovations- today and tomorrow at HP Green R & D Centre, Bengaluru on October 15-16, 2016.
6. Nagendra Kulal made Oral Presentation on Chemical fixation of CO<sub>2</sub> by converting into valuable cyclic carbonate using novel mixed metal oxide catalyst at International conference on Green Chemistry and Nanotechnology to be held at St. Aloysius College Mangalore on 27-28, Feb 2017.

### **C. Review meetings:**

#### **a) Academic review meetings:**

1. Doctoral Advisory Committee meeting to review the six-month research progress of Mr. Manjunathan on August 9, 2016 at Sadashivnagar campus. Doctoral committee members, Prof. Y. S. Bhat, Prof. B. Chandrashekar and Dr. Raman Ravishankar attended the meeting. The meeting was attended by Dr. A. B. Halgeri and Dr. G. V. Shanbhag. DAC members gave several valuable suggestions to improve the quality of research.
2. The first DAC meeting of Mr. Nagendra Kulal before PhD registration was conducted at Sadashivnagar campus on November 11, 2016. The DAC members, Dr. Manikandan and Dr. Y S Bhat and PhD supervisor, Dr. Ganapati Shanbhag attended the meeting chaired by Dr. A. B. Halgeri.
3. Manipal University conducted a Pre-registration Viva at Manipal on December 30, 2016 attended by their panel of experts. Mr. Kulal gave a presentation on his synopsis which was attended by Dr. Shanbhag. The committee of MU approved the synopsis of Mr. Kulal with few minor corrections.
4. Doctoral Advisory Committee meeting to review the six-month research progress of Mr. Manjunathan on December 19, 2016 at Sadashivnagar campus. It was Mr. Manjunathan's 3 years of doctoral research and his 6th DAC meeting. DAC members gave several valuable suggestions to improve the quality of research. They also approved to extend his work for another 6 months to complete his pending work and writing of thesis.

#### **b) Project Review Meetings**

1. Dr. Ding ZhongYi, Technology Process Manager, GTC USA visited PPISR on 18-19, September 2016 to review the progress of new GTC sponsored project started from January 2016. For the ongoing new project, there were discussions on the progress made during 8 months during the technical review meeting chaired by Dr. A. B. Halgeri. Dr. Ganapati Shanbhag and Dr. Sanjeev Maradur made technical presentations about the progress of the project and literature related to the subject.
2. Mr. Joseph Gentry, Vice President, M/s GTC Technology Inc. USA visited the institute on 26th September, 2016 for the Review of ongoing sponsored project. Dr. Shanbhag presented the progress made so far in the project. Dr. Gentry was happy with the results obtained in the project.
3. Dr. Shanbhag and Dr. Maradur visited GTC Technology Inc Houston USA for a review meeting on December 1-2, 2016 which was attended by Dr. Joseph Gentry, Dr. Ding ZhongYi, Dr. Sachin Joshi, Mr. Venkata and others. Dr. Shanbhag presented the highlights of overall work conducted by PPISR during last 6 years and details of the present project work. The GTC team gave several suggestions for the future work and appreciated the overall progress made in the project. They also announced that the project would be extended for another two years.
4. 1st quarterly Project review meeting of new HPCL sponsored project was held at HP Green R & D Centre, Bengaluru on February 2, 2016. From HPCL R & D Centre, Dr. N V Choudhary (General Manager), Dr. Peddy V C Rao (Dy. Gen. Manager), Dr. Raman Ravishankar (Senior Manager) and Dr. Sudarshan Reddy attended the meeting. From PPISR, Dr. A. B. Halgeri, Dr. G. V. Shanbhag and Dr. S. P. Maradur were present. Dr. G. V. Shanbhag gave a presentation on the progress made in the project work in the first quarter and discussed the ongoing and future proposed work. HPCL team gave several suggestions which would be incorporated in the future work. They appreciated the overall progress made in the project.
5. 2nd and 3rd quarterly Project review meeting of new HPCL sponsored project was held at HP Green R & D Centre, Bengaluru on May 30, 2016. Dr. G. V. Shanbhag gave a presentation on the progress made in the project work in the first quarter and discussed the ongoing and future proposed work. HPCL team gave several suggestions which would be incorporated in the future work. They appreciated the overall progress made in the project.
6. Annual review meeting of new HPCL sponsored project was held at HP Green R & D Centre, Bengaluru on November 15, 2016. Dr. G. V. Shanbhag gave a presentation on the progress made in the project work for one year and discussed the ongoing and future proposed work. HPCL team gave many suggestions which would be incorporated in the future work. They were happy with the overall progress made in the project.

**Dr. Sanjeev P. Maradur**

Assistant Professor

E-mail: sanjeevpm@poornaprajna.org

**BRIEF CV:**

- 2012-Present: Asst. Professor, PPISR, Bangalore, India
- 2011-2012: Postdoctoral Research Associate, Dept. of Chemistry, University of Oklahoma, USA
- 2010-2011: Postdoctoral Student, Alan MacDiarmid Energy Research Institute (AMERI), Chonnam National University, Gwangju, South Korea
- 2009-2010: Postdoctoral Scientist, Dept. of Chemistry, Korea Advanced Institute of Science and technology (KAIST), Daejeon, South Korea
- 2007-2009: Research Scientist, Jubilant Life Sciences Ltd, Noida, India
- 2006-2007: Senior Research Fellow, Dept. of chemistry, IIT-Bombay, Mumbai, India
- 2003-2006: Ph.D. Dept. of Chemistry, Shivaji University Kolhapur, India

**RESEARCH INTERESTS:**

Our group is working on a class of advanced materials, which share the advantages of both mesostructured materials and polymers of organic frameworks. The organic framework can provide numerous opportunities to tailor the chemical properties through the incorporation of a wide variety of useful organic functional groups by grafting or co-condensation. These polymers provide us with good opportunities for designing novel and innocuous support for heterogenization of a homogeneous catalyst as well as catalysts by itself. Also we are working on Value addition of biomass platform chemicals: Conversion of biomass derived alcohols and glycerol into value added products.

**ACHIEVEMENTS/RECOGNITIONS/AWARDS/MEMBERSHIP:**

- Received Seed Money for Young Scientist Research Program Award from Vision Group on Science and Technology, Govt of Karnataka in 2014.
- Received a plaque from GTC Technology Inc. USA in 2014 & 2015 in recognition of the milestones achieved by the group in developing a modified zeolite catalyst for aromatics technology.
- Co-inventor in 2 Korean patents on a). Preparation of novel mesoporous polymer and b). Low cost carbon-fiber technology with two different research groups of South Korea.
- Life member of International Zeolite Association (IZA) and Catalysis Society of India (CSI) and member of American Chemical Society.

**STUDENTS:**

**PhD students**

- Sathyapal Churipard. R.
- Kempanna S. Kanakikodi
- Manjunathan P (Joint Student with Dr Shanbhag)

### **M.Tech. project students:**

- Manish Kumar, Chem Engg Dept, Manipal University, Manipal (Present: PhD Scholar, NIT-Trichy)
- Sharath Ravi Chem Engg Dept, Manipal University, Manipal (Present: Research Engineer, Shell Technology, Bengaluru)

### **NATIONAL AND INTERNATIONAL COLLABORATORS**

1. Dr. Ding ZhongYi, Technology Manager, PWT Inc, USA
2. Dr. Raman Ravishankar, Chief Manager, HP Green R & D Center, Bengaluru
3. Dr. Nagesh Kini, Senior Manager, R&D, Thermax Industries Ltd., Pune

### **RESEARCH**

#### **SPONSORED PROJECTS:**

1. Development of Novel Mesoporous Polymer Based Catalysts for Low Temperature Catalytic Applications Sponsored by Hindustan Petroleum Green R&D Center, Bangalore  
PI: Dr. Sanjeev P Maradur; Co-PI: Dr. Ganapati V Shanbhag  
Project Fellows: Sathyapal Churipard. R and Mr. Kempanna S. Kanakikodi  
Date: 2016-2018
2. Design and development of a catalyst and process for C1-C3 hydrocarbon conversion to olefins and aromatics (Sponsored by: PW Technology, USA)  
PI: Dr. Ganapati V Shanbhag; Co-PI: Dr. Sanjeev P Maradur  
Project fellows: Mr. Santosh Kumar, Mr. Saikiran, Mr. Manjunath D., Mr. Mahesh Kumar, Ms. Anusha R;  
Date: 2016-2017
3. Design and development of a catalyst and process for selective methylation of benzene/toluene to produce p-xylene (Sponsored by: GTC Technology, USA)  
PI: Dr. Ganapati V Shanbhag; Co-PI: Dr. Sanjeev P Maradur  
Research Fellows: Mr. Santosh Kumar, Mr. Saikiran and Mr. Kempanna  
Date: 2011-2017
4. Conversion of Waste Plastics into Fuels Short Term Project Sponsored by Thermax Industries Ltd, Pune  
PI: Dr. Sanjeev P Maradur; Co-PI: Dr. Ganapati V Shanbhag  
Project Fellow: Manish Kumar

#### **ACADEMIC PROJECTS:**

- Peroxotungstate supported mesoporous polymer as catalyst for the oxidation of alcohols by hydrogen peroxide  
PI: Dr. Sanjeev P. Maradur; Project fellow: Sathyapal Churipard. R
- Oxidation of cyclohexene to adipic acid  
PI: Dr. Sanjeev P. Maradur; Project fellow: Sathyapal Churipard. R
- Room temperature tetrahydropyranilation of alcohols using acid functionalized mesoporous polymers  
PI: Dr. Sanjeev P. Maradur; Project fellow: Sathyapal Churipard. R, Kempanna S. Kanakikodi.
- Super-hydrophobic Mesoporous polymers as green catalysts for catalytic etherification of glycerol with TBA as an alkylating agent  
PI: Dr. Sanjeev P. Maradur; Project fellow: Kempanna S. Kanakikodi, Sathyapal Churipard. R.

## RESEARCH HIGHLIGHTS

### A. Published papers (2016-2017)

1. Catalytic etherification of glycerol to tert-butyl glycerol ethers using tert-butanol over sulfonic acid functionalized mesoporous polymer P. Manjunathan, M. Kumar, S. R. Churipard, S. Shivshankaran, G. V. Shanbhag and Sanjeev. P. Maradur. RSC Advances, 2016, 6, 82654-82660.
2. Remarkable Catalytic Activity of Sulfonated Mesoporous Polymer (MP-SO<sub>3</sub>H) for the Synthesis of Solketal at Room Temperature Sathyapal R Churipard, Pandian Manjunathan, Prakash Chandra, Ganapati V Shanbhag, Raman Ravishankar, Peddy VC Rao, Sri Ganesh Gandham, AB Halgeri, Sanjeev P Maradur. New J. Chem, 2017, DOI: 10.1039/C7NJ00211D.

### B. Papers presented in Conferences

1. Mr. Sathyapal presented a poster in National workshop on Challenges in Catalysis Science and Technology, held at IICT, Hyderabad entitled "Sulfonic acid functionalized mesoporous polydivinylbenzene (MP-SO<sub>3</sub>H) as an efficient solid acid catalyst for etherification of glycerol with tert-butanol" and got the best poster award
2. Mr. Sathyapal presented a poster in International Conference on Energy Innovations - Today and Tomorrow hosted by HPCL green R & D centre, Bangalore, entitled Synthesis of Solketal: A potential Fuel Additive for diesel and gasoline derived from bio-renewable glycerol reaction with acetone over solid acid catalyst at room temperature
3. Mr. Kempanna presented his research as a poster in International Conference on Energy Innovations - Today and Tomorrow hosted by HPCL green R & D centre, Bangalore, entitled Tert-Butyl glycerol ethers: A Potential Fuel additive Alternate to MTBE by Glycerol etherification with tert-Butanol over Acidic Mesoporous Polymer

### C. Review meetings:

#### a) Academic review meetings:

1. 2nd Doctoral Advisory Committee meeting was organized to review the six-month research progress of Mr. Sathyapal C R on August 16, 2016 at Sadashivnagar campus. Doctoral committee members, Prof. Y. S. Bhat, Prof. N. Nagaraju and Dr. Sebastian Peter attended the meeting. The meeting was attended by Dr. A. B. Halgeri and Dr. Sanjeev Maradur. DAC members gave several valuable suggestions to improve the quality of research.
2. 3rd Doctoral Advisory Committee meeting was organized to review the six-month research progress of Mr. Sathyapal C R on March 15, 2017 at Sadashivnagar campus. Doctoral committee members, Prof. Y. S. Bhat and Prof. N. Nagaraju attended the meeting. The meeting was attended by Dr. A. B. Halgeri and Dr. Sanjeev Maradur. DAC members gave several valuable suggestions to improve the quality of research.
3. The first DAC meeting of Mr. Kempanna K., before PhD registration was conducted at Sadashivnagar campus on November 18, 2016. The DAC members, Dr. G. S. Rao, Prof. V. Gayatri and Dr. Y S Bhat and PhD supervisor, Dr. Sanjeev Maradur attended the meeting chaired by Dr. A. B. Halgeri.
4. Manipal University conducted a Pre-registration Viva at Manipal on December 30, 2016 attended by their panel of experts. Mr. Kempanna gave a presentation on his synopsis which was attended by Dr. Maradur. The committee of MU approved the synopsis of Mr. Kempanna with few minor corrections.

## b) Project Review Meetings

1. Dr. Ding ZhongYi, Technology Process Manager, GTC USA visited PPISR on 18-19, September 2016 to review the progress of new GTC sponsored project started from January 2016. For the ongoing new project, there were discussions on the progress made during 8 months during the technical review meeting chaired by Dr. A. B. Halgeri. Dr. Ganapati Shanbhag and Dr. Sanjeev Maradur made technical presentations about the progress of the project and literature related to the subject.
2. Mr. Joseph Gentry, Vice President, M/s GTC Technology Inc. USA visited the institute on 26th September, 2016 for the Review of ongoing sponsored project. Dr. Shanbhag presented the progress made so far in the project. Dr. Gentry was happy with the results obtained in the project.
3. Dr. Shanbhag and Dr. Maradur visited GTC Technology Inc Houston USA for a review meeting on December 1-2, 2016 which was attended by Dr. Joseph Gentry, Dr. Ding ZhongYi, Dr. Sachin Joshi, Mr. Venkata and others. Dr. Shanbhag presented the highlights of overall work conducted by PPISR during last 6 years and details of the present project work. The GTC team gave several suggestions for the future work and appreciated the overall progress made in the project. They also announced that the project would be extended for another two years.
4. 1st quarterly project review meeting of new HPCL sponsored project on mesoporous polymers was held at HP Green R & D Centre, Bengaluru on May 30, 2016. Dr. Maradur gave a presentation on the progress made in the project work in the first quarter and discussed the ongoing and future proposed work. HPCL team gave several suggestions which would be incorporated in the future work. They appreciated the overall progress made in the project.
5. 2nd quarterly project review meeting of new HPCL sponsored project on mesoporous polymers was held at HP Green R & D Centre, Bengaluru on November 15, 2016. Dr. Maradur gave a presentation on the progress made in the project work for one year and discussed the ongoing and future proposed work. HPCL were happy with the overall progress made in the project.

**Dr. Suresh Babu Kalidindi**

DST-INSPIRE faculty / Assistant professor  
Email: sureshk@poornaprajna.org

**BRIEF CV:**

- DST-INSPIRE Faculty/Assistant Professor. Poornaprajna Institute of Scientific Research(PPISR), Bangalore, Aug 2015-present
- Postdoctoral Research Associate. University of Liverpool, United Kingdom, September 2013-July2015.
- Alexander von Humboldt Fellow. Max Planck Institute for Intelligent Systems, Stuttgart and Ruhr University, Bochum, Germany. August 2011 September 2013
- RD-IFSC Post Doctoral Fellow. Ruhr University, Bochum. Germany, May 2010- July 2011
- Ph.D. Supervisor, Prof. Balaji R. Jagirdar, Indian Institute of Science, Bangalore, India, Aug 2005 April 2010

**RESEARCH INTERESTS:**

1. Design and development of metal-organic framework based catalysts for biomass conversion into value added chemicals.
2. Design and development of Photocatalytic MOFs.
3. Design of Metal-MOF hybrid materials for selective hydrogenation

**ACHIEVEMENTS/RECOGNITIONS/AWARDS/MEMBERSHIP:**

- 2016 DST- Early career research award
- 2015 DST-INSPIRE Faculty Award
- 2011-13 Alexander von Humboldt Fellowship
- 2010-2011 Post-doctoral fellowship from Research Department- Interfacial Systems Chemistry, Ruhr University, Bochum
- 2009-2010 Best Ph. D thesis award- Prof. S. Soundarajan Medal from Indian Institute of Science (IISc), Bangalore.
- 2007-08 Vasudevamurthy-Soundarajan prize for best seminar during the academic year from Department of Inorganic Physical Chemistry, Indian Institute of Science (IISc), Bangalore
- 2007-2010 Senior research fellowship (SRF,) from Council of Scientific and Industrial Research (CSIR), Government of India.
- 2005-2007 Junior research fellowship (JRF,) from Council of Scientific and Industrial Research (CSIR), Government of India.
- Published 25 research publications in internationally reputed journals and 1 book chapter (H= index =15).

**STUDENTS:**

**Ph.D. Student:** Vasudeva Rao B  
**Project Fellow:** Marilyn D

**Past students**

**M.Tech. project students**

1. Sucharita Kamath

## **RESEARCH PROJECTS:**

1. Transformative Crystalline Hybrid Porous Materials: Chemical Synthesis and Applications- (Sponsored by: Department of Science and technology (DST), INSPIRE)  
PI: Dr. Suresh Babu Kalidindi  
Research Fellows: Mr. Vasudeva Rao B.  
Date: 2015-2020
2. Design and Development Stable Metal Organic Frameworks (MOFs) with Multiple Functional Sites for Catalysis- (Sponsored by: Department of Science and technology (DST))  
PI: Dr. Suresh Babu Kalidindi  
Research Fellows: Ms. Marlyin D.  
Date: 2016-2019

## **RESEARCH HIGHLIGHTS**

### **A. Papers presented in Conferences**

1. Dr. Suresh gave invited lecture in the National seminar on Recent Trends in Chemical Speciation, Kinetics and Nanomaterials (RTCSKN - 2017) held at Department of Inorganic & Analytical Chemistry, Andhra University, Visakhapatnam on 3rd & 4th March, 2017.
2. Best oral presentation : Mr. B. Vasudeva Rao received best oral presentation award in the National seminar on Recent Trends in Chemical Speciation , Kinetics and Nanomaterials (RTCSKN - 2017) held at Department of Inorganic & Analytical Chemistry, Andhra University, Visakhapatnam on 3rd & 4th March, 2017. The title of the presentation is "Selective Hydrogenation of Carbon-Carbon Double bond (C=C) in Cinnamaldehyde Through Pd@MIL-101(Fe) Catalyst".

### **B. Review meetings:**

#### **a) Academic review meetings:**

1. The first DAC meeting of Mr. B. Vasudeva Rao before PhD registration was conducted at Sadashivnagar campus on Oct 3, 2016. The DAC members, Dr. Manikandan and Dr. Y S Bhat and PhD supervisor, Dr. Ganapati Shanbhag attended the meeting chaired by Dr. A. B. Halgeri.
2. Manipal University conducted a Pre-registration Viva at Manipal on December 1, 2016 attended by their panel of experts. Mr. B. Vasudeva Rao gave a presentation on his synopsis which was attended by Dr. Suresh. The committee of MU approved the synopsis and registered him for Ph. D.

## 11 Biological Sciences Department

### 11.1 Mission and research progress

The Biological Science Department is equipped with facilities for isolation and identification of microbes, plant and microbial secondary metabolites extraction systems, molecular biology facilities for the cloning, recombinant expression, purification and crystallization of key biomolecules. Computational facility with essential packages for crystallographic data analysis, phasing and refinement, model building, ab initio modeling, and various other programs are available in the department. The research activities in the department are supported by in-house grants as well as grants from agencies such as Department of Biotechnology (DBT), Board for Research In Nuclear Science (BRNS), Vision Group On Science and Technology (VGST) along with in-house funding (PPISR) and Department of Science and Technology (DST).

The Biological Sciences Department offers PhD program in two major research areas; Structural biology and Microbiology. In structural biology our main focus is on the study structure based modification of T-cell co-stimulatory molecules to generate lead molecules for autoimmune disorders and cancer. We are also interested in enzymes having biological and medicinal importance. For example, enzymes involved in purine metabolism, methyltransferases implicated in antibiotic resistance. The microbiology group headed by Dr. Ananda K. mainly focuses on antidiabetic compounds from endophytic fungi isolated in medicinal plants. Dr. Ananda K. also initiated some progress in modification of insulin for improving its therapeutic applications in controlling diabetes. Two students obtained their PhD degree from the department and all the current students are registered for PhD under Manipal University.

#### Major Areas of Research

1. Modification of T-cell costimulatory molecules to generate lead biologics to treat autoimmune disorders and cancer.
2. Structural and functional studies of enzymes involved in purine metabolism.
3. Bioactive compounds from plant and endophytic fungal association.
4. Lignin degrading enzymes from endophytic fungi.
5. Chemical modification of therapeutic protein for enhancing their half life

## 11.2 Faculty profile

### Dr. Udipi A. Ramagopal

Associate Professor

Ramalingswami fellow, DBT, India (2011 - 2016)

Biological Science Department

Email: [udupi.ramagopal@poornaprajna.org](mailto:udupi.ramagopal@poornaprajna.org)

Phone: +91-80-27434007

#### Research:

- Structural Biology of enzymes and drug design
- Structural Biology of T-cell check-point blockade receptors.
- Weak anomalous scatterers and de novo phasing
- Protein assembly and design

#### Publications (2016-2017):

1. **Raghurama P. Hegde**, Fedorov, A.A., Sauder, J.M., Burley, S.K., Almo, S.C. & **Ramagopal UA\***, 2017, "The treasure your data may have: Phasing with unexpected weak anomalous scatterers", *ActaCryst F73*, 184-195.
2. **Ramagopal UA**, Liu W, Garrett S, Yan Q, Srinivasan M, Wong S, Bell A, Mankikar S, Vangipuram R, Deshpande S, Korman A, Almo, SC. 2017, Structural basis for cancer immunotherapy by the first-in-class checkpoint inhibitor Ipilimumab. Answering referees, *Proc. Nat. Acad. Sci. (USA)*. In Press.
3. Lzr-Molnr E, Scanduzzi L, Basu I, Quinn T, Sylvestre E, Palmieri E, **Ramagopal UA**, Nathenson SG, Guha C, Almo SC. 2017, Structure-guided development of a high-affinity human Programmed Cell Death-1: Implications for tumor immunotherapy. *EBioMedicine*, 17:30-44.
4. Samanta D, Guo H, Rubinstein R, **Ramagopal UA\***, Almo SC, 2017, Biochemical and Structural studies reveal a canonical mode of molecular recognition between immune receptor TIGIT and nectin-2, *Molecular Immunology* 81, 151-159.
5. Liu W, **Ramagopal UA**, Cheng H, Bonanno JB, Toro R, Bhosle R, Zhan C, Almo SC. 2017, Crystal Structure of the Complex of Human FasL and Its Decoy Receptor DcR3. *Structure (Cell Press)*, 24(11), 2016-2023.
6. McClelland EE, **Ramagopal UA**, Johanna R, James C, Antonio N, Moses MP, Almo SC, and Casadevall A. A. 2016, Small Protein Associated with Fungal Energy Metabolism Affects the Virulence of *Cryptococcus neoformans* in Mammals. *PLoS Pathog*, 12(9):e1005849.

#### Members:

**Dr. Debayan Day, Research Associate (PhD, IISc):** Structural and evolutionary investigations on antibiotic resistant conferring rRNAmethyltransferases for designing novel strategies of drug development

**Dr. Raghurama P. Hegde, Research Associate (PhD, IISc)**

- (i) Structural Study of proteins from the enolase superfamily.
- (ii) Testing the limits of macromolecular crystallographic phasing.

**Ms. Pavithra G. C. (Graduate Student)**

Thesis Title: Structural Studies of Purine Phosphoribosyltransferases from Pathogenic Bacteria

**Ms. Swetha L. (Graduate Student)**

Thesis title: Structure guided modification and characterization of B7-2 molecule for potential use in immunotherapy

**Mr. Shankar Kundapura**

Thesis title: Rational modification of immune checkpoint receptors for the blockade of PD-1 pathway in cancer immunotherapy.

**Projects:**

**Sponsored projects**

- Ramalingaswami Fellowship titled Co-stimulatory molecules: Biology and therapeutic intervention, Department of Biotechnology (DBT), New Delhi, India.
- Design of modified B7-1 (CD-80) and B7-2(CD86) molecules to create potential reagents for cancer and auto-immune disorders, Vision Group on Science and Technology (VGST), Karnataka.
- Structural and evolutionary investigations on antibiotic resistant conferring rRNAmethyltransferases for designing novel strategies of drug development, Department of Science and Technology, India.

**Dr. Ananda K.**

Asst. Professor

**Areas of interest**

1. Endophytic fungi from medicinal plants
2. Insulin and chemical modification

**Research**

1. Effect of irradiation on endophytic fungi producing laccase enzyme isolated from plants
2. Enzyme inhibitors from endophytic fungi of medicinal plants for the treatment of type 2 diabetes
3. Modification of Insulin protein for the therapeutic applications

**Publications of 2016-17:**

1. Deboleena Dhara, Dhanya Sunil, Pooja R Kamath, Ananda Kulal, S. Shrilakshmi and S. Balaji (2017). New Oxadiazole Derivatives: Synthesis and Appraisal of Their Potential as Antimicrobial Agents. *Letters in Drug Design & Discovery* 14(999):1-1.
2. Hebbar, R. S., Isloor, A. M., Ananda, K., Abdullah, M. S., & Ismail, A. F. (2017). Fabrication of a novel hollow fiber membrane decorated with functionalized Fe<sub>2</sub>O<sub>3</sub> nanoparticles: towards sustainable water treatment and biofouling control. *New Journal of Chemistry*, 41(10), 4197-4211
3. Nandam Harikrishna, Arun M. Isloor, K. Ananda, Tanya Parish, Jozaizulfazli Jamalis, Hazem A. Ghabbour and Hoong-Kun Fun (2017). Antitubercular and Antimicrobial Activity of NH<sub>4</sub>VO<sub>3</sub> Promoted 1,4-Dihydropyridine Incorporated 1,3,4-trisubstituted Pyrazole. *Letters in Drug Design & Discovery*, 14, 000-000
4. Poojari, J., Sunil, D., Kamath, P.R., Ananda, K., Kirana, M.P. (2016). Antioxidant Properties and Electrochemical Behavior of some Acetyl Salicylic Acid Derivatives. *Journal of Applied Pharmaceutical Science* Vol, 6(11), 165-171
5. Shubhalaxmi, Manjunatha BS, Ananda K, Bhat KS. (2016) Synthesis of a series of pyrazoline derivatives carrying tosyl substitution and evaluation of their antimicrobial properties. *J App Pharm Sci* 6 (11): 214-217.
6. Shubhalaxmi, B.S., Ananda, K. and Bhat, K.S., (2016). Pyrimidinethione derivatives with tosyl substitution: Synthesis, and antimicrobial property investigation. *Journal of Applied Pharmaceutical Science* Vol, 6(06), pp.073-078.
7. Shubhalaxmi, Pathak L, Ananda K, Bhat KS. (2016): Synthesis of focused library of novel aryloxyacids and pyrazoline derivatives: Molecular docking studies and antimicrobial investigation. *Cogent Chemistry*, (2):1141388.
8. Hebbar RS, Isloor AM, Ananda K, Ismail AF. Fabrication of polydopamine functionalized halloysite nanotube/polyetherimide membranes for heavy metal removal. *Journal of Materials Chemistry A*. 2016;4(3):764-74.

**Training of Students:**

PhD Awarded : 02  
MSc Project completed : 03  
BSc Project completed : 06  
BSc Inspire students : 03  
PhD students working : 03

**Lab members:** Past PhD Students:

1. Dr. Pavithra N.
2. Dr. Sathish L.

**Present PhD Students:**

1. Ms. Kavitha K N
2. Mr. Kiran M P
3. Ms. Shrilakshmi S

**Completed Projects:**

1. Antimicrobial and anti oxidants of endophytic fungi from Medicinal plants Principal Investigator: Dr.Ananda K. ; Research Fellow: Sathish L
2. Anti-diabetic compounds of endophytic fungi from medicinal plants used for the treatment of diabetes. Principal Investigator: Dr.Ananda K. ; Research Fellow: Pavithra N
3. Anticancer metabolites from endophytes of medicinal plants

Principal Investigator: Dr. Ananda K

**Ongoing Projects:**

1. Effect of electron beam radiation on endophytic fungi producing ligninase enzyme  
PI:Dr.Ananda, K.  
Research Scholar: Ms.Kavitha K.N
2. Alpha glucosidase enzyme inhibitors from Simarouba glauca and from its endophytic fungi  
PI: Dr.Ananda K, Research Scholar: Mr.Kiran M P
3. Site specific modification of insulin for increasing its half-life and pharmacological properties  
PI: Dr.Ananda K.  
Research Scholar : Ms. Shrilakshmi S

**Research Collaboration**

1. Dr. Arun M Isloor, Associate Professor, NITK, Surathkal collaboration for the Biological activity of synthesized compounds and materials.
2. Genelon Institute of Lifesciences, Yelahanka, Bangalore made a MOU for mutual collaborative research and Dr.Ananda K is a member of scientific advisor committee.

**Govt. Sponsored project:**

Received research grant for the project titled Effect of electron beam radiation on endophytic fungi producing ligninase enzyme for three years from BRNS, DAE, Govt. of India

**SYMPOSIA/SEMINARS/WORKSHOP ATTENDED:**

1. Poster presented in 9th Annual KSTA conference on Science, Technology and Innovations in the 21st Century, held at Christ University organized jointly by Karnataka Science and Technology Academy (KSTA) and Christ University, Bengaluru during 20-21, December 2016. Poster Title, Alpha glucosidase inhibitor isolated from medicinal plant Simarouba glauca for treating type 2 diabetes.

## 12 Theoretical Sciences Department

### 12.1 Mission and research progress

Theoretical science aims at a scientific understanding of the mathematical structure and conceptual theme underlying the physical laws and the emergence of this macroscopic world from these laws. The Department works in the broad fields of many-body and mesoscopic physics, nanoscience, quantum information theory, quantum foundations and Solar physics.

Our first PhD student was Ms (Dr.) Akshata Shenoy-Hejmadi (PhD, IISc, 2015), jointly guided with Prof T. Srinivas of Electrical Communication Engg Dept, IISc, who is currently at the Group of Applied Optics, University of Geneva. Our second student was Dr S. Omkar (PhD, MU, 2016), who is currently in the Center for Macroscopic Quantum Control Group. Our third student, Dr. S. Aravinda, who is currently a postdoc at IMSc, Chennai, has successfully defended his thesis.

The Doctoral Advisory Committee (DAC) has been constituted for our current three PhD students: Prof. C. Sivaram (IIA, Bangalore) and Prof. S. K. Srivatsa (PESU, Bangalore) for Messrs Rahul Sharma and Ranjith Kumar, and Prof. C. Sivaram and Prof. Rajeev Joshi (CUK, Kalburgi) for Mr U. Srikanth. The first DAC meeting for Messrs Rahul S. and Ranjith R. were held on 27th February 2017, and that for Mr U. Srikanth on May 15.

#### Mission & Goals

- Understanding the interplay of topology and interactions in light-matter systems
- Understanding the essence of nonclassicality and the fundamental message of quantum theory about the nature of physical reality.
- Exploring practical issues pertaining to quantum information processing, among them quantum cryptography and quantum noise.
- Identifying patterns in Solar surface phenomena and their connection to terrestrial weather.

#### Glimpses of Current Research

- Dynamics of entanglement: in spin chains, dissipative and non-dissipative noisy channels.
- Classification of quantum cryptographic protocols in quantum mechanics and generalized probability theories.
- Quantum spin pumping and superconducting quantum dots.
- Axiomatic approach to quantum mechanics from computation/information theoretic perspective.
- Physics of light and matter interaction
- Quantum mechanical formulation of free will.
- Bell-Kochen-Specker theorem for identity in quantum mechanics.
- Contextuality and nonlocality in quantum mechanics.
- Multi wavelength studies of Gamma-ray bursts, UV Astronomy, Optical spectroscopy of hard X-ray sources, CVs.
- Fractal and time-series analysis of Solar supergranulation.

## 12.2 Faculty profile

### Dr. Sujit Sarkar

Assistant Professor

**Areas of Research Interest:** Quantum many body system are extremely difficult to simulate with classical means. The concept of using another quantum system which is experimentally more controllable as a simulator of original problem has gained a significant attention to the scientific community. Amongst the experimental platforms studied as quantum simulators superconducting qubits and the optical cavity QED systems are the most promising, due to relative straightforward scalability, easy design and integration with standard electronics.

#### PhD Students :

1. Mr. Rahul Sharma: Title of the Project: The Physics of edge states for topological insulator and interacting light-matter system.
2. Mr. Ranjith Kumar R: Title of the Project: Quantum simulation of topological phase for interacting light-matter physics and relativistic physics for condensed matter system.

#### Sponsored Projects :

1. Dept of Science and Technology (DST) project on "Geometric phase of quantum phase transition in quantum many-body systems" (2 JRF positions).
2. Indo-Taiwan project on Quantum spin systems and transport (co-guiding two PhD students in Taiwan)

#### Research projects:

1. Physics of Dirac fermion and Majorana fermion in superconducting qubit systems: PI: Dr. Sujit Sarkar;  
Student: Rahul Sharma
2. Physics of Dirac fermion and Majorana fermion in optical cavity QED systems:  
PI: Dr. Sujit Sarkar;  
Student: R. Ranjith Kumar
3. Superconducting Quantum Dots:  
PI: Dr. Sujit Sarkar;  
Student: R. Ranjith Kumar
4. Topological Quantum Phase Transition and Local Topological Order in a Strongly Interacting Light-Matter System:  
PI: Dr. Sujit Sarkar;  
Student: Rahul Sharma

#### Research Highlights and Publications

1. Topological Quantum Phase Transition and Local Topological Order of Light in a One Dimensional Array of Nonlinear Cavities. Sarkar S, (Accepted in Nature Publication Scientific Report).
2. Physics of Majorana modes in interacting helical liquid, Sarkar S, Nature Sci.Rep. 6 30569 doi:10.1038/srep30569 (2016) (Nature publication group) (Refers.)
3. Topological Quantum Phase Transition of Light. Sarkar S, (Journal of Physical Society of Japan, 85, 014004 (2016). (Refereed)

## **Dr. R. Srikanth**

Assistant Professor

### **Areas of Interest**

- Foundations of Quantum Mechanics
- Quantum Information Theory
- Quantum cryptography
- Solar physics: supergranulation
- Cognition

### **RESEARCH**

#### **Quantum information theory:**

1. Non-Markovianity in quantum information processing
2. Representing graphs by quantum states
3. Quantum noise characterization via quantum error correcting codes
4. Counterfactual cryptography
5. Quantum correlations in particle physics

#### **Foundations of quantum mechanics:**

1. Quantum mechanics, special relativity and the nature of the quantum state
2. Characterizing nonclassicality in single and multi-partite systems
3. Absolute and genuine superlocality
4. Computation in the convex framework

#### **Quantum cryptography:**

1. Foundational implications of quantum cryptography
2. Post-cold-war quantum cryptography
3. Noise-restricted eavesdropping in practical situations

#### **Solar physics:**

1. Solar supergranulation
2. Solar energy management

#### **Foundations of science:**

1. Computability, volition and cognition
2. Identity and individuation

## PhD Students

### Present regular student:

1. Mr. Srikanth Utagi  
Thesis title: Computational speed-up in Quantum Theory and Generalized Probability Theories

### Present external students:

1. Ms Sowmya G. M (along with Prof. U. Paniveni, NIEIT, Mysore)  
Thesis title: Rotational effects of the Solar supergranular spectrum
2. Ms. Rajani G, (along with Prof. U. Paniveni, NIEIT, Mysore)  
Thesis title: Long-term variation of the fractal dimension of the Sun
3. Ms. Yamuna M, (along with Prof. U. Paniveni, NIEIT, Mysore)  
Thesis title: Long-term variation of the fractal dimension of the

### Past Ph.D Students:

1. Dr. S. Aravinda:  
Thesis title: Foundational Aspects of Contextuality and Nonlocality.  
Currently at: Institute for Mathematical Sciences, Chennai, India.
2. Dr. S. Omkar  
Thesis title: Operator Sum-Difference Representation and quantum error correction based characterization of noise due to Dissipative and Nondemolition Interaction with a squeezed Environment.  
Currently at: Center for Macroscopic Quantum Control, Seoul National University, S. Korea.
3. Dr Akshata Shenoy Hejmadi:  
Thesis title: Nonlocality and counterfactuality in Quantum Cryptography  
Currently at: Group of Applied Optics, University of Geneva, Switzerland.

### Sponsored projects / symposia

1. DST-SERB project initiated in April, 2017 for the topic “Computational speed-up in generalized probability theories”. Mr U. Shrikant has been taken under this project.
2. Three-day symposium sponsored by the Indian Council for Philosophical Research (ICPR) titled “Dialog across Traditions: Modern Science and Ancient Insights on Reality” (Oct 25-27, 2016).

### Research projects

1. The nonclassicality of multipartite systems  
PI: Dr. R. Srikanth, Co-PI: Prof. A. Pathak  
RA: Mr S. Aravinda
2. Cryptographic security and hierarchical axioms for quantum mechanics  
PI: Dr. R. Srikanth, Co-PI: Prof. A. Pathak  
RA: Mr S. Aravinda
3. Quantifying the global quantumness of states using commutators?  
PI: Dr. R. Srikanth  
Students: Mr Pavan Iyengar (DLRC, Pune) and Mr G. N. Chandan (IISc)

4. Non-Markovian Dynamics of Discrete Time Quantum Walks  
PI: Prof. Subhashish Banerjee (IIT-Jodhpur), Co-PI: Dr R. Srikanth  
Student: Mr E. Pradeep Kumar (IMSc)
5. Noise can be helpful: analysis of some cryptographic attacks  
PI: Dr R. Srikanth, Co-PI: Prof. Subhashish Banerjee (IIT-Jodhpur)  
Student: Mr Vishal Sharma (IIT-Jodhpur)
6. Fractal dimension of Solar supergranulation  
PI: Prof. U. Phaniveni; Co-PI: R. Srikanth  
Students: Ms Rajani G., Mrs. G. M. Sowmya and Ms. M. Yamuna

## RESEARCH HIGHLIGHTS

### Publications:

1. Nonclassicality of local bipartite correlations C. Jebaratnam, S. Aravinda, R. Srikanth Phys. Rev. A 95, 032120 (2017)
2. Characterization of Unruh channel in the context of open quantum systems Subhashish Banerjee, Ashutosh Kumar Alok, S. Omkar, R. Srikanth. J. High Energ. Phys. (2017) 2017: 82.
3. Can the use of the Leggett-Garg inequality enhance security of the BB84 protocol? Akshata Shenoy H, S. Aravinda, R. Srikanth and Dipankar Home Accepted in Physics Letters A.
4. Extending quantum mechanics entails extending special relativity S. Aravinda and R. Srikanth J. Phys. A: Math. Theor. 49, 205302 (2016)
5. The Unruh effect interpreted as a quantum noise channel S. Omkar, Subhashish Banerjee, R. Srikanth, Ashutosh Kumar Alok Quantum Inf. and Comp. 16, 0757 (2016)
6. The two-qubit amplitude damping channel: characterization using quantum stabilizer codes, S. Omkar, R. Srikanth, Subhashish Banerjee, Anil Shaji Annals of Physics, 373, 145-162 (2016).
7. Bipartite separability and non-local quantum operations on graphs Supriyo Dutta, Bibhas Adhikari, Subhashish Banerjee, R. Srikanth Phys. Rev. A 94, 012306 (2016)
8. Violation of no-signaling in higher-order quantum measure theories Subhashish Banerjee, Ashutosh Kumar Alok, R. Srikanth and Beatrix C. Hiesmayr Int. J. Quantum Inform, 14, 1650024 (2016)
9. The Unruh effect interpreted as a quantum noise channel S. Omkar, Subhashish Banerjee, R. Srikanth, Ashutosh Kumar Alok Quantum Inf. and Comp. 16, 0757 (2016)
10. The two-qubit amplitude damping channel: characterization using quantum stabilizer codes, S. Omkar, R. Srikanth, Subhashish Banerjee, Anil Shaji Annals of Physics, 373, 145-162 (2016).
11. Bipartite separability and non-local quantum operations on graphs Supriyo Dutta, Bibhas Adhikari, Subhashish Banerjee, R. Srikanth Phys. Rev. A 94, 012306 (2016)

### Talks

1. 1. Invited talk at the Indian Council for Cultural Research, N. Delhi, sponsored symposium on Quantum reality and the concept of Shunya, Dec 9-10 (2016). Shunya as the Effective Limit on Causal Regress
2. Invited talk at the 11th Nalanda Dialog, Nalanda Mahaviharai, Jan 28-30 (2017). On the cognition of time

## 13 PPISR Publications

### Year 2016-2017

- [1] S Aravinda and R Srikanth. Extending quantum mechanics entails extending special relativity. *Journal of Physics A: Mathematical and Theoretical*, 49(20):205302, 2016.
- [2] Lucas Pereira dos Santos, Ernani Trombetta, Thais Sydenstricker Flores-Sahagun, and Kestur G Satyanarayana. Effect of domestic compatibilizer on the performance of polypropylene-sawdust composites. *Journal of Composite Materials*, 50(10):1353–1365, 2016.
- [3] Supriyo Dutta, Bibhas Adhikari, Subhashish Banerjee, and R Srikanth. Bipartite separability and nonlocal quantum operations on graphs. *Physical Review A*, 94(1):012306, 2016.
- [4] N Harikrishna, Arun M Isloor, K Ananda, Abdulrahman Obaid, and Hoong-Kun Fun. Synthesis, and antitubercular and antimicrobial activity of 1-(4-chlorophenyl) pyrazole containing 3, 5-disubstituted pyrazoline derivatives. *New Journal of Chemistry*, 40(1):73–76, 2016.
- [5] Raghavendra S Hebbar, Arun M Isloor, K Ananda, and AF Ismail. Fabrication of polydopamine functionalized halloysite nanotube/polyetherimide membranes for heavy metal removal. *Journal of Materials Chemistry A*, 4(3):764–774, 2016.
- [6] Janardhan L Hodala, Anand B Halgeri, and Ganapati V Shanbhag. Enhancement in activity and shape selectivity of zeolite bea by phosphate treatment for 2-methoxynaphthalene acylation. *RSC Advances*, 6(93):90579–90586, 2016.
- [7] Karthik S Joshi, R Srikanth, and Urbasi Sinha. Violation of no-signaling in higher-order quantum measure theories. *International Journal of Quantum Information*, 14(05):1650024, 2016.
- [8] BS Manjunatha, K Ananda, K Subrahmanya Bhat, et al. Pyrimidinethione derivatives with tosyl substitution: Synthesis, and antimicrobial property investigation. 2016.
- [9] Pandian Manjunathan, Manish Kumar, Sathyapal R Churipard, S Sivasankaran, Ganapati V Shanbhag, and Sanjeev P Maradur. Catalytic etherification of glycerol to tert-butyl glycerol ethers using tert-butanol over sulfonic acid functionalized mesoporous polymer. *RSC Advances*, 6(86):82654–82660, 2016.
- [10] Erin E McClelland, Udipi A Ramagopal, Johanna Rivera, James Cox, Antonio Nakouzi, Moses M Prabu, Steven C Almo, and Arturo Casadevall. A small protein associated with fungal energy metabolism affects the virulence of *Cryptococcus neoformans* in mammals. *PLoS pathogens*, 12(9):e1005849, 2016.
- [11] S Omkar, R Srikanth, Subhashish Banerjee, and Anil Shaji. The two-qubit amplitude damping channel: Characterization using quantum stabilizer codes. *Annals of Physics*, 373:145–162, 2016.
- [12] Sowmya Palimar, SD Kaushik, V Siruguri, Diptikanta Swain, Alison E Viegas, Chandrabhas Narayana, and Nalini G Sundaram. Investigation of ca substitution on the gas sensing potential of lafeo 3 nanoparticles towards low concentration so 2 gas. *Dalton Transactions*, 45(34):13547–13555, 2016.
- [13] Jyothi Poojaria, Dhanya Sunila, Pooja R Kamatha, K Anandab, and DP Kiranb. Antioxidant properties and electrochemical behavior of some acetyl salicylic acid derivatives. *Journal of Applied Pharmaceutical Science Vol*, 6(11):165–171, 2016.
- [14] S Raghavendra Subramanya, Kestur Gundappa Satyanarayana, and Balachandra Shetty Pillar. Evaluation of structural, tensile and thermal properties of banana fibers. *Journal of Natural Fibers*, pages 1–13, 2016.

- [15] Anupama Rangan, MV Manjula, KG Satyanarayana, and Reghu Menon. Lignin/nanolignin and their biodegradable composites. *Biodegradable Green Composites*, pages 167–198, 2016.
- [16] Swetha Sandesh, Prashant Kumar R Kristachar, Pandian Manjunathan, AB Halgeri, and Ganapati V Shanbhag. Synthesis of biodiesel and acetins by transesterification reactions using novel casn (oh) 6 heterogeneous base catalyst. *Applied Catalysis A: General*, 523:1–11, 2016.
- [17] Sujit Sarkar. Physics of majorana modes in interacting helical liquid. *Scientific reports*, 6, 2016.
- [18] BS Shubhalaxmia, K Anandab, and K Subrahmanya Bhata. Synthesis of a series of pyrazoline derivatives carrying tosyl substitution and evaluation of their antimicrobial properties. *Journal of Applied Pharmaceutical Science Vol*, 6(11):214–217, 2016.
- [19] Chitra Shukla, Anindita Banerjee, Anirban Pathak, and R. Srikanth. Secure quantum communication with orthogonal states. *International Journal of Quantum Information*, 14(06):1640021, 2016.
- [20] Subhashish Banerjee, Ashutosh Kumar Alok, S Omkar, and R Srikanth. Characterization of unruh channel in the context of open quantum systems. *Journal of High Energy Physics*, 2017(2):82, 2017.
- [21] Swetha SM Bhat, Diptikanta Swain, Mikhail Feyngenson, Joerg C Neufeind, Abhishek K Mishra, Janardhan L Hodala, Chandrabhas Narayana, Ganapati V Shanbhag, and Nalini G Sundaram. Bi4tao8cl nano-photocatalyst: Influence of local, average, and band structure. *Inorganic Chemistry*, 56(10):5525–5536, 2017.
- [22] Sathyapal R. Churipard, Pandian Manjunathan, Prakash Chandra, Ganapati V. Shanbhag, Raman Ravishankar, Peddy V. C. Rao, Gandham Sri Ganesh, A. B. Halgeri, and Sanjeev P. Maradur. Remarkable catalytic activity of a sulfonated mesoporous polymer (mp-so3h) for the synthesis of solketal at room temperature. *New J. Chem.*, 41:5745–5751, 2017.
- [23] Raghurama P Hegde, Pavithra G Chinnaswamy, Debayan Dey, Steven C Almo, S Ramakumar, and Udupi A Ramagopal. Can the propensity of protein crystallization be increased by using systematic screening with metals? *Protein Science*, 2017.
- [24] Raghurama P Hegde, Alexander A Fedorov, J Michael Sauder, Stephen K Burley, Steven C Almo, and Udupi A Ramagopal. The hidden treasure in your data: phasing with unexpected weak anomalous scatterers from routine data sets. *Acta Crystallographica Section F: Structural Biology Communications*, 73(4), 2017.
- [25] Dibyendu Samanta, Haisu Guo, Rotem Rubinstein, Udupi A Ramagopal, and Steven C Almo. Structural, mutational and biophysical studies reveal a canonical mode of molecular recognition between immune receptor tigit and nectin-2. *Molecular immunology*, 81:151–159, 2017.
- [26] Akshata Shenoy, S Aravinda, R Srikanth, and Dipankar Home. Can the use of the leggett–garg inequality enhance security of the bb84 protocol? *Physics Letters A*, 2017.

## 14 New Research Students

1. Ms. Marilyn Esclance Dmello has joined as a PhD student to work under the guidance of Dr. Suresh Babu Kalidindi
2. Mr. Giridhar Kulkarni and Ms. G. Brunda have joined as Research scholars to work under the guidance of Dr. Nalini G Sundaram
3. Mr. Abhishek Jadhav has joined as a Research scholar to work under the guidance of Dr. Ganapati V Shanbhag

4. Mr. Ranjith Kumar R and Mr. Rahul Sharma have joined as Research scholars to work under the guidance of Dr. Sujit Sarakar
5. Mr. Srikanth Utagi has joined as a Research Scholar to work under the guidance of Dr. R. Srikanth in Theoretical Sciences Department
6. Dr. Marri Subba Reddy has joined as a Research Associate to work under the guidance of Dr. Ganapati Shanbhag to work on the the industry project sponsored by HP Green R & D Centre Bengaluru.
7. Ms. Anusha has joined as a Research Engineer to work under the guidance of Dr. Ganapati Shanbhag to work on the GTC, USA sponsored project.

## 15 Highlights of Research Activities

### Achievements:

1. A one year project sponsored by PW Technology, USA to Catalysis Group was successfully completed in February 2017. Based on the performance, the new agreement was signed to continue the project in this financial year.
2. Mr. P. Manjunathan and Mr. Pradeep Shanbogh have been selected for the award of Senior Research Fellowship(SRF) by CSIR, India for three years from the year 2017.
3. Ms. Archana was awarded the travel support of \$300 to attend the AsCA-2016 conference held at Hanoi, Vietnam AsCA (Asian Crystallography Association). She also received the Best poster presentation award of \$100 sponsored by Cambridge Crystallographic Data Centre (CCDC).
4. Dr. Nalini Sundaram received a starter grant of \$1000 from the International Centre for Diffraction Data (ICDD) under the ICDD Grant-In-Aid program from October 2016-September 2017
5. Mr. Manjunathan P. won a Best Presentation Award for his poster presented on doctoral research work at Research Colloquium-2016 held at Manipal University, Manipal on April 4, 2016.
6. Mr. Manjunathan and Mr. Satyapal won the Best Poster Award Sulfonated mesoporous polydivinylbenzene as an efficient solid acid catalyst for glycerol etherification with tert-butanol at the 17th National Workshop on Challenges in Catalysis Science and Technology organized by Catalysis Society of India.
7. Mr. Manjunathan, Mr. Aravinda and Mrs. Pavithra G C received a Certificate of Appreciation and a cash award by AMEF during Founder's Day 2016 for his contribution towards research at PPISR.
8. Chemical Today magazine published an interview of Dr. Shanbhag in June 2016 issue.

### Conferences/Seminars/Workshops:

1. Dr. A B Halgeri along with the Heads of various Research Institutions who were affiliated with MU have been invited by the Vice Chancellor of Manipal University to attend the Research Colloquium which was held on April 5, 2016.
2. Dr. Ganapati Shanbhag visited San Antonio, USA to deliver an invited talk titled Novel perovskite type hydroxides and their oxide derivatives as solid acid-base catalysts for biodiesel synthesis and byproduct glycerol transformations at the International Conference on World biodiesel Congress and Expo held on December 5-7, 2016.
3. Dr. Shanbhag gave an invited talk at GTC Technology Houston, USA titled Novel solid acid-base catalysts for biodiesel synthesis and conversion of biomass derived compounds into value added chemicals on December 1, 2016.
4. Dr. Ganapati Shanbhag was invited speaker at Asia-Pacific Congress on Catalysis (AP-CAT7) in Mumbai, India from January 17-21, 2017 at Hotel Lalit, Mumbai with the focal theme-Catalysis for Sustainable Development, Peace and Prosperity. Title of the talk Mesoporous tin oxide: An efficient catalyst with versatile applications in acid and oxidation catalysis.
5. Dr. Ganapati Shanbhag delivered an invited talk on Novel tin based solid acid-base catalysts for selected organic transformations in National Workshop on Catalysis organized by Catalysis Society of India held at CSIR-Indian Institute of Chemical Technology, Hyderabad held on June 23-25, 2016.

6. Shanbhag gave invited talk on Biomass-Roll of catalysts for its conversion into energy and chemicals at International conference on Green Chemistry and Nanotechnology to be held at St. Aloysius College Mangalore on 27-28, Feb 2017.
7. Shanbhag was a Resource Person at National Meeting on Scope of Materials Science at G.S.S. College, Belagavi on 24-25, March, 2017 where he gave a lecture on Basics of Catalysis and catalytic biomass conversion into energy and chemicals.
8. Ms. Pavithra presented her poster titled Structural studies of Adenine phosphoribosyltransferases of pathogenic bacteria at The Research Colloquium on 4th April 2016 held at Manipal University, Manipal.
9. Dr. Suresh Babu K delivered invited lecture on Characterization of nanostructured materials using SEM and TEM at SIT Tumkur on 17 July 2016.
10. Mr. Manjunathan presented his research work by poster titled Mesoporous tin phosphate as an efficient catalyst for transformation of bio-renewable feedstock into biofuels and chemicals at International Conference on Energy Innovations- today and tomorrow at HP Green R & D Centre, Bengaluru on October 15-16, 2016.
11. Mr. Nagendra Kulal presented a poster on Novel mixed metal oxide catalysts for CO<sub>2</sub> valorization: cycloaddition of CO<sub>2</sub> to epoxides for cyclic carbonate synthesis at International Conference on Energy Innovations- today and tomorrow at HP Green R & D Centre, Bengaluru on October 15-16, 2016.
12. Ms. Archana presented a poster at the 8th AONSA Neutron School, BARC during 14th -19th November 2016, Mumbai.
13. Dr. Ramagopal delivered a talk at M S Ramaiah Institute of Technology, Bengaluru on November 21, 2016.
14. Dr. G. V. Shanbhag gave a talk on Basics of catalysis and its importance in present day research during Winter School for undergraduate students of BSc at PPISR on November 28, 2016.
15. Dr. Nalini and her group actively participated in ICDD (International Centre for Diffraction Data) workshop held at IISc Bangalore during the IUMRS, Young Scientists conference in December 2016.
16. Dr. Ananda and Mr. Kirana M P attended 9th Annual KSTA conference on Science, Technology and Innovations in the 21st Century, held at Christ University organized jointly by Karnataka Science and Technology Academy (KSTA) and Christ University, Bengaluru during 20-21 December 2016. We had a poster presentation on the topic entitled, Alpha glucosidase inhibitor isolated from medicinal plant Simarouba glauca for treating type 2 diabetes.
17. Mrs. Swetha gave an invited talk on introduction to immune system and immunotherapy at Dept. of Biotechnology, Sir MVIT College, Bangalore.
18. Dr. Ramagopal attended 6th Ramalingaswami Fellowship Conclave held at, IISER-Pune between 4th-6th Jan-17.
19. Dr. Sujit attended the Statistical Physics Meeting at ICTS, Bangalore on Feb'16.
20. Mr. Nagendra Kulal made Oral Presentation on Chemical fixation of CO<sub>2</sub> by converting into valuable cyclic carbonate using novel mixed metal oxide catalyst at International conference on Green Chemistry and Nanotechnology to be held at St. Aloysius College Mangalore on 27-28, Feb 2017.
21. Dr. Shanbhag gave a lecture on Gas Chromatography at 5-day workshop on Instrumental Methods of Chemical Analysis and was one of the organizers of this workshop conducted by PPISR from February 13-17, 2017.

22. Dr. Maradur gave a talk on Spectroscopic methods during the workshop on Instrumental Methods of Chemical Analysis held on 13-17th Feb 2017.
23. Dr. Suresh gave invited lecture in the National seminar on Recent Trends in Chemical Speciation , Kinetics and Nanomaterials (RTCSKN - 2017) held at Department of Inorganic & Analytical Chemistry, Andhra University, Visakhapatnam on 3rd & 4th March,2017.
24. Ms. Archana Presented a poster at National conference on Luminescence and its Applications at IICT, Hyderabad.
25. Ms. Shrilakshmi S attended Technical Workshop on "Protein applications in biotechnology" under TEQIP Phase II and Proteomics society India, jointly organized by Ramaiah institute of technology and aristogene biosciences was attended from 16-21 January 2017.

## 16 Other Research Activities:

1. Dr. Ananda was participated as Judge for Indian Science & Engineering Fair (INSEF), Bangalore Regional Fair on Innovation and Research based project competition for 8th - 12th standard students, held at Vagdevi Vilas School, Bangalore in association with Science Society of India on November 12, 2016.
2. Dr. Ananda was appointed as External Examiner for the MSc Biotechnology Practical exams by Mangalore University at Bioscience Department, Konaje and Alvas College, Moodubidri on December 30th, 2016 and January 2nd, 2017 respectively.
3. Dr. Shanbhag was invited to become Doctoral Advisory Member as an external expert of a PhD student of well-known industrial R & D Centre and registered under Manipal University.
4. Dr. Ananda was received invitation from Mangalore University to be a member of Question Paper settings committee for the Microbial Biotechnology course under MSc Biotechnology, Mangalore University.
5. Mr. Nagendra Kulal registered for PhD programme under the guidance of Dr. Shanbhag at Manipal University on December 12, 2016.
6. Mr. Abhishek Jadhav joined the group as Research Fellow in HPCL sponsored project on July 25, 2016.
7. Dr. Subba Reddy Marri joined the group as Research Associate in HPCL sponsored project on September 19, 2016.
8. Mr. Darshan Gaonkar attended 17th National workshop on Challenges in Catalyst CCST-2016 held at Hyderabad on 23-25, June, 2016.

## 17 Invited Lectures at PPISR

1. Dr. Gopal Kundu Scientist G and Director from National Center for Cell Science, Pune gave a talk on Therapeutic Targetting of Oncogenic Molecules in Breast and Other cancers, Nanoparticles based approach on August 26, 2016
2. Dr. Zhong Yi Ding from GTC Technology, US LLC, Houston, Texas gave a talk on Energy and its impact to Petrochemical Technology on September 19, 2016.
3. Dr. Venkata Krishnan Ramanujam, GTC Technology, US LLC, Houston, Texas gave a talk on Application oriented research for the future on December 9, 2016.
4. Dr. Sivaram former Director of NCL ,Pune & currently I NSA / Sr Scientist gave a talk on Porous Functional Polymers as Separators for Lithium Ion Batteries at PPISR on December 23rd, 2016.
5. Dr. Bharathifrom Prof. Umarji's lab , MRC department, IISc is giving a guest lecture on "Infrared detectors and Phase change materials" on 15.03.2017
6. Prof. Ajayan Vinu, University of South Australia visited our institute and gave an invited talk on "Functional Nanoporous Materials for Energy and Environment" on March 6, 2017

## 18 In-house Seminars:

1. Title: Metal- Organic Frameworks as Tunable Functionalities for Photocatalysis  
Speaker: Marilyn E. DMello, Junior Research Fellow,  
Date: March 17, 2017
2. Title: Plants defense mechanism: role of defensins as innate immune system  
Speaker: Mr. Kirana M P  
Date : Dec 13, 2016
3. Title: Production of biofuels and their byproduct valorization  
Speaker: Mr. Kempanna S. Kanakikodi  
Date: November 29, 2016
4. Title: Investigations of open-framework materials and supercapacitor based on patronite-RGO/CNT hybrids  
Speaker: Dr. Subba Reddy Marri  
November 23, 2016
5. Title: The advantages and disadvantages of being Polyploido  
Speaker: Dr. Ananda K  
Date: November 16, 2016
6. Title: Biosensors: Design and Applications  
Speaker: Dr. Nalini G Sundaram  
Date: November 8, 2016
7. Title: Chemical modification of proteins by polyethylene glycol  
Speaker: Shrilakshmi S,  
Date: Oct 04, 2016
8. Title: Artificial Photosynthesis via Semiconductor Photocatalyst  
Speaker: Ms. Archana K M  
Date: 20th September 2016.
9. Title: Chemical fixation of carbon dioxide by converting into value added chemicals using metal modified heterogeneous catalysts  
Speaker: Mr. Nagendra Kulal  
Date: September 2, 2016.
10. Title: Modification of immune checkpoint receptors for blockade of immunoinhibitory pathway in cancer  
Speaker: Mr. Shankar V Kundapura,  
Date: Aug 23, 2016
11. Title: Metal-Organic Frameworks (MOFs) for Catalysis  
Speaker: Vasudeva Rao .B,  
Date: Aug 11, 2016
12. Title: Overview of Materials Science Research  
Speaker: Dr. Shanbhag  
Date: Founder's Day technical programme , July 7, 2016
13. Title: Mesoporous SnO<sub>2</sub>: An efficient catalyst with versatile applications in acid and oxidation catalysis  
Speaker: Mr. Manjunathan  
Date: Founder's Day technical programme, July 7, 2016.
14. Title: Microwave assisted synthesis of organic and inorganic chemicals  
Speaker: Dr. G. Shanbhag  
Date: July 1, 2016.

15. Title: Current progress towards creation of synthetic self-assembling protein scaffolds  
Speaker: Dr. Udupi A. Ramagopal  
Date: June 24, 2016
16. Title: Introduction to Dendrimers: Highly Branched Polymers and their Applications  
Speaker: Dr. Sanjeev P. Maradur  
Date: June 17, 2016
17. Topic: Perovskites for Low Cost and High Efficiency Solar Cells  
Speaker: Mr. Pradeep Shanbogh,  
Date: June 10, 2016
18. Title: Soft Crystalline Porous Frameworks: Design to Applications  
Speaker: Dr. Suresh B. Kalidindi  
Date: May 19, 2016.
19. Title: Ricin: Boon or Bane?  
Speaker: Pavithra G. C.  
Date: May 13, 2016
20. Title: Hierarchical zeolites: A potential candidates for commercial applications  
Speaker: Kempanna S. Kanakikodi  
Date: May 06, 2016
21. Title: Magnetoelectric Materials: An Opportunity for Design of Voltage Controlled Devices?  
Speaker: Dr. Nalini. G. Sundaram  
Date: Apr 22, 2016
22. Title: Quantum simulation of Dirac fermion mode, Majorana fermion mode and Majorana-Weyl fermion mode in cavity QED lattice  
Speaker: Dr. Sujit Sarkar  
Date: Apr 14, 2016
23. Title: Recent innovations in catalytic oxidations  
Speaker: Sathyapal Churipard R.  
Date: Apr 07, 2016

## 19 Events and meetings

### 19.1 Founder's Day Celebration

#### 19.1.1 Inauguration of Bharat Ratna Prof. C. N. R. Rao Laboratory

This year's Founder's Day was celebrated on July 28th, 2016 at PPISR Campus near Bidalur. On the same occasion, the Bharat Ratna Prof. C. N. R. Rao Laboratory for Materials Science was inaugurated by H H Sri Vishwapriya Teertha Swamiji, president AMEC and AMEF, Bangalore in the august presence of Bharat Ratna Prof. C. N. R. Rao, Dr.(Mrs.) Indumati Rao and Prof. K. Kasturirangan, former Chairman of ISRO, other invitees, Director and all members of PPISR. The Laboratory was built thanks to a generous donation by Prof. C. N. R. Rao and his wife, Dr. Indumati Rao. The laboratory was brought to reality in the span of one year. The programme was attended by a large number of people, including Trustees of AMEC and AMEF, school teachers and staff from all Poornaprajna schools in Bangalore.

The program began with prayer followed by lighting of Lamp. Prof. K. Srihari, Honorary Secretary, AMEC & AMEF welcomed the guests. Addressing the gathering, Prof. C. N. R. Rao recalled his association with the institute from its early days. In his speech, he quoted Sir Robert Robinson, "When there is no building, people think freely. The minute the building comes up, the four walls appear to confine the mind from working. Fortunately, that is not the case here in this institute, where research already begun before the buildings were established, is still being continued assiduously." Talking further about the future of science in India, he said, "Today, scientific research is not easy. To be excellent and in the frontline is very difficult. Only a few Indians are there on that level today. It is very difficult to do quality work in competition with the rest of the world, given the expanse and rapid pace of science."

Prof. Rao also inspired the gathering with his ideas on the future of science in India. He said, "Science is not just about scientific rigor while on the job, but also about scientific outlook and temperament. You don't need to be a scientist to have a scientific outlook. An example is H H Sri Vibudhesha Teertha Swamiji, who took interest in establishing this institution." He ended his speech wishing the best to the institution saying, "I wish you great luck, but science is not just about luck. It is all about the dedication, doggedness and tenacity with which the researchers work."

Dr. Anand B. Halgeri, Director of PPISR, gave an overview of research activity along with the history of the institute and the progress that has been made so far. He said, "PPISR over the years has been climbing the ladder of success steadily, at present with over 160 research papers published in prestigious international peer-reviewed journals, and several awards won for best poster-presentation by PPISR research scholars at national and international conferences. One of the most important milestones has been the graduation of nine PhD students, with many more imminent in the near future."

Later Addressing the gathering guest of honour Prof. Kasturirangan said, "It is a pleasure to be inaugurating this Laboratory for Materials Science, which is yet another gem to have originated from the brain of Prof. C. N. R. Rao", referring to the decades he spent in frontline research, including cryogenics.

H H Sri Vishwapriya Theertha Swamiji, PPISR, gave his presidential remarks. Encouraging the research work being carried out in the institution, he said, "We need to take Poornaprajna's philosophy along with science." Thanking Prof. C. N. R. Rao for his contribution, he said that his support and well wishes will always remain with this institution.

Dr. Ganapati V Shanbhag compered the programme and Dr. Ananda gave vote of thanks.

#### 19.1.2 Scientific Programmes on Founder's Day Celebration

Scientific programs, involving lectures from distinguished scientists, were conducted on 7th & 8th July, 2016 as a prelude to the Founder's day.

Invited Talk: Dr. Shama Bhat Founder, Chairman and Director Bhat Bio-tech India Private Limited (BBI) inaugurated the program. Prof. Srinivasan Natarajan, Professor, SSCU, IISc delivered a keynote lecture on colours of chemistry. He explained how one can develop unique colour pigments that can be used paint industry using basic principles of inorganic chemistry.

Materials Science technical session started with an invited talk by Dr. Madhusudan Rao, Shell Technology Centre, Bengaluru. He delivered lecture on Hydroprocessing Catalysts: Characterization and Selection. Before starting of afternoon session, Dr. Ganapati V Shanbhag gave an overview of Materials Science Dept. Later, Dr. Sebastian C. Peter, Faculty, JNCASR, Bengaluru delivered invited lecture on Development of Low Cost Metal Based Robust Catalysts for Green Energy Production in Fuel Cells. The last part of scientific session involved internal speakers. Dr.Nalini Sundaram delivered a lecture on sunlight driven photo catalysis in oxide nanomaterials.

Mr. Manjunathan spoke about mesoporous SnO and its catalytic applications.

On the second day, lectures were delivered for Biological science and Theoretical Science Departments.

At the starting of Biology session, Dr.Ramagopal gave an overview of the departmental activities. Dr. T. Govindaraju from Bioorganic Chemistry Laboratory, JNCASR gave an interesting talk on Silk and Peptidomimetics for Biomaterials Applications. Dr. Praveen Kumar Vemula from Institute for Stem Cell Biology and Regenerative Medicine (inStem -NCBS) spoke on disease-responsive drug delivery an emerging concept in biomedical science.

In the Theoretical Department session, Prof. Biman Nath (RRI, Bengaluru) and Prof. Paniveni Udayashankar (NIEIT, Mysore) gave invited lectures on topics related to universe and solar

## **19.2 Workshop on Diffraction Methods for Structural Analysis in Materials Science**

The Thematic Workshop sponsored by UGC-DAE and organized by PPISR and Physics Department, Bangalore University (BU) and UGC-DAE CSR Mumbai Centre was held during July 25-27 2016. The workshop took place at PPISR for two days and one day at BU. 40 participants, including research scholars and faculty from Institutes and Universities in and around Karnataka attended the workshop. The workshop was inaugurated by Dr. Siruguri, Director UGC-DAE, Mumbai centre.

Dr. Damale, Chairman Physics dept Bangalore university, Dr. Halgeri, director PPISR, Prof. Y.S. Bhat, PPISR and other resource persons from UGC-DAE Mumbai and Indore centre were present. After the inauguration, Dr. Siruguri gave a talk on Materials Science Using Neutrons elucidating the importance of Neutron diffraction in various materials. The second talk by Dr. Lalla, from the UGC-DAE Indore Centre was on Overview of facilities at Indore Centre followed by talk on X-ray Diffraction. This was followed by a talk by Dr. Rajeev Ranjan from IISc, Bangalore on Crystallography in Piezoceramics.

In the afternoon session, a talk on Rietveld method was given by Dr. Nalini followed by a hands -on session on the use of GSAS and Fullprof software for X-ray refinements by PPISR Research Scholar Mr. Pradeep, and Dr. Diptikanta from IISc, Bengaluru respectively. The second day began with a talk by Dr. Saibal Basu, on Neutron and Xray Reflectivity, followed by Dr. S. D. Kaushik on the Basics of neutron powder diffraction, Dr. P.D.Babu on Magnetic structures from Neutron Diffraction Experiments and Dr. Rayporl on Rietveld analysis of Neutron powder diffraction data using Fullprof. Hands on session on using Fullprof for Rietveld refinement of Neutron data was conducted in the afternoon.

The third day included lectures on Electron Diffraction by Dr. N.P.Lalla, a talk on Magneto-electric and spin lattice coupling studies on Pb based multiferroics by Dr. Basavaraj Angadi followed by hands on session on Magnetic Structure refinement of Neutron data. HH Sri Vishwapriya Swamiji, Chairman PPISR, graced the concluding session of the workshop. The valedictory talk was given by the Chief Guest, Prof. T.N.Guru Row on Symmetry and Structure in the Solid State followed by the distribution of certificates to the participants. Benediction was given by Swamiji.

## **19.3 Dialogue Across Traditions: Modern Science And Ancient Insights On Reality**

In a first in India, PPISR conducted a symposium convened by physicists in order to bring together scientists and traditional scholars, thereby fulfilling a fond dream of the Founder H H Sri Vibudheshha Teertha Swamiji. Sponsored by ICPR (Indian Council for Philosophical Research), New Delhi, and AMEF (Udupi Sri Admar Mutt Education Foundation), A Dialog across Traditions: Modern

science and ancient insights on reality was held during Oct 25-27, 2016 at Sadashivnagar campus, facilities for which were graciously provided by Poornaprajna School, Sadashivnagar. AMEF Chairman HH Sri Vishwapriya Theertha Swamiji inaugurated the meeting, expressing happiness at this confluence of science and philosophy, pointing out that the ancient rishis of India were indeed scientist-saints. AMEF Secretary Prof. K. Srihari gave an account of the events through which the Founder Swamiji, a religious Chief Pontiff, was inspired to found PPISR, an institute dedicated purely to scientific research.

At the inauguration, the symposium patron, Prof A. B. Halgeri introduced the chief guest, renowned Sanskrit scholar Prof K. S. Kannan, who was, together with other eminent traditional scholars and scientists, felicitated by HH Swamiji. Padma Bhushan Prof. B. V. Sreekantan, former Director of TIFR, Mumbai and NIAS, Bangalore, presented the valedictory talk on recent advances in observational cosmology. The joint conveners of the meeting were Dr R. Srikanth of PPISR, Prof Sisir Roy and Prof. Debjyoti Gangopadhyay. The local organization ably supported by our senior research scholar, Mr S. Aravinda. The meeting was attended by over 30 scientists and traditional scholars. The meeting was attended by over 30 scientists and traditional scholars.

Philosophy can impart depth, while science imparts rigor. The challenge, then, is to establish a dialog across these two traditions, which was the motivation for this meeting! The symposium was conducted in the form of six discussion panels on the topics of Identity and Individuality, Origin of the Universe (Space, time & matter) and the quantum vacuum, Quantum entanglement and metaphysics of relationships, Quest for ultimate reality: Modern physics and ancient wisdom, Nature of time and Free will.

#### **19.4 Winter School 2016**

Winter School for Undergraduate Students of PP College, Udupi, was conducted, following the tradition of the previous years.

An outreach programme of Winter School for the undergraduate students of Poornaprajna College, Udupi, was organised during November 28 – Dec 02, 2016, at PPISR, Bidalur campus, with around twenty students along with a lecturer, who had accompanied them. The winter school was inaugurated by Dr. Harish R Bhat, CES, IISc, Bangalore alongside the inaugural talk by himself. Various scientific concepts were explained to students in interactive manner.

The concepts included Catalysis and its importance in present day research, material characterization techniques, introduction to material science, research guidance for undergraduate students, nanomaterials, a few basic aspects of quantum magnetism, mysteries of quantum mechanics, simple harmonic motions, gene to structure, applications of plants and fungal metabolites, epigenetic and hands-on experience based practical classes.

On the whole, the winter school module had been designed with a concise and healthy mix of both theory and experiments to provide a glimpse into the working style of research laboratories, handling laboratory equipment and analyzing results with sophisticated instruments and opening the interest for students to pursue scientific research activities. The five-day winter school was concluded with the valedictory function address by Dr. T.G. K. Murty, Senior Scientific Advisor, ARCI, Hyderabad.

#### **19.5 Skill Development Programme**

A training programme on skill development related to effective communication skills and self motivation was organised at our Bidalur campus for faculty and students on 26 November 2016, under the guidance of Poornaprajna Institute of Faculty Improvement, Widia PPEC. Col. Rajaram, Joint Secretary, Sri Sridhar, Principal, Widia School and Mrs. Avanti, convenor conducted the programme successfully. Both staff and students of PPISR got benefited out of this programme.

#### **19.6 Workshop on Instrumental Methods of Chemical Analysis:**

We have organized a Five-Day Workshop on Instrumental Methods of Chemical Analysis at Poornaprajna Institute of Scientific Research from Feb 13-17, 2017. We have intended to organize this Workshop to improvise the knowledge of young students on the latest methods of analysis

using some of the sophisticated instruments. We had arranged lectures in the morning sessions and hands on experiments using the various sophisticated facilities available at our Institute in the afternoon sessions. Prof Tapas Kumar Maji, Scientist at JNCASR was invited as the Chief Guest to inaugurate the above Workshop and also delivered a lecture on February 13, 2017. Dr. Guru Murthy Hegde, Prof. C. N. R. Rao Chair Professor, BMS R and D Centre, BMS College of Engineering, was invited as the Chief Guest for the Valedictory function that was held on Feb 17, 2017. The above programme was well attended by 20 research scholars in an around Karnataka who were keen in equipping themselves for Research and Industry jobs and also for the industrial professionals

## **19.7 H H Sri Vibudhesha Theertha Swamiji Memorial Endowment Lecture**

As per the guidelines of the Management of Admar Mutt Education Foundation, PPISR has instituted a Memorial Endowment Lecture in honour of our Founder Chairman H H Sri Vibudhesha Theertha Swamiji from this year onwards at PPISR by arranging a lecture of a very distinguished/eminant scientist from renowned Institutions every year. This year, we have arranged H H Sri Vibudhesha Theertha Swamiji Memorial Endowment Lecture titled “How do we tackle the resurgent drug resistant tuberculosis?” by Prof V. Nagaraja, President of Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru on February 23, 2017 at 11: 30 a.m. at PPISR, Bidalur campus. The Boards of trustee members of AMEF, council members of AMEC, Science teachers of all Poornaprajna Education Centres located in Bangalore jurisdiction, few faculty and students from IISc participated in this programme.

## **19.8 Outreach Programme**

In order to create a passion towards science and also to realize the dreams of HH Sri Vibudhesha Teertha Swamiji, PPISR is conducting outreach programmes every year. In view of the overwhelming response from the students who had participated in the outreach programmes over the last few years and in continuation to nurture them to venture into science, we had conducted outreach programmes from Jan 9th to 13th, 2017 for all students of Poornaprajna schools of Bangalore jurisdiction. Nearly 410 students from all Poornaprajna Schools in Bangalore participated in this programme. On January 27th 2017 PPISR had organized outreach programme for Govt. High School students in Bidalur and nearly 45 students participated in this programme.

## **20 Visitors’ views**

- Dr. S SIVARAM, Prof. And INSA Senior Scientist, I I S E R, Pune. Deeply impressed by the faculty and students, of their commitment and dedication to scientific research. The diversity of problems being examined is astonishing. I enjoyed my interaction. I wish the institute greater and greater success.
- Dr. TAPAS KUMAR MAJI, Prof. Chemistry and Physics of Materials Unit, JNCASR, BLore. PPISR is located in a beautiful surrounding of nature and ideal place to do good science. Wonderful faculties and students, delighted interacting with them. Hope it will be a model private research institute for India in the future.
- Prof. AJAYAN VINU, University of South Australia, Adelaide, Australia. I am really impressed by the facilities and the quality of the students and faculty members. Within a short span of time they have established a world class centre for catalysis. I am sure and hopeful that this institute will become the top research institute in the field of catalysis. I also see a huge potential for research collaboration and happy and looking forward to enhancing the research collaboration with PPISR
- Mr. SACHIN JOSHI, Licensing Manager, GTC Technology, USA. It was an enriching and enlightening experience. The institute at a time when it is starting to receive fruits of benefits

from Swamiji's vision. The dedication of the Director, faculty and staff with commitment shown by fellows and students has expedited the development of the institute and will help the institute achieve great success in near future. I am honoured to have visited the institute and my best wishes for its success.

Prof. RAVEENDRANATH NAYAK, Director, School of Mgmt. Manipal University, Manipal I really enjoyed going through your labs where your scientists are working enthusiastically with a variety of projects along with their PhD Students. The outcomes of these research projects have far fetching benefits to humanity and Indian Science and Technology. I wish you all the best in your endeavours



A technical session of scientific lectures were held at the Bidalur Campus on July 6, 2016 in commemoration of Founder's Day Celebrations.



Workshop on instrumental methods of Chemical Analysis February 13 - 17, 2017



**HH Sri Vibudhesha Teertha Swamiji Memorial Endowment Lecture:** The guest of honour Prof. V Nagaraja, President of Jawaharlal Nehru Center for Advanced Scientific Research, delivered the endowment lecture on February 23, 2017 at Bidalur Campus.



Visit by Mr. Joseph Gentry of GTC, USA, to Bidalur Campus on September 26, 2016.



Visit of Delegation from Institute of Hazardous Material Management, USA, to the Bidalur Campus on October 21, 2016.

# TEAM PPISR



POORNAPRAJNA INSTITUTE OF SCIENTIFIC RESEARCH  
#167, Poornaprajnapura, Bidalur Post,  
Devanahalli,  
BENGALURU – 562 164.  
Phone: 080-2760 7242.

City Campus:  
#04, 16<sup>th</sup> Cross, Sadashivanagar,  
BENGALURU – 560 080.  
Phone: 080-2361 1836.  
Website: [ppisr.res.in](http://ppisr.res.in)