



Poornaprajna Institute of Scientific Research

PROMOTED AND MANAGED BY ADMAR MUTT EDUCATION FOUNDATION (AMEF)
Recognised by Dept. of Scientific & Industrial Research (DSIR) Govt. of India & MAHE, Manipal

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Annual

Newsletter

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In the news

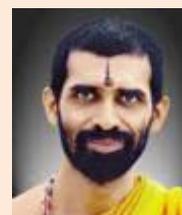
- ★ Seven research scholars successfully defended their PhD viva-voce examination and obtained doctoral degrees from MAHE, Manipal..
- ★ Industry project sponsored by SULZER-GTC, USA was successfully completed by Dr. Shanbhag's group during 2023.
- ★ A new project sponsored by SABIC Agri-Nutrients Company and SABIC Research and Technology Private Limited has been initiated by Dr. Shanbhag's group.
- ★ A project on "Design and development of UV-visible light active rooftop photocatalyst panels for green H₂ generation and value added chemicals from sunlight harvesting" sponsored by DST/SERB under the startup research grant (SRG) scheme has been initiated by Dr. Naresh Nalajala's group.
- ★ Dr. R Ranjith Kumar, has won the prestigious National Dr. K. V. Rao Scientific Society Research Award for his exemplary work done in Physics.
- ★ Five best presentation awards were received by PhD students in 2023 at National and International conferences.
- ★ The Institute has published 21 research papers in highly reputed international journals and two Indian patents have been filed in this year.
- ★ Two MOU signed with well-known Institutes like Galgotias University at Greater Noida and Mount Carmel College, Bengaluru



H. H. Shree Eeshapriya Theertha Swamiji, Chairman



H. H. Sri Vibudhesha Theertha Swamiji, Founder, (1928 - 2009)



H. H. Sri Vishwapriya Theertha Swamiji, Former Chairman

Vision

To promote and nurture excellence in the fundamental and applied sciences for the advancement of scientific knowledge and the benefit of mankind

From the Director's Desk



It gives me a immense pleasure in presenting the 14th volume of “Newsletter” highlighting the overall activities and achievements of PPISR during 2023. We have continued our efforts to achieve new milestones both in academic and sponsored research projects. The New Year began with challenging projects from SULZER-GTC, USA with signing agreement for a period of one year and later on with SABIC Agri-Nutrients Company and SABIC Research and Technology Private Limited. We signed an agreement for a period of 1 year. All these projects brought new dimension on new areas of value addition to petrochemicals and also SABIC micronutrients/fertilizers.

The other three projects, one from DST-SERB on quantum physics, second from DST-SERB on Demonstration of Hydrogen production from sunlight harvesting, third project from DST on topological state of quantum matter. We continue to carry out the research project on computational studies on pharma compound sponsored by M/S Sravathi AI Technology Private Limited. The institute has published 21 research papers in highly reputed international journals and two Indian patents have been obtained in this year.

Five of our doctoral students received best oral/poster presentation awards at various National and International conferences. Seven students namely, Dr Chethana, Dr. Shrilakshmi Rao, Dr. Shankar Kundapura, Dr. Kartik YR, Dr. Vaishnavi BJ, Dr. Vinod Rao, and Dr. Ranjith Kumar have been awarded PhD degrees from MAHE Manipal. We have also recruited several new PhD research scholars and project fellows. We have continued our efforts to conduct outreach programs for our PPC high school students and research orientation programs for Poornaprajna High School students in Bengaluru and currently this year, we had organized a two-day science event in association with Royal Society of Chemistry LSD, PPISR, and PPEC Institutions in Bengaluru. Nearly thirty research interns from various colleges/universities carried out research activities with our faculty members in all areas of research as a part of their MSc projects. We published some good research papers in association with these interns. There were two MOU signed with well-known Institutes like Galgotias University at Greater Noida and Mount Carmel College, Bengaluru to facilitate collaborative research programs and scientific exchange programs/conferences etc. On the whole, the year 2023 was challenging, highly productive and successful. I would like to attribute all these achievements to excellent work carried by our team faculty members, students and supporting staff. I also would like to express my deep gratitude to H H Shree Eeshapriya Theertha Swamiji and AMEF management for their continuous support, encouragement and guidance to achieve these successful milestones.

Dr. A. B. Halgeri

Editorial



2023 proved to be a highly productive year for PPISR across various domains. A total of four sponsored projects, encompassing both industry and government collaborations, were successfully executed. Additionally, the institute initiated four new projects, evenly distributed between industry and government partnerships. The year saw the publication of 21 research papers in high-impact journals, accompanied by the filing of two national patents. Noteworthy recognition was achieved with five best presentation awards at national and international conferences. Furthermore, a research scholar from PPISR received a prestigious national-level award, underscoring the institute's commitment to high-quality research. The culmination of these achievements made 2023 the most successful year since the institute's inception, marked by the conferral of seven Ph.D. degrees. This issue delves into the research highlights of each group operating in diverse scientific areas, featuring publications, research activities, important events, and milestones at PPISR. As the editor of this issue, I take immense pleasure in offering a glimpse into the comprehensive landscape of research activities, scientific accomplishments, and events that unfolded at PPISR throughout the year 2023.

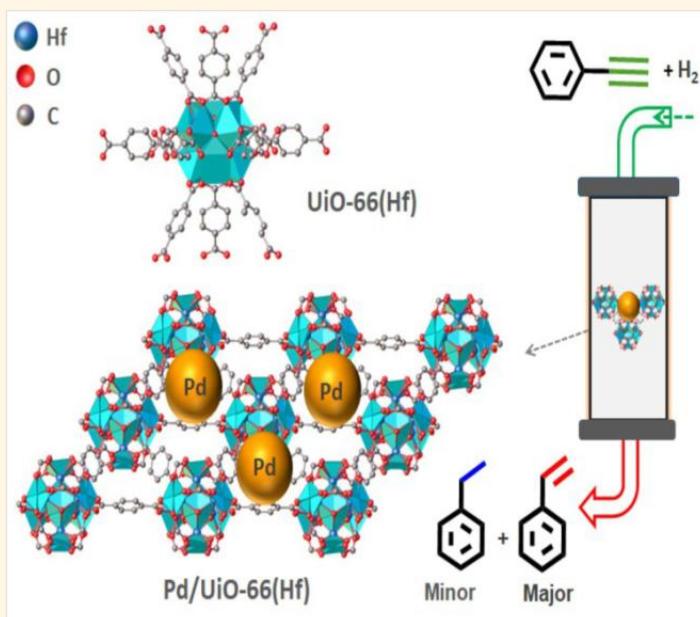
Dr. Naresh Nalajala



Dr. Ganapati Shanbhag and his group work in frontier areas of catalysis for the design of novel catalysts for green chemical processes such as chemical fixation of CO_2 to make valuable chemicals such as methanol, carbonates, carbamates and substituted urea, conversion of biomass by-products like glycerol, furfural, levulinic acid into value-added chemicals, pore engineering of microporous materials for shape-selective catalysis and gas adsorption. Till 2023, the group has published 48 research articles in internationally reputed journals, 3 book chapters and 4 patents. One student received best presentation award at an international conference this year. Ms. Vaishnavi B. J. received PhD degree from MAHE Manipal in July 2023 on the PhD topic on “designing novel catalysts for conversion of biomass derivatives furfuryl alcohol and levulinic acid into value-added chemicals”. Another PhD student Ms. Chethana A. also obtained her PhD degree from MAHE on “Design of Semiconductor Oxide Nanomaterials for Efficient Gas Sensors.” Overall, 3 publications have come out of this group in international journals this year and 3 sponsored projects have been executed.

During 2023, 3 sponsored projects were executed by Dr. Shanbhag’s Group. An industry project sponsored by Sulzer-GTC Technology Inc, USA was successfully completed. The 2nd industry project sponsored by SABIC has been initiated. Another project sponsored by VGST, Govt. of Karnataka with CESEM grant on “Chemical fixation of CO_2 by converting into value added chemicals using metal-modified ordered nanoporous silicate catalysts” was completed in this year. Overall, the group could achieve significantly in sponsored and academic research programmes due to the hard work of all the researchers involved.

Dr. Sanjeev Maradur’s group continued to work on metal organic framework (MOF) for catalytic applications. The group published a work on Continuous Flow Liquid-phase Semihydrogenation of Phenylacetylene over Pd Nanoparticles Supported on UiO-66(Hf) Metal-Organic Framework. The major findings have been published in Chemistry Select Journal, Wiley Publishing. Also, the group continued to work on metal organic framework catalysis for the hydro-deoxygenation of furfural to 2-methylfuran (2-MF) and carboxymethylation of biomass derived alcohols. In another project, our group published an article on utilizing the Cerium oxide with different morphologies as catalyst in converting the biomass derived alcohols to high value alkylmethyl carbonates. Dr. Maradur and his group continued research collaborations with scientists from Christ University, REVA University and Manipal Academy of Higher Education. 5 Masters worked under the guidance of Dr. Maradur for the Masters internship. Dr. Maradur submitted a research proposal to work on carbon capture and utilization through direct air capture to an USA based company in collaboration with ModeliCon InfoTech LLP, Bengaluru and Anukoolan Pune. A proposed demonstration plant is planned to be built up at PPISR campus. Two research proposal has been submitted to Govt agencies for possible funding.



Research Highlights – Materials Science & Catalysis Division

The key focus of **Dr. Naresh Nalajala's** research group "SHAPECAT" at PPISR is to unravel the structure-property relationships of shape-engineered nanohybrid materials. One of the objectives of SHAPECAT is to design and develop the well-integrated shape-engineered nanohybrids. SHAPECAT is aiming at the sustainable production of green hydrogen from sunlight harvesting (photocatalysis) and using renewable electricity (electrocatalysis). SHAPECAT foresees to explore the underlined scientific knowledge on conversion of green house gas emissions (for eg., CO₂, CH₄ etc), stable and abundant molecules (for eg., N₂) to value added chemicals (for eg., methanol, ethanol and ammonia) from sunlight harvesting and using electricity. Further, SHAPECAT focus is to understand the sensing behavior of the shape-engineered nanohybrids towards different target gases (H₂, CO₂, CH₄, CO, SO₂, NO₂ etc). Currently, SHAPECAT is pursuing the objective of design and development of rooftop photocatalyst panels for solar H₂ generation and value-added chemicals" which is funded by SERB-SRG. Also SHAPECAT is successful with DST-Inspire Ph. D. fellowship by Ms. AshaDevi with research objective of shape-engineered nanomaterials for solar H₂ generation and value-added chemicals from sunlight harvesting. Thus far, SHAPECAT guided eight master student projects on "nanomaterials for sensor and photocatalytic applications including hydrogen generation".

Research Highlights – Theoretical Sciences Division

Dr. R Srikanth's group explored aspects of counterfactual quantum digital signature and its connection to twin-field cryptography. The question of eternal non-Markovian noise in the case of unital and nonunital channels was investigated. Together with a new PhD student, Mr Sanjoy Dutta and collaborators, a study of concatenated codes obtained using quantum error correcting codes and decoherence-free subspaces has been initiated (<https://arxiv.org/abs/2312.08322>). In work on the fractal dimension of Solar supergranulation in Ca II data, the bifractal property was discovered across smaller and larger scales of supergranular cells.

Dr. Sujit Sarkar's group works on different aspects of theoretical condensed matter physics. Both interacting and non-interacting models representing topological states, have been explored to realise new and interesting phenomena such as edge states, phase transitions etc. The group has expertise in identifying the critical or gapless phases and the transitions using various analytical tools. Exploring the topological aspects in non-hermitian condensed matter systems is the recent research interest of the group. Apart from these the group has worked extensively in characterization of topological states using quantum field theoretical tools. The group published several research articles related to the topological states of condensed matter.

Research Highlights – Biological Sciences Division

The work at Dr. Ramagopal's lab is mainly aimed at the understanding structure-function relationship of biologically important proteins. We use X-ray diffraction as the main technique to determine the structure of proteins, protein-ligand and, protein-protein complexes. The insights gained from the structural studies will be assessed using other biochemical, bioinformatics biophysical techniques. For example, we pursue research in the structural biology of immune receptors, generate structure-based mutants and measure the affinity of such mutants with their cognate receptors using biophysical techniques. Towards this goal, we have generated several mutants of PD-1 (programmed death-1) and TIGIT (T cell immunoglobulin and ITIM domain) with an aim to create potential lead molecules for T-cell checkpoint blockade immunotherapy.

The group also works on enzyme-ligand/substrate complexes, the preferential association of cell surface receptors to understand the signalling mechanism. For example, the structure of LPQH, an immunomodulatory surface lipoprotein of *Mycobacterium tuberculosis*, reveals a distinct fold and provides insights into the evolutionarily conserved patch on its surface, hinting at its important role in the myriad functional role of this protein (see the figure).

Poornaprajna Analytical Center

Instruments available for external users for sample analysis

Chemisorption instrument [TPD (NH₃/CO₂), H₂-TPR, N₂O-Chemisorption, BEL]; Physisorption instrument (BET Surface area, porosity, BEL); X-Ray Diffractometer (Bruker); FTIR Spectrophotometer (Bruker); Atomic Absorption Spectrophotometer (Perkin Elmer); UV-Vis Spectrophotometer (Perkin Elmer); Fluorescence Spectrophotometer (Agilent); Simultaneous Thermal Analyzer (TGA-DTA, DSC Perkin Elmer); Mechanical property testing (Grain crush strength; Attrition resistance).

Contact: Dr. Sanjeev P. Maradur ; pac@ppisr.res.in, Mrs. Latha Srinivasan; latha@ppisr.res.in, (080) 23611836). For more information visit our website

<https://ppisr.res.in/content/poornaprajna-analytical-center>

Dr. Ananda K and his research group in the year 2023 made an innovative therapeutic molecule based on the mutation of amino acids on native insulin and generated a new type of insulin. This novel finding applied for a Indian patent (application No. 202341002384) and patent titled “Biologically active zinc-free hexameric insulin analogues”. In this year one of the students received PhD award under MAHE Manipal on the thesis titled "Rational modification of insulin driven by evolutionary studies and chemistry for therapeutic applications". We have identified few endophytic fungi which are isolated from sandal wood and initiated a new area of research on phytoplasma inhibition by endophytic fungi. Three MSc students from prestigious universities completed their intern project on different area of research such as omega-3 fatty acids, plastic degradation and phytoplasma. This group has published two publications in well recognized journals during the year in collaboration. One student is working for PhD and planning to take few more students to continue the ongoing research. There are many interesting findings which are in communication with prestigious journals and going to be published soon.

Publications (2023)

1. R Kumar R., Kartik Y.R., Sarkar S. Topological phase transition between non-high symmetry critical phases and curvature function renormalization group (2023) *New Journal of Physics*, 25 (8), art. no. 083027
2. Jagadish V., Srikanth R., Petruccione F. Initial Correlations and Complete Positivity of Dynamical Maps (2023) *Open Systems and Information Dynamics*, 30 (3), art. no. 2350011
3. Manal A.K., Shanbhag G.V., Srivastava R. Design of a bifunctional catalyst by alloying Ni with Ru-supported H-beta for selective hydrodeoxygenation of bisphenol A and polycarbonate plastic waste (2023) *Applied Catalysis B: Environmental*, 338, art. no. 123021
4. Kanth S., Malgar Puttaiahgowda Y., Kulal A. Synthesis, characterization, and antimicrobial activities of a starch-based polymer (2023) *Carbohydrate Research*, 532, art. no. 108900
5. Sujith S., Vaishnavi B.J., Kamath G., Kumar R.R., Reddy R.S., Valavarasu G., Ravishankar R., Maradur S.P., Bennet C., Shanbhag G.V. Highly selective aromatization of light naphtha using mesoporous aluminosilicate catalysts and theoretical model for predicting activity (2023) *Journal of Porous Materials*, 30 (4), pp. 1069 - 1083
6. Thokala N., Vankayala K., Gaonkar A.D., Periyasamy G., Fazl-Ur-Rahman K., Valle K., DMello M.E., Basavaiah K., Kalidindi S.B. An exfoliated redox active imide covalent organic framework for metal free hydrogen gas sensing (2023) *Sensors and Diagnostics*, 2 (5), pp. 1176 - 1180
7. Utagi S., Banerjee S., Srikanth R. On the eternal non-Markovianity of non-unital quantum channels (2023) *International Journal of Quantum Information*, art. no. 2350039
8. Kulal N., Bhat S.S., Hugar V., Mallannavar C.N., Lee S.-C., Bhattacharjee S., Vetrivel R., Shanbhag G.V. Integrated DFT and experimental study on Co₃O₄/CeO₂ catalyst for direct synthesis of dimethyl carbonate from CO₂ (2023) *Journal of CO₂ Utilization*, 67, art. no. 102323
9. Munirathnappa A.K., Maurya S.K., Kumar K., Hester J., Kumar R., Shivaprasad S.M., Sundaram N.G. Polymorphism in LiDy(WO₄)₂: Phase tunable synthesis, neutron diffraction, and symmetry-driven upconversion red emission (2023) *Materials Today Chemistry*, 30, art. no. 101501
10. Rajani G., Sowmya G.M., Paniveni U., Srikanth R. Bifractal Behavior of Solar Supergranulation and Magnetic Activity (2023) *Acta Astronomica*, 73 (2), pp. 187 – 195
11. Jagadish V., Srikanth R., Petruccione F. Noninvertibility and non-Markovianity of quantum dynamical maps (2023) *Physical Review A*, 108 (4), art. no. 042202
12. Kartik Y.R., Sarkar S. Mixed state behavior of Hermitian and non-Hermitian topological models with extended couplings (2023) *Scientific Reports*, 13 (1), art. no. 6431

Industry and Government Sponsored Projects

During 2023, 4 sponsored projects were executed by PPISR. An industry project sponsored by Sulzer-GTC Technology Inc, USA was successfully completed. The 2nd industry project sponsored by SABIC has been initiated. Another project sponsored by VGST, Govt. of Karnataka with CESEM grant on “Chemical fixation of CO₂ by converting into value added chemicals using metal-modified ordered nanoporous silicate catalysts” was completed in this year. After successful completion of the project sponsored by Sravathi AI Technology Pvt Ltd (SAITPL) as PI Dr. Sanjeev P. Maradur and Co-PIs: Dr. Rajappan Vetrivel, Dr. Ganapati V. Shanbhag), Bengaluru, achieved an extension for one more year with work titled “Rationalization of Yield Prediction Guided by Computational Insights”. Dr. Naresh Nalajala was successful with startup research grant (SRG) from Science and Engineering Research Board (SERB) and the focus of this project is to develop rooftop photocatalyst panels for solar hydrogen generation. Dr. Srikanth’s ongoing project sponsored by SERB on "Qubit and higher-dimensional nonunital noninvertible quantum dynamical maps: geometry and the relation to quantum non-Markovianity" ..

13. Krishnaveni V., Esclance DMello M., Sahoo P., Thokala N., Bakuru V.R., Vankayala K., Basavaiah K., Kalidindi S.B. Palladium-Nanoparticle-Decorated Covalent Organic Framework Nanosheets for Effective Hydrogen Gas Sensors (2023) ACS Applied Nano Materials, 6 (13), pp. 10960 – 10966
14. Kumar R.R., Roy N., Kartik Y.R., Rahul S., Sarkar S. Signatures of topological phase transition on a quantum critical line (2023) Physical Review B, 107 (20), art. no. 205114
15. Cheruvathoor Poulouse A., Medved M., Bakuru V.R., Sharma A., Singh D., Kalidindi S.B., Bares H., Otyepka M., Jayaramulu K., Bakandritsos A., Zbořil R. Acidic graphene organocatalyst for the superior transformation of wastes into high-added-value chemicals (2023) Nature Communications, 14 (1), art. no. 1373
16. Rao V.N., Banerjee A., Srikanth R. Quantum counterfactuality with identical particles (2023) Communications in Theoretical Physics, 75 (6), art. no. 065102
17. DMello M.E., Vishwanathan S., Bakuru V.R., Shanbhag G.V., Kalidindi S.B. Metal-Organic Framework-Derived Co-Doped ZnO Nanostructures Anchored on N-Doped Carbon as a Room-Temperature Chemiresistive Hydrogen Sensor (2023) ACS Applied Nano Materials, 6 (1), pp. 238 – 247
18. Gupta S., Puttaiahgowda Y.M., Parambil A.M., Kulal A. Fabrication of crosslinked piperazine polymer coating: Synthesis, characterization and its activity towards microorganisms (2023) Journal of Molecular Structure, 1274, art. no. 134522
19. Swamy A., Kanakikodi K.S., Bakuru V.R., Kulkarni B.B., Maradur S.P., Kalidindi S.B. Continuous Flow Liquid-Phase Semihydrogenation of Phenylacetylene over Pd Nanoparticles Supported on UiO-66(Hf) Metal-Organic Framework (2023) ChemistrySelect, 8 (5), art. no. e202203926
20. Rahul S., Roy N., Kumar R.R., Kartik Y.R., Sarkar S. Unconventional quantum criticality in a non-Hermitian extended Kitaev chain (2023) Scientific Reports, 13 (1), art. no. 12121
21. Jebarathinam C., Das D., Srikanth R. Asymmetric one-sided semi-device-independent steer ability of quantum discordant states (2023) Physical Review A, 108 (4), art. no. 042211

Highlights of Research Activities

❖Dr. Ganapati Shanbhag delivered a lecture for the Faculty Development Program (FDP) held at Department of Chemical Engineering, Ramaiah Institute of Technology, Bengaluru. The FDP was on “Renewable, green and sustainable energy from biomass/wastes: AN approaches towards sustainable development” held on 30 January-03 February 2023.

❖Dr. Ganapati Shanbhag was the Guest of honor and gave Keynote Lecture at National Seminar on "Recent Advances in Chemical Research" Organized by St Aloysius College (Autonomous), Mangaluru on March 6, 2023. He gave the lecture on “Sustainable catalytic conversion of biomass for the production of biofuels and bioproducts.”

❖Dr. Ganapati Shanbhag gave an invited talk at International Conference on “Advances in Materials, Ceramics and Engineering Sciences (AMCES-2023)” organized by Dayananda Sagar college of Engineering (DSCE), Bengaluru in association with Indian Ceramic Society and VTU, Belagavi at Dayananda Sagar college of Engineering (DSCE), Bengaluru during 13-15th of March 2023. He delivered a talk on "Designing catalytic materials for organic transformations: Pore engineering and active sites selection" and also he Chaired the session on Oral presentations

❖Dr. Maradur gave an invited talk at Faculty Development Program on "Polymer Composites for Engineering Applications” (PCEA-2023) conducted by Department of Chemistry, B. M. S. College of Engineering, Bengaluru 23rd May 2023.

New positions of Ph.D. alumni

This year, a few of the Ph.D. alumni of PPISR got prestigious positions in Government and private organizations. Dr. Swetha Lankipalli P. (Ph.D. in 2022 from Biological Sciences) joined as assistant professor at National Forensic Science University, Govt. of India, Gandhinagar. Dr. Marilyn D'Mello (Ph.d. in 2022 from Materials Science and Catalysis) achieved the prestigious SERB-NPDF postdoctoral fellowship and she will pursue her research interest at Centre for Nano and Soft matter Science (CeNS). Dr. Chethana A (Ph.d. in 2023 from Materials Science and Catalysis) achieved the prestigious DST-WISE postdoctoral fellowship and she will pursue her research interest at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR). Dr. Vinod N. Rao (Ph.D. in 2023) joined as postdoc at Quantum Technologies group at University of York, UK.

Dr. Shankar V. Kundapura (Ph.D. in 2023) joined as postdoc at structural biology group at University of Vienna, Austria. Dr. Ranjith Kumar R. (Ph.D. in 2023) joined as institute postdoc at Department of Physics, IIT Bombay.

Highlights of Research Activities

- ❖ Dr. Ganapati Shanbhag was nominated as speaker at an International Conference on "Catalysis Engineering and Technology" (CET-2023) which was scheduled on June 14-16, 2023 in Dubai, UAE. This conference was conducted in collaboration with Catalysis Society of India.
- ❖ Scientists from High Performance Plastic India Pvt Ltd, A Unit of SABIC, Bengaluru visited PPISR on 6th June 2023 to discuss about possible research collaboration. Dr Gaurav Mediratta, P, Sivakumar, Konda, Shivakumar, Dr. Satish Pandey, R K, Prashant from SABIC and Dr. Maradur, Dr Shanbhag, Dr. Naresh N, Dr A. B. Halgeri from PPISR attended the meeting. Dr Maradur made a presentation about the expertise and research capabilities at PPISR. Further discussions to work on a collaborative program is under process.
- ❖ Dr. Maradur gave an invited talk to MSc students at BVV Science College, Bagalkot on 5th August 2023
- ❖ Scientists from Yokogawa, Bengaluru visited PPISR on 14th September 2023 to discuss about possible research collaboration. Mr. Ravikumar Ramamurthy, Mr. Prasenjit Das, Dr. Maharnob Sarkar and Mr. Rakesh Ramachandran from Yokogawa and Dr. Maradur, Dr Shanbhag, Dr. Ananda, Dr. Naresh N, Dr A. B. Halgeri from PPISR attended the meeting. Dr Maradur, Dr Naresh and Dr. Ananda made a presentation about the expertise and research capabilities at PPISR. Further discussions to work on a collaborative program is under process.
- ❖ Dr. Ganapati Shanbhag gave a Key note address and also chaired the technical session at a three days International Conference on, "Green Chemistry Solutions for Sustainable Future (ICGCSF-2023)" organized by GITAM university, Bengaluru Campus in association with Catalysis Society of India (CSI), Bengaluru Chapter, from 20th to 22nd September, 2023.
- ❖ Dr. Shanbhag gave an invited talk on "Catalysis and its role in the green synthesis of fuels and chemicals" in a programme sponsored by Royal Society of Chemistry in association with PPEC, at Sadashivnagar campus on November 21, 2023 as a part of Science Exhibition by high school students and invited talks related to Chemistry.
- ❖ Dr. Ganapati V. Shanbhag was appointed as Secretary of the Catalysis Society of India (Bengaluru Chapter) in 2023.
- ❖ An idea based on "Design and development of rooftop photocatalyst panels for green H₂ generation from sunlight harvesting" proposed by Dr. Naresh Nalajala for Bharat Petroleum Corporation Ltd (BPCL) Innovation Award 2023 and shortlisted as one among the final race at national level competition and presented the idea to Jury at Mumbai Office.
- ❖ Pointed out connection between non-Markovianity and invertibility of channels, and studied factors influencing the eternality of non-Markovianity in unital or nonunital channels. Indicated conditions under which initial correlations can allow a transformation be a quantum dynamical map
- ❖ Discovery of the bifractal property of Solar supergranulation in Ca II data in work with co-guided students Mrs S. Bharath and Mrs Rajani G.

Activities In The Institute

Coursework Inauguration



As part of PPISR Ph. D. program, this year we organized course work inauguration on Feb 16. As a chief guest Dr. Gurumurthy Hegde Director, Centre for Advanced Research and Development (CARD), CHRIST (Deemed to be University) was invited and he delivered an inspiring lecture on "The Evolution of Education". The program was honored by Director Dr. A. B. Halgeri and participation of all the faculty members and Ph. D. scholar along with new joinees.

Patents (2023)

1. Biologically active zinc-free hexameric insulin analogues, (2023), Indian Patent Application No. 202341002384, Inventors: Ramagopal UA, Rao SS, Kundapura S, Ananda K.
2. High affinity PD-1 mutant as lead molecules for cancer immunotherapy, (2023), Indian Patent Application No. 202341044329 Inventors: Ramagopal UA, Kundapura S.

Activities In The Institute

Ph.D. Degree Awards

- 1. Dr. Chethana Aratandy:** Dr. Chethana Aratandy was awarded PhD on “Design of Semiconductor Oxide Nanomaterials for Efficient Gas Sensors” by Manipal Academy of Higher Education (MAHE), Manipal on **March 2, 2023** under the guidance of **Dr. Nalini .G Sundaram**. **Present Position:** DST-WISE Postdoc fellow at JNCASR, B'ire.
- 2. Dr. Shrilakshmi S:** Dr. Shrilakshmi S was awarded PhD on “Rational Modification of Insulin Driven by Evolutionary Studies and Chemistry for Therapeutic Applications” by Manipal Academy of Higher Education (MAHE), Manipal on **May 16, 2023** under the guidance of **Dr. Ananda Kulal**.
- 3. Dr. Shankar V. Kundapura:** Dr. Shankar V. Kundapura was awarded PhD on “Rational Modification of Immune Checkpoint Receptors of PD-1 Pathway for Cancer Immunotherapy” by Manipal Academy of Higher Education (MAHE), Manipal on **June 26, 2023** under the guidance of **Dr. Udupi A. Ramgopal**. **Present Position:** Postdoc fellow at University of Vienna, Austria.
- 4. Dr. Vinod N Rao:** Dr. Vinod N Rao was awarded PhD on “Feasibility Study of Practical Counterfactual Quantum Cryptography” by Manipal Academy of Higher Education (MAHE), Manipal on **July 19, 2023** under the guidance of Dr. Srikanth R. **Present Position:** Postdoc fellow at University of Cork, UK.
- 5. Dr. Vaishnavi B. J.:** Dr. Vaishnavi B. J. was awarded PhD on “Designing novel catalysts for conversion of biomass derivatives furfuryl alcohol and levulinic acid in value added chemicals” by Manipal Academy of Higher Education (MAHE), Manipal on **July 14, 2023** under the guidance of **Dr. Ganapati V. Shanbhag**.
- 6. Dr. Kartik Y. R.:** Dr. Kartik Y. R. was awarded PhD on “Geometry, Criticality and Topological transitions in Hermitian and non-Hermitian systems” by Manipal Academy of Higher Education (MAHE), Manipal on **June 29, 2023** under the guidance of **Dr. Sujit Sarkar**. **Present Position:** Postdoc fellow at Tel Aviv University, Israel.
- 7. Dr. Ranjith Kumar R.:** Dr. Ranjith Kumar R. was awarded PhD on “Topological Phase transition at Quantum Criticality in One Dimensional Topological systems” by Manipal Academy of Higher Education (MAHE), Manipal on **September 1, 2023** under the guidance of **Dr. Sujit Sarkar**. **Present Position:** Institute postdoc fellow at IIT Bombay.



International conference @ GITAM

PPISR in association with Catalysis Society of India (CSI), Bangalore Chapter and GITAM has conducted an international conference on International Conference on Green Chemistry Solutions for Sustainable Future. During the inaugural session of the conference, our director Dr. A. B. Halgeri, was honored by vice-chancellor of GITAM University. Dr. A. B. Halgeri participated in panel discussion on “Career Opportunities in Industry and Academia – Participants interaction with Industry and Academia experts”. One of our faculty Dr. Ganapati V. Shanbhag invited as a keynote speaker. Many of our Ph. D. scholars presented their work at this international platform and Dr. Vaishnavi B. J. won the best oral presentation award for her outstanding research work. Our faculty was actively involved as chairs for various oral and keynote talks of this conference.

Best presentation awards

1. Ms. Bhavana Kulkarni has received the “Best Seminar Award” for the year 2022-2023 during the Annual day programme-2023 on 2nd February 2023 at PPISR
2. Ms. Vaishnavi B J received the “Best Research Scholar Award” for the year 2022-2023 during the Annual day programme-2023 on 2nd February 2023 at PPISR.
3. Dr. Ranjith Kumar R. won research award on 1st September 2023 from Dr. K. V. Rao Scientific Society for his research work on “Multicritical Phenomenon in Topological States of Matter”.
4. Dr. Vaishnavi B. J. student of Dr. Shanbhag won best ORAL presentation award for her research on “Combinational approach of experimental and DFT for alkyl levulinate synthesis from biomass-derived feedstocks using sulfonic acid functionalized flexible MOF catalyst” at International Conference on “Green Chemistry Solutions for Sustainable Future (ICGCSF-2023)” organized by Department of Chemistry, GITAM University from 20th to 22nd September, 2023.
5. Ms. Bhavana B. Kulkarni won 2nd Place for Best Oral Presentation at 3rd international Conference Global trends in sustainable technology and its applications in applied sciences organized by Reva university and Indian association of Applied microbiologist (IAAM) 30-31st October 2023.
6. Ms. Bhavana B. Kulkarni has received the best poster prize award from Nanoscale Horizons at International winter school and International conference on RAM-90- 2023 by JNCASR) Bengaluru, 4-6th December 2023.

Activities In The Institute

PPISR Annual day celebrations

The Annual Day Programme on 02-02-2023 graced by the august presence of HH Shree Eeshapriya Thertha Swamiji. The programme begun with the invocation followed by welcome address from the Director of the institute Dr. Anand B. Halgeri. The lamp which is the symbol of divinity, considered as “Tamahssomaah Jyothirgamayah” was lighted by the dignitaries. The Hon. Secretary of PPISR Dr. K. Srihari, spoke about the visions of the founder chairman followed by the Highlights of Research Activities presented by the dean of the institute Dr. Ganapati V. Shanbhag. Also some of the students were recognized for their excellent seminar works and representatives as brand ambassadors of the Institute. H H Shree Swamiji honored them and also distributed the prizes for the winners who participated in the annual sports activities- 2023. H H Shree Eeshapriya Theertha Swamiji, Chairman, PPISR/AMEF released the Newsletter for the year 2022 and it was followed by his benediction.



PPISR Founder's Day conference

Founder's Day was celebrated at PPISR in fond remembrance of Founder late H. H. Sri Vibudhesha Theertha Swamiji on July 6, 2023 at Bidalur campus. Director Dr. A. B. Halgeri delivered an overview and inaugural speech. Dr. Ganapati V. Shanbhag gave a preamble on PPISR Founder. This was then followed by invited talk Dr. Dr. Shubha V., the former distinguished scientist of CSIR, National Aerospace Laboratories, Bengaluru was the chief guest for the inaugural session with a key note address by her. The celebration was graced with several eminent scientists across various disciplines with an array of lectures; “Embracing the Future: Circular Economy in the Chemical Industries” by Dr. Navneet Kumar Gupta, Centre of Sustainable Technologies, IISc, “Gravitational Geometric Phase” by Dr. Banibrata Mukyopadhyaya, Department of Physics, IISc, Bengaluru and followed by the concluding lecture by Dr. Manjunath M. V., Department of Neurovirology, NIMHANS, Bengaluru on the topic Understanding neurological complications of COVID-19: A Lab based approach.



MOU signed with reputed organizations



1) **Galgotias University, Noida:** The M O U between PPISR, Bidalur Campus and Galgotias University, Greater Noida, UP was signed on June 30, 2023 in the Presence of PPISR Director and the Vice Chancellor of Galgotias University Sri. K. Mallikarjuna Babu.



2) **Mount Carmel College, Bengaluru:** Dr. K. C. Mahesh and Dr. N S Kaviyarasi signed MOU with PPISR on 23rd March 2023.

PPISR welcomes new faculty



Dr. Nagasuresh Enjamuri
Assistant Professor
Ph.D.: IIT Dhanbad
Postdoc: NCL Pune and
Hokkaido University, Japan
Research: Conversion of CO₂,
biogas, and biomass into
valuable fuels and chemicals.

Outreach activities for high school students



Each year, PPISR organizes an outreach activity under the theme "Today's Science for Tomorrow Scientists" to foster scientific awareness among high school students. This year, the event drew participation from over 550 students representing various schools. Dr. Sanjeev P. Maradur served as the coordinator, and a team of doctoral students showcased a range of experiments from different departments. The excitement heightened with lab visits, providing students firsthand exposure to the research facilities at PPISR.

Outstanding contribution awards by AMEF

Admar Mutt Education Foundation inducted two awards to recognize outstanding contribution from the faculty and students of PPISR. In this year, Dr. R. Srikanth, received *Outstanding Scientist Award* for his achievements in the field of quantum computing during the last decade and was honored by the Chairman of PPISR H. H. Shree Eeshapriya Theertha Swamiji during the second annual day celebration on February 02, 2023. Ms. Marilyn DMello, was honored with *Best Research Scholar* award for the outstanding performance during her 4 years research at PPISR.



Visit of Sulzer-GTC Technologies, USA

PPISR is delighted to have the opportunity to host Sulzer-GTC Technologies, USA, as a prominent sponsor of research projects at the institute. In the course of reviewing the project's advancement, Dr. N. Nikolay, Head of Technology Commercialisation Gas Solutions at CFCL of Sulzer-GTC, visited our institute from June 21st to June 24th, 2023. During this time, he engaged with our scientists and students, observed the ongoing research activities related to sponsored projects, and actively participated in extensive discussions with the Director Dr. A. B. Halgeri and Principal Investigator, Dr. Ganapati V. Shanbhag.



Visit of Shell Technologies, Bangalore and Amsterdam



Prof. Dr. Thomas Weber, Principle Scientist Shell Technology, Amsterdam and Dr. Kartick Mondal, Senior Scientist, Shell Technology, Bangalore along with their teams visited our campus.

Visit of Yokogawa, Bangalore



Scientists from Yokogawa, Bengaluru visited PPISR on 14th September 2023 to discuss about possible research collaboration. Mr. Ravikumar Ramamurthy, Mr. Prasenjit Das, Dr. Maharnob Sarkar and Mr. Rakesh Ramachandran from Yokogawa and Dr. Maradur, Dr Shanbhag, Dr. Ananda, Dr. Naresh N, and Dr A. B. Halgeri from PPISR attended the meeting.

Activities In The Institute

Science Exhibition for PPEC schools



Poornaprajna Education Centre, Sadashivnagar had organized a two days programme on SIGNIFICANCE OF CHEMISTRY IN DAY-TO-DAY LIFE in association with Royal Society of Chemistry (RSC), Deccan Section and Poornaprajna institute of Scientific Research, Bidalur in allied branches of climate change, Recycling plastics, Sustainability, Waste management and Bio Fuel to create greener, cleaner and Eco friendly systems through awareness lectures and Exhibitions by participation of students of other PPEC schools of Bengaluru.

National Science Day celebrations



On the occasion of National Science Day, two day conference (March 9-10) on “Scientific Concepts and Advancement for Humanity” was organized at Bidalur Campus. During the conference, eminent scientists from academia and industry delivered invited talks; Dr. Kartick Mondal, Scientist from SHELL Technology Centre, Bengaluru, Dr. P. V. Shivaprasad National Centre for Biological Sciences, TATA Institute of Fundamental Research, Bengaluru, Dr. Kusharga Bansal of JNCASR, Bengaluru, Prof. Nayantara Gupta, Raman Research Institute, Bengaluru. Followed by these talks, Ph. D. scholars delivered talks on various aspects of chemistry and physics.

Internship at PPISR



To foster scientific curiosity among graduate and postgraduate students, PPISR has launched an internship program. In 2023, over thirty students from diverse universities and colleges such as GITAM, Mount Carmel, St. Aloysius, and Mangalore University completed their master projects through this initiative. Research endeavors spanned across disciplines including chemistry, materials science, and biological sciences. The internship program at PPISR proved highly successful, offering enhanced opportunities for students to explore research as a prospective career path.

AMEF Board of Trustees Meeting

Admar Mutt Education Foundation Board of Trustees meeting was held on November 19, 2023. Trustee members discussed on different issues related to the PPISR. Dr. A. B. Halgeri presented the overall highlights of PPISR research activities and all the Trustee members highly appreciated the achievement of PPISR and overall progress of all the research activities. H. H. Shree Eeshapriya Theertha Swamiji, Chairman, AMEF presided over the meeting.

The PhD awardees of PPISR, Dr. Karthik, Dr. Vaishnavi, Dr. Chethana, Dr. Vinod, Dr. Ranjit, Dr. Shankar, and Dr. SreeLakshmi during 2023, were honored by Shree Swamiji on this occasion.



Invited talks



There were several invited lectures and webinars by distinguished speakers conducted at PPISR during 2023. Some important lectures are as follows. Prof Kattesh V. Katti, M.Sc., Ph.D., DSC, FRSC, FNAI, visited our research campus at Bidalur on June 8, 2023. He also delivered an invited talk on “Green Nanotechnology Toward Renaissance of Ayurvedic Medicine Genesis of Nano Ayurvedic Medicine as “A New Medical Modality”. Prof. Krishna Prasad, distinguished scientist at the Centre for Nano and Soft Matter Sciences (CeNS). The visit to the laboratories was followed by the lecture on “From Laboratory Research to Tangible Prototypes: A Case Study of Smart Windows Using Liquid Crystals”. The former Faculty alumni of PPISR Dr. Mallikarjuna Shakarad, presently a professor in the Department of Zoology of University of Delhi visited the campus and delivered a lecture. He was honored during his visit to the campus. Prof. K. R. Krishnamaurthy, senior consultant to Deepak Nitrite Ltd., Vadodara delivered an invited talk on Selective hydrogenation of Furfural: Gateway for sustainable fuels and chemicals. Prof. K. Seshan, Professor, Univeristy of Twente, The Netherlands visited our institute and delivered an insightful lecture on Fuels for transport, Fossil, Electricity and Hydrogen!

Miyawaki Forest@PPISR



In light of growing concerns about environmental pollution and a steadfast commitment to environmental protection, PPISR has established a Miyawaki forest. Afforestation not only stands as scientific method but also as a promising approach to safeguarding soil, air, water, and climate. This initiative was personally spearheaded by His Holiness Shree Eesha Priya Theertha Swamiji on May 25, 2023. The forest comprises a total of 1500 saplings in an acre of desert land encompassing 25 different plant species, including fruits and medicinal plants. A dedicated team ensures the well-being of the saplings and provides periodic updates on the forest's growth to the revered Swamiji.

Visitor's Views

Prof. KATTESH V. KATTI, 3400, Beach Cove Street, Columbia, University of Missouri, USA

I sincerely thank Dr. Anand Halgeri for his institution. The research and educational enterprises of PPISR. One so profound that it deserves significant funding from the Government and private sectors. I am excited to collaborate and develop a working relationship with this Steller institution. Dr. Anand is providing a visionary leadership to PPISR.

Dr. NIKOLAY NESTERENKO, Head of Technology Commercialization Gas Solutions, CFCL.

I spent three (3) days in PPISR. It was an incredible experience for me. I could observe that the project is a real team work and everyone contributed and they so do the maximum to achieve success and to solve the problems. I would like to also highlight a very strong technical level of all the students and to help. One can see that, a very healthy and trusted scientific environment has been developed in PPISR by Dr. Halgeri. I would like also to thank the hospitality and commitment to the work which they are performing for us.

Sri. K. MALLIKARJUNA BABU, Vice-Chancellor, Galgotias University, Greater Noida, UP.

This is my first visit to PPISR. I am quite fascinated to see a wonderful research facility with serene atmosphere. Faculty members sorry, all the research scientists are very knowledgeable I their respective domains and all of them are well accomplished personalities. The work and culture at the institute really promotes the scientific temper. The stewardship of the Director prof. A. B. Halgeri is an added strength. I wish to collaborate between PPISR and Galgotias University will goa long way in helping humanity through science.

Dr. SHUBHA V., Former Distinguished Scientist, CSIR, National Aerospace Laboratories, B, lore.

Very good research facilities and also scientists working in very interesting areas. Very good collaborative work is going on. It is a combination of Fundamental and Technology oriented work. Many papers have been published which automatically speaks for the excellent research going. All the best for students and staff to achieve many laurels and contribute to the country.