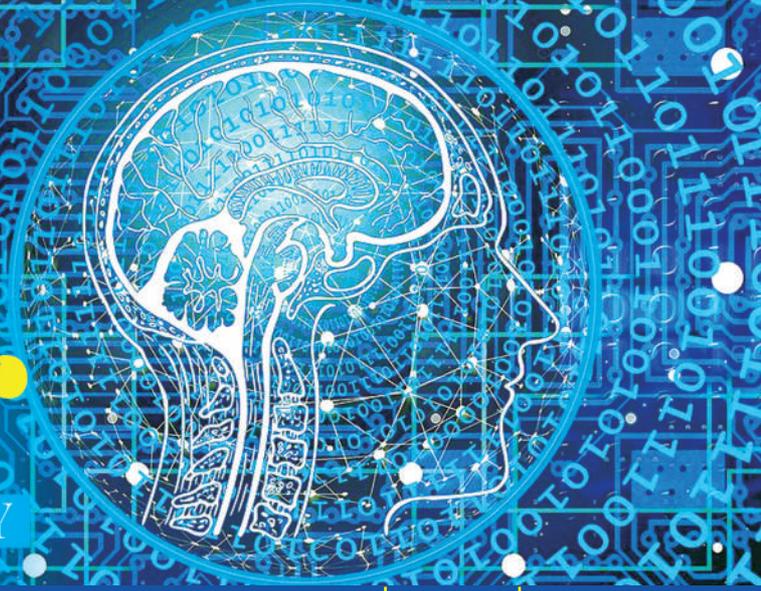




insider

MAHATMA GANDHI UNIVERSITY



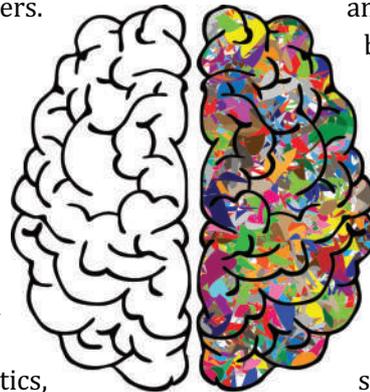
Issue 1 | January | 2021

Going Global Academic Tracks on the **RISE OF INDUSTRY 4.0 TECHNOLOGIES** and its Global Challenges

We are in the midst of an increased pace of technological change in the regime of Industry 4.0. The scale of technology change in the coming decades will be greater than ever. Artificial intelligence has been identified as one of the next generation technologies that can shape the world's future and create numerous job opportunities. Robotics is about to enter an exciting new age, as robots become more responsive, smarter and more human, and find applications in a range of industries. Technologies such as machine learning, visual intelligence, the Internet of Things (IoT), speech and signal processing, and big data analytics are unprecedented opportunities for the private sector companies and the public sector. Every institution capable of exploiting these technologies will have a chance to radically streamline and enhance existing processes, create entirely new business models, and develop innovative products and services for a new

The School of Artificial Intelligence and Robotics explores the emerging opportunities from the Industry 4.0 technologies like Internet of Things, Industrial Internet of Things, Cyber-Physical Systems, Smart Manufacture, Cloud Computing, Cognitive Computing, Artificial intelligence, and Robotics.

generation of consumers. To solve these issues, many trained people are expected in these fields in the coming years. It is with a vision to tap this opportunity, MGU has planned to establish a School of Artificial Intelligence and Robotics, which covers all aspects of Industry 4.0 technologies. The post-graduate and research programmes of the school can contribute much to this requirement by providing training to young technology and research graduates. The school also envisions to promote academic research in specialized areas like vision intelligence, speech



and language processing, and big data analytics by establishing specialized labs and workstations equipped with, high-end computing and supporting facilities. The School plans to offer new postgraduate and research programmes reflecting state-of-the-art software and hardware technology advances and expose students to new, much sought-after skill and up-to-date areas of research. The latest technological advances are incorporated into the programmes by developing new interdisciplinary approaches and fields such as embedded systems, robotics, computer intelligence and virtual reality.

MGU brings state-of-the-art master's programs to five newly established science schools in the fields of Artificial Intelligence and Robotics, Nanoscience and Nanotechnology, Energy Materials, Mathematics and Statistics, and Data Analytics to cope with the rapid evolution of technology in the world.

M Sc Artificial Intelligence and Machine Learning

Artificial Intelligence is a field of study that seeks to explain and emulate intelligent behaviour in terms of computational processes. It focuses on the theory, design, application and development of biologically, socially, and linguistically driven computer paradigms. Robotics deals with well-developed knowledge of areas ranging from computer science and artificial intelligence to engineering and neuroscience, in order to produce hardware which can sense and manipulate the real world. The postgraduate programme in Artificial Intelligence and Machine Learning to be offered by the School aims to impart theoretical and practical knowledge in the specialized area of applied artificial intelligence and machine learning.



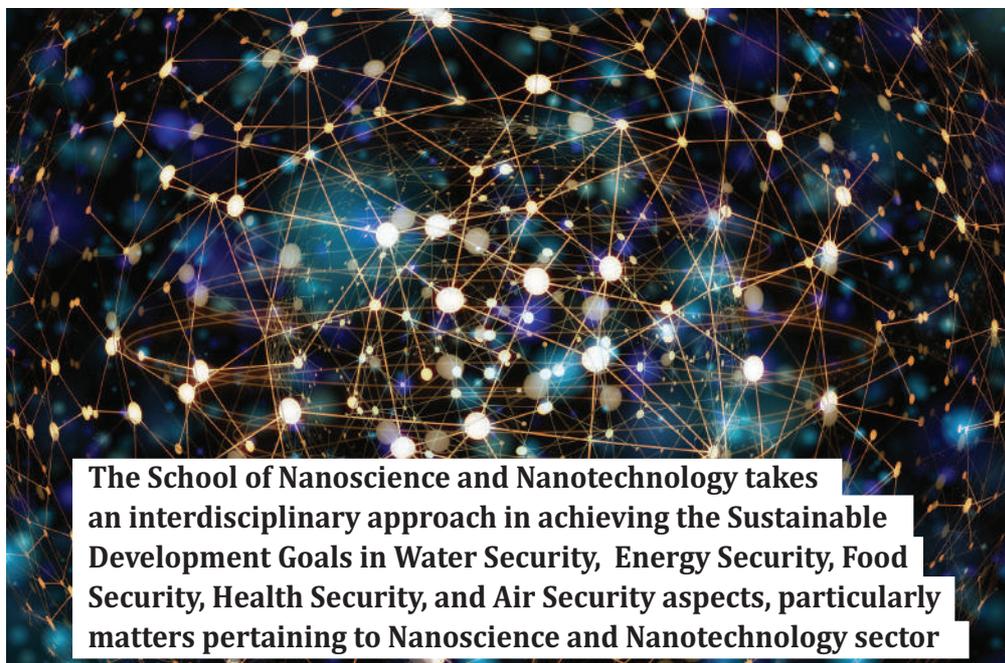
Admission Criteria

The eligibility for admission to M Sc Artificial Intelligence and Machine Learning is a first class Bachelor's or B.Tech degree in Computer Science/ Information Technology/ Cyber Forensics/Electronics or any other equivalent degree.

To find out more, contact :

Prof. Bindu V. R.
E-mail: binduvr@mgu.ac.in

Initiates Innovations and Transformative Change in Nanoscience and Nanotechnology



The School of Nanoscience and Nanotechnology takes an interdisciplinary approach in achieving the Sustainable Development Goals in Water Security, Energy Security, Food Security, Health Security, and Air Security aspects, particularly matters pertaining to Nanoscience and Nanotechnology sector

The newly formed School of Nanoscience and Nanotechnology operates as an academic and interdisciplinary research center for integrating various branches of science and technology. The school act as a nodal institution to provide training and research in a variety of interdisciplinary areas of Nanoscience and Nanotechnology. The school also provides state-of-the-art facilities and advisory services to researchers in other organizations and educa-

tional institutions to enhance the quality of their research activities in the sector.

The School places great importance on academic and research programs in collaboration with leading institutions in the country and abroad and thus generate exchange activities for faculty and students. The School intends to co-ordinate research activities in relevant and potential areas and to seek possible collaborations with different industries to make technological products.

For more information, get in touch with

Prof. Nandakumar Kalarikkal
E-mail: nkalarikkal@mgu.ac.in

The school provides academic programs M. Tech in Nanoscience and Nanotechnology, Master's Programs (M.Sc) in Nanoscience and Nanotechnology (Chemistry/Physics) incorporating physical, chemical, biological and environmental aspects relating to Nanoscience and Nanotechnology along with device fabrications and waste management. The School also provides PhD programs to meet our society's immediate sustainable development needs.

Universities in Developing Countries should become Centres of Technological and Social innovation as in Developed Countries



Prof. Sabu Thomas
Vice Chancellor,
Mahatma Gandhi University

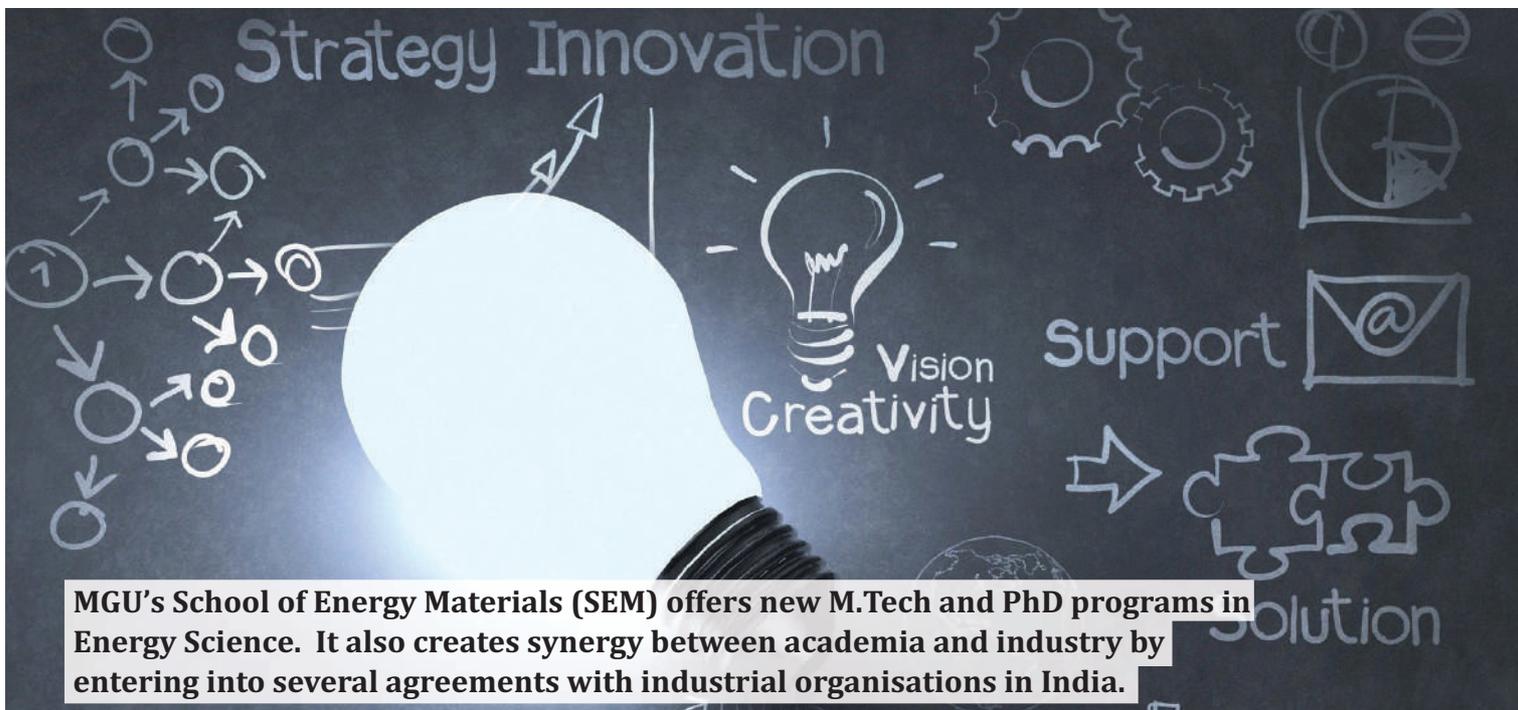
Prof. Sabu Thomas is ranked #2 in the field of polymer science in India and #114 amongst the best scientists in the world

Stanford University in the United States recently released a list that represents the 2 percent of the most cited scientists in various disciplines. The comprehensive list includes 1,59,683 people with close to 1,500 scientists, physicians and engineers in India. The list includes the name of Professor Sabu Thomas, the Vice-Chancellor of the MGU. All were selected based on an international assessment of their research papers. Professor Thomas is ranked second in the field of polymer science in India and 114 among the best scientists in the world according to this ranking. It is a proud moment for the MGU as seven former members of Prof. Sabu Thomas's group Prof. Kuruvilla Joseph, Prof. Laly A Pothen, Dr. Siby Varghese, Dr. Sreekala M.S, Dr. Deepalakshmi Ponnana, Dr. Kishore Kumar, and Dr. Robin Augustine are also in the Single Year list as rising stars!

In developed countries, universities play a key role in formulating innovative strategies to synergize research and education to meet their countries' emerging socio-economic and scientific interests. Universities in developed countries serve as an office for technology transfer and licensure of innovators. They rigorously focus on research and development activities to identify and support next-generation business models on campus as per the emerging needs of global economies. In recent years, universities in developed countries have placed greater emphasis on support for start-ups and collaboration with established organizations and public research institutes to produce innovative services and products. In addition, universities open their facilities, faculties and students to facilitate collaboration with public and private organisations to create greater economic value. In short, strengthening the innovation capabilities of students and faculties within their academic infrastructure is considered one of the main goals of universities in developed countries. Yet, when it does to ours like developing countries, university interaction with commercial enterprises and research establishments in terms of producing economically valuable knowledge is relatively scanty due to various resource constraints. As a result, the disparity between universities in developed and developing countries in terms of their capacity to innovate is widening over the period. In India, traditional state-funded universities are the main generators of higher education and economically valuable knowledge. The government oversees various policy measures to strengthen innovation infrastructure and knowledge

production in our public universities. However, it is an undeniable fact that many of our leading universities, particularly public funded universities are underperforming in producing economically valuable knowledge and innovation as compared to universities in the developed countries. This underperformance undermines India's overall ability to innovate and grow the economy. We can clearly observe this based on India's position in various international innovation ranking studies, such as the Global Innovation Index (GII). According to the latest GI statistics, India ranks just 48th out of a group of 131 countries. Our universities must not only retain their traditional teaching and research role, but also commit to capitalizing on knowledge, patents and start-ups. Generally speaking, education and research activities at our universities should be more integrated with the development of a knowledge-based economy. In particular, universities should create direct associations with industrial organizations and other public and private research institutions to maximize knowledge capitalization. Our universities should also consider measures to induce employment of its resources to stimulate the social innovation practices which facilitate the transformative societal change and upliftment of economically backward communities in the nation. Bearing all these factors in mind, I hope that MGU's new start-up ecosystem and recent innovative measures in starting multidisciplinary academic schools in science and social science disciplines would definitely increase its competitiveness among global universities.

Institutes an Academic Innovation System for the Energy Sector



MGU's School of Energy Materials (SEM) offers new M.Tech and PhD programs in Energy Science. It also creates synergy between academia and industry by entering into several agreements with industrial organisations in India.

SEM emphasizes research and education to develop sustainable energy systems for the future. It is a new interdisciplinary School deeply engaged in transdisciplinary energy teaching and research. Recently, the School launched an M.Tech Energy Materials Program focused on the development of new materials for energy production and storage through green approaches. SEM's research activities aim to develop

clean energy systems in response to India's future energy demands. The school presently has several visiting professors, Ph.D students, post-doctorates, project students and other associate members from industry and academia.

If you would like further information, please contact:

Prof. Sabu Thomas
E-mail: drsabuthomas@mgu.ac.in

Recent Activities of the SEM

Within a short time, the School of Energy Materials has led numerous international scholarly programs.

Conferences

- ▶ First International Online Conference on 'Blends, Composites, Bio-Composites and Nanocomposites', 9-11 October 2020.
- ▶ International Online Conference on '100 Years of Polymer Science - From Past to Future', 13-15 November 2020.
- ▶ Fifth International Online Conference on 'Reuse and Recycling of Materials (Polymers, Wood, Paper, Leather, Glass, Metals, Ceramics, Semi Conductors, Water etc) and their products (ICRM - 2020)', 11-13 December 2020.
- ▶ International Webinar on 'Advances in Physics, Chemistry, Mathematics, Computer Sciences & Biological Sciences (CONIAPS XXVI)', 18-20 December 2020.

Research Projects under Development

- ▶ Green Synthesized Metal Nanocluster Grafted TiO₂ for Photocatalytic Conversion of CO₂. Funding Organisation: Kothari.
- ▶ Development of Pineapple Leaf Fiber Composite with Bioresin. Funding Organisation: NOVA MILAN LTD.
- ▶ Lightweight Nanocellulose/Rubber Hybrid Nanocomposite for Tyre Engineering: The Role of Interface Modification On Morphology and Ultimate Properties. Funding Organisation: Apollo Tyres.

Began New Schools in Math, Data Science and Quantitative Disciplines

The newly founded School of Mathematics and Statistics and School of Data Analytics launches courses in M.Sc Mathematics, M.Sc Statistics, and M.Sc Data Science and Analytics

The MGU recently established two new Schools for basic and interdisciplinary studies and research - the School of Mathematics and Statistics and the School of Data Analytics. Mathematics and Statistics are fundamental disciplines of knowledge and constitutes most important tools for all programs of study and research as well as science and technology, social sciences, health and welfare, industry, business and management. The NAAC peer teams had recommended launching the School of Mathematics and Statistics over the last two accreditations. In this new era of increasing thrust on Mathematical Modeling and Statistical Data Analytics and Data Science, there is wide scope and potential for offering postgraduate and research level interdisciplinary programs in these disciplines. Data Science and Analytics is the most sought-after



profession in today's labour market and is an emerging field of research with interdisciplinary applications. The vice-chancellor, Dr. Sabu Thomas, took the lead and the Syndicate decided to create the School of Mathematics and Statistics and the School of Data Analytics in 2020-2021. The Vice-Chancellor nominated Prof. K. K. José, former professor and

head of the department of statistics and biostatistics as honorary director for the coordination of academic activities of both schools. Dr. Jose is a distinguished academician who has published over 125 research papers in reputable national and international journals and has successfully supervised over 25 research scholars in statistics.



Why Datascience School?

Prof. K. K. Jose,

Honorary Director, The School of Mathematics and Statistics and the School of Data Analytics

The current age is that of information technology and data analytics. In today's data-driven world, all decisions and planning are grounded in statistics, data analysis, and data science. High demand for experts in data analytics and data science is felt in research and development, science and technology, industry, health and epidemiology, planning and forecasting, business and management,

defense, transportation, etc. Hence a School of Data Science and Data Analytics was an urgent need for ensuring high level research and employment potential for our students. It is proposed to commence the following interdisciplinary postgraduate programs at these schools during this academic year. (i) M.Sc. Mathematics (ii) M.Sc. Statistics (iii) M.Sc. Data Science and Analytics.

Each program includes a full semester of project and internship work. In tune with the recent developments in research and employment fields, this program will have elective courses on Statistical Computing using R and Python, Data Science and Data Analytics, Biostatistics and Demography, Epidemiology and Clinical Control, Industrial Statistics and Quality Control as well as Econometrics.

MGU Gets a Patent for the Invention on Electromagnetic Radiation Protection from Mobile Phones and other Electronic Gadgets

The materials developed is a new mixture of carbon nanotubes and nano-composite polymer, was invented by Prof. Sabu Thomas, Prof. Nandakumar Kalarikkal, Dr. Ajitha A R, Dr. Geethamma V G, Dr. Lovely P Mathew, and Dr. Aswathi M K. The invented material was prepared by mixing carbon nanotubes (CNTs) with the polymer mixture of a significant biopolymer, polytrimethylene terephthalate and polypropylene. Due to the tuned morphology and selective localization of CNTs, the invented composite has achieved good electrical and mechanical properties. This invented material can be used to protect against electromagnetic radiation from mobile phones and other electronic gadgets. At the moment, metals are widely used as electromagnetic



Prof. Sabu Thomas' team has filed a patent for the development of a Polymeric Nanocomposite that has the ability to block Electromagnetic Waves emitted by mobile phones

shielding materials. The invented material sheds light on the applicability of nano-composite polymers as an effective protective material against electromagnetic interference (EMI) with a lower weight and thickness. MGU undertakes many research activities for the development of various high-performance Polymer Nanocomposites for EMI shielding applications. The project was funded by the UGC.

For more information about this invention, Please contact:

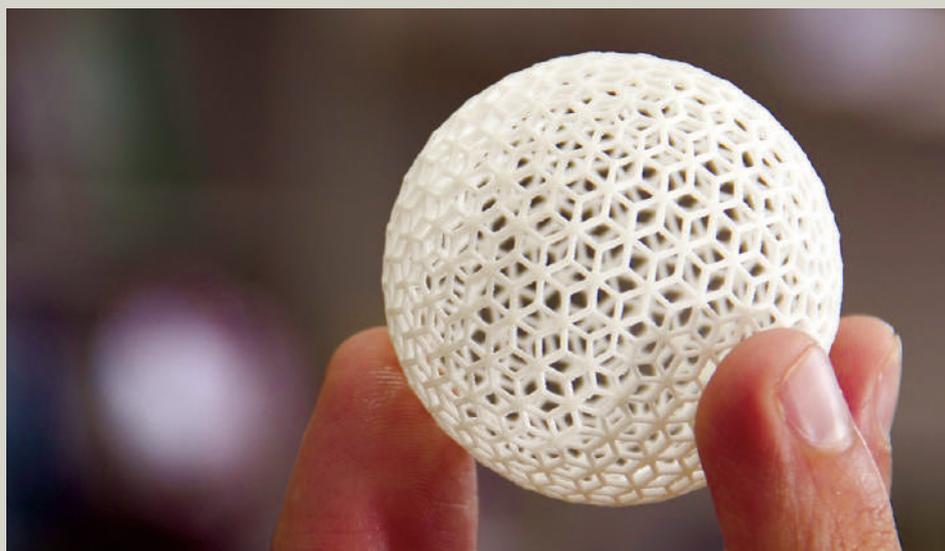
Prof. Sabu Thomas,
E-mail: drsabuthomas@mgu.ac.in &
Prof. Nandakumar Kalarikkal
nkkalarikkal@mgu.ac.in



Receives India Government Senior Researcher Grant for 3D Printing Research

Ms. Blessy Joseph
CSIR-Senior Research Fellow, IIUCNN, MGU

Ms. Blessy Joseph is receiving a Senior Research Fellow (FRS-DIRECT) from the Council of Scientific and Industrial Research (CSIR), Government of India. Ms. Blessy has written extensively in peer-reviewed journals and is currently the editor of several books. Her latest publication includes "Insights into the biomechanical properties of plasma treated 3D printed PCL scaffolds decorated with gold nanoparticles" published in Composite Science and Technology (Elsevier, Impact Factor 7.094). The manuscript describes in detail the manufacturing of the healing scaffold of the additive manufacturing technique or 3D printing. Plasma-modified scaffolds



have shown excellent biological properties and open new paths in tissue engineering. Ms. Blessy was a visiting scholar at the Université South Bretagne in France and the

Université de Lorraine in France. This work was carried out in collaboration with the University of South Britain, France and the University of South Australia.

IMPSS Turns into a Game-Changing Program for Teaching and Research in the Social Sciences

The first batch of 30 students admitted into the new Integrated Master's Programme in Social Sciences (IMPSS) from a variety of disciplines. It is also rapidly expanding its institutional ties and academic collaborations with universities and leading social scientists around the world.

There is a massive exodus from Kerala to outer universities for undergraduate studies in the social sciences. A rough estimate shows that on an average thousand students from assorted regions of Kerala move to the universities and institutions of higher learning in the social sciences in Delhi, Hyderabad, Pune, Pondicherry, Chennai and Bangalore. This mass exodus is partly due to a lack of renowned national or regional social science institutions in Kerala. In this context, MGU has launched IMPSS to respond to the growing demand for higher education

centers in the social sciences. The integrated Masters programme in Social Sciences is conceptualized with the objective of setting base for higher-level intellect and research at an entry level. The main objective of this curriculum is to understand the social sciences in their most inclusive sense as encompassing various disciplinary attempts. This multidisciplinary program is limited to research and training in various fields. The multidisciplinary approach helps students from different disciplines to continue their studies without a lot of

disciplinary hassle. IMPSS programme currently cultivates a better and deeper understanding and provide crucial insights into major social science disciplines, through the expertise of a team of specialists from various statutory departments of the University and the employment of interdisciplinary tools and methods.

For further details,
Please contact

Prof. M.H. Ilias
E-mail: mhilias@gmail.com



Why is it integrated?

Prof. M.H Ilias, Honorary Director, IMPSS

The schools and social science centers of the MGU have a long army of academics who are known at the national and international level in their respective fields. But their expertise has not been fully exploited by the university and the present programme is capable enough to use their potentiality and thereby make a tag in social science education in South India. In addition, the growing popularity of social science disciplines in today's socio-economic regime has created a strong demand for pure social science topics in Kerala. Phenomenal increase in the number of civil service aspirants in the state has also made social science disciplines more appealing. In this milieu, IMPSS

provides a delicately balanced intersection of social science disciplines within the multidisciplinary framework of subject fields like History, Political Science, Economics, Anthropology, International Relations, Gandhian Studies, Public Policy and Governance, and Human Rights. We are glad to announce that in a short period of time, IMPSS has developed various institutional linkages and collaborated with international universities like Hasan Kalyoncu University, Turkey and University of Virginia, United States. IMPSS also collaborates with distinguished scholars such as Prof. Laura U. Marks, Simon Fraser University, Canada; Prof. Faisal Devji, University of Oxford; Prof.

Oliver James, University of Exeter, UK; Prof. A K Ramakrishnan and Prof. Udaya Kumar, Jawaharlal Nehru University, New Delhi; Prof. Susan Visvanathan, Prof. Sanil V, and Prof. Binitha Thampi, Indian Institutes of Technology, New Delhi and Madras, for providing credit and non-credit based various seminar courses. Seminar courses are the additional courses designed in a series of 4-6 lectures on certain subjects, which are not covered in the curriculum taught. The duration of such a course is two to three months. The University invites external scholars to provide such courses and each course will have participants from outside the university as well as master's program students.

Malayalam Computing Project Conducted in MGU Revolutionizes the TeX Typesetting in Academia

Dr. K.H. Hussain, a recent PhD graduate from the School of Social Sciences, invented and popularised the Malayalam unicode font Rachana in TeX-based academic typesetting in Malayalam language.

TeX is an academic culture instead of composing software. Most European universities have adopted legislation to submit theses solely in LaTeX. No other popular packages like MS Word, LibreOffice, Adobe PageMaker, InDesign, etc. are allowed for academic writing. The TeX initiative took place at the School of Social Sciences is a significant contribution to Malayalam computing and MGU is expected to make it a part of the program for researchers. This would be a model that could be extended to other languages such as Tamil, Hindi, Arabic, etc. that would open up scientific literature in vernacular scripts. The ‘TeX initiative in academic Malayalam’ started at MGU in 2019 when Dr. Hussain wrote his thesis entitled “Creating Bibliographic Information Systems using the Malayalam script: Application of Unicode Language Technology”. It was the first thesis typeset using LaTeX in Rachana font, which is designed by Dr. Hussain. It was also the first thesis presented in Malayalam script in the social science departments at Kerala universities. Normally LaTeX typesetting is used in the production of theses in mathematical sciences because no other program can claim the perfection it creates in mathematical and chemical expressions. The major contribution of the work is that mathematical precision that was bought into LaTeX Malayalam applying Rachana font for the traditional script. Furthermore, the scientific literature carried out by LaTeX as well as the ultimate functionality of Malayalam writing is the striking contribution of the research.



Five milestones in the modern history of the Malayalam alphabet (Lipi)

Dr. K.H.Hussain, Inventor of the Rachana unicode Malayalam font and founder of the ‘TeX initiative in academic Malayalam’ at MGU

- The hand-written Malayalam script was mainly evolved since the 11th century and was different in shapes and styles with different names such as *Vattezhuthu*, *Kolezhuthu*, etc. It was Fr. Benjamin Bailey, who integrated these differences into a standardized alphabet with a pan-Indian outlook. He designed metal fonts of Malayalam for printing in 1824 and subsequently publishing thrived in Kerala. The majority of the population could then see the alphabet of its native language and learning, reading and writing progressed systematically.
- In 1970, the Malayalam conjunctions were truncated from 900 to 90. The amendment adopted by the Government of Kerala mainly concerned typewriters in the name of simplifying the printing process. In 1974, the modified script was introduced in textbooks and, since that time, a non-systematization of learning and writing has taken place in the student community. In the eighties, when desktop publishing spread and became popular in the publishing industry, many Malayalam fonts were designed for modified scripts. DTP fonts contained many variations of conjunctions with no concern for standards.
- In 1999, “Rachana Akhsaravedi” launched its campaign for an “original” script in Malayalam computing under the leadership of R.Chitrajakumar. Rachana’s campaign motto was “Our script for Our language”. Rachana font was conceived by Dr. Hussain based on traditional/ original/old script.
- After 5 years of the creation of Rachana, Malayalam embraced the technology of the Unicode language. The ASCII Rachana font was redesigned for Unicode in 2006. Swathanthra Malayalam Computing (<https://smc.org.in/>) was the maintainer and distributor of Unicode Rachana in 2007. A number of applications and websites have been adapted to Rachana to display their content.
- Renowned typesetter C.V. Radhakrishnan founded the ‘Sayahna Foundation’ (<http://www.sayahna.org/>) in 2015 and started typesetting Malayalam classics like works of Ulloor and A.R. Rajaraja Varma (Keralapanini) in Rachana using the LaTeX typesetting package. This is the first TeX Initiatives in Unicode Malayalam. About two hundred Malayalam books, including hundreds of classics, have been archived in Sayahna thus far and are distributed freely using Creative Commons. The Sayahna Foundation has undoubtedly established the exhaustiveness of the Rachana as the basis for the future script of Malayalam.

Methodical Conquest **beyond Horizons!**

Prof. Nandakumar Kalarikkal, a world-class academic in Nanoscience and Nanotechnology, the individual who travels along with MGU during its bad and good times, writes about the evolutionary growth of the university's science departments



Prof. Nandakumar Kalarikkal

Director & Professor, International and Inter University Centre for Nanoscience and Nanotechnology; Director & Chair, School of Pure and Applied Physics; MGU Syndicate Member.

Established on a Gandhi Jayanti day, 02 October 1983, Mahatma Gandhi University (MGU, formerly known as 'Gandhiji University') has taken a long intellectual hike in the field of science and technology during its 37 year old legacy of educational eminence. Science schools of MGU including, School of Bio Sciences (SBS), School of Chemical Sciences (SCS), School of Computer Sciences (SOCS), School of Environmental Sciences (SES), School of Pure and Applied Physics (SPAP) have diligently evolved with time to compete, triumph and prosper thereby, increasing the visibility of the University in the National and International scientific arena. Very recently, the University has established new schools such as School of Mathematics and Statistics, School of Artificial Intelligence and Robotics, School of Nanoscience and Nanotechnology, School of Energy Materials in order to generate trained manpower in specific fields for the future sustainable developments of the society. In virtue of these constant efforts, MGU has been funded by numerous schemes of Govt. of India, as well as Kerala among which, Scheme for Promotion of Academic and Research Collaboration (SPARC) by Ministry of Human Resource Development (MHRD), Science and Engineering Research Board (SERB),

Promotion of University Research and Scientific Excellence (PURSE), Nano Mission programmes by Department of Science and Technology (DST), Govt. of India, are notable mentions. Particularly, DST has set up a Sophisticated Analytical Instrument Facility (SAIF) in collaboration with MGU, unlike many institutions in India, to provide access to advanced instrumentation to carry out research in modern science and technology even in backward areas. The different Schools have also received substantial funding through UGC-Govt. of India SAP and DST-Govt. of India FIST schemes to establish state of the art facilities to pursue top level research and academic activities. An advanced laser facility has also been set up with the International and Inter University Centre for Nanoscience and Nanotechnology through the Innovative Program of UGC-Govt. of India. Various International and Inter University Centres as well as other Inter School Centres like International and Inter University Centre for Nanoscience and Nanotechnology (IIUCNN), Inter University Instrumentation Centre (IUIIC), Advanced Centre for Environmental Studies and Sustainable Development (ACESSD), Inter University Centre for Biomedical Research (IUCBR), Inter University Centre for Studies in

Science and Music (IUCSSM), Inter University Centre for Organic farming and Sustainable Agriculture (IUCOFSA), Centre for High-Performance Computing (CHPC), Advanced Molecular Materials Research Centre (AMMRC), National Institute of Plant Science Technology (NIPS), Institute for Integrated programmes and Research in Basic Sciences (IIRBS) sought to bridge the researchers of University and industry by offering them a platform to exchange their thoughts and encourage the scholars of the University to work on product development at industrial level. The science faculty members of MGU have always proved to be tough competitors as well as front-runners in developing indigenous technologies and are holding as many as twenty plus International and Indian scientific patents, including four from the US. MGU has signed a good deal of Memorandum of Understanding (MoUs) with many foreign Universities and industries which promotes fruitful collaboration, student and faculty exchanges etc. thereby, resulting in integral development endeavour of the University through its students and faculties. Regular execution of International as well as Indian conferences, workshops, webinars etc. is an inevitable milestone of the University since it ensures the

scientific updation, even during this Covid-19 pandemic era. Institute for Intensive Research in Basic Sciences (IIRBS), International and Inter University Centre for Nanoscience and Nanotechnology (IIUCNN), Advanced Molecular Materials Research Centre (AMMRC) and Centre for High Performance Computing (CHPC) envisage advanced studies in respective areas which brought many achievements to the University.

MGU has been selected for first

ever Indo-US (Obama-Singh) 21st Century Knowledge Initiative by the University Grants Commission in 2012 for institutional partnership projects in research and educational activities between India and the US. The University has also won the best State University Chancellor's Award (instituted by the Hon'ble Governor of Kerala) twice during 2015-16 and 2017-18, owing to the effectual scientific contribution made by the University in a short span. The University bagged Rs. 5 Crores each

as prize money which is being invested to set up an International Academic Convention Centre binding together all the sophisticated research facilities of all University centres under the same roof, housing an auditorium as well, with state of the art facilities. No matter what, MGU always strives to thrift!

(The support from Ms, Shilpa Santhosh and Ms. Fency Sunny, IIUCNN in the finalization of this write up is gratefully acknowledged.)

UGC-STRIDE Expands Capacity Development Programmes for Faculty Members

The UGC-STRIDE office of MGU conducted an entrepreneurial skills development program in November 2020. This was a webinar series organised by the Business Innovation and Incubation Centre (BIIC) to draw a bead on the enhancement of skills and knowledge which are essential for inculcating entrepreneurship among young students and staffs. 180 faculty members of MGU-affiliated colleges participated in the Program. The programme introduced the topics such as entrepreneurial competencies of the startup ecosystem, best practices in entrepreneurship, idea generation and preparation of a business plan, social entrepreneurship, technology business incubation, and innovation ecosystem development. Dr. Radhakrishnan E.K., Director of the Business Innovation and Incubation Centre, was the convener of the programme.

Another capacity building programme on research ethics and plagiarism was organized by Dr. Biju Lekshmanan, School of Gandhian Thought and Development Studies, as part of UGC-STRIDE in December



As part of the Transdisciplinary Research Program for India's Developing Economy (STRIDE), MGU recently organised programs to enhance the faculty's expertise in entrepreneurship and research ethics.

2020. The purpose of this training program was to educate researchers and faculties about research ethics, as plagiarism is one of the most virulent violations of academic integrity.

120 participants took part in the programme. The training programme covered subject areas like research ethics and academic integrity, intellectual honesty,

redundant publications, effective scholarly communication, maintain a personal research library with the help of Zotero, and plagiarism detection software.

The UGC-STRIDE office also organised a lecture by renowned sociologist Prof. Joseph Tharamangalam, Mount St. Vincent University, Canada, on "Sociological imagination during COVID-19".



Indian Council of Social Science Research (ICSSR) funds for the study “Impact of Risk Communication on People’s Perceptions of COVID-19: Implications on the State of Kerala”

Dr. Abhilash Babu, Project Co-ordinator

The COVID-19 crisis requires modulations in human behaviour that span various social groups to contain the illness. However, protection against virus through various strategies designed by the government agencies is communicated and received differently across different societies is evident from the available documents in the social media, print media and visual media. As a



result, the effectiveness of risk communication strategies and their outcomes, i.e., public perception of risk, is critical to shaping their behaviour.

The proposed research project studies the perceptions of vulnerable groups in society regarding the disease, its spread and various government-imposed strategies for containing the disease.

Kick-starts Asian Tourism Research Journal

School of Tourism Studies at MGU formally launches the Journal of Asian Tourism Research (JATR) under the aegis of Asian Tourism Research.

The Journal of Asian Tourism Research (JATR) is conceived as an interdisciplinary journal focusing on tourism research and related fields, with a focus on “tourism phenomena in Asia”. Tourism in Asia is shaping the unusual and complex features of economy, human ecology, gender, travel behaviour, society, culture, environment and governance system blending together in a completely new and unique manner. That makes Asian tourism quite different from the rest of the universe. JATR specifically addresses research opportunities across all “Asian tourism contexts” that shape and reshape Asia’s growth. The JATR

provides a forum for researchers to critically examine the context of Asian tourism development. All aspects that have a direct or indirect influence on the tourism industry, society and the environment in Asian destinations and its source markets are the main areas of dialogue.

For guidance on article submission, please contact

Prof. Robinet Jacob

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ASIAN
TOURISM
RESEARCH

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The 1st Asian Tourist Research Conference 2020 Held at MGU

MGU’s School of Tourism Studies hosted the first Asian Tourism Research Conference 2020 from December 1 to 3, 2020, in collaboration with Sunway University, Malaysia. The first Asian Tourism Research Conference (ATRC) is the brainchild of the School of Tourism Studies. The Asian Tourism Research Conference 2020 aimed to explore research into Asian destinations due to the

significant growth and transformation of tourism in Asia, particularly in emerging economies. The event featured 50 scientific papers, five keynote speeches and four expert sessions.

A 30-minute session with representatives from the Philippines, Malaysia and Australia also culminated in the conference. It was attended by 400 delegates from different countries.



The Millennial Asia publishes the latest research article by Dr. Toney K Thomas entitled “Normality of the Complexities of Later Life in Aged Homes”

Dr. Toney K. Thomas from the School of Tourism Studies has been appointed as the Adjunct Professor in Tourism in the Institute of Tourism and Hotel Management, Far Eastern University Philippines effective from 21st January 2021

Dependency on Aged Care Homes is unusually becoming a viable option for elderly couples these days, which is unconventional to the Asian way of life. The perception of the aged care home, perceived as an institution, has gradually shifted over the years and continued to evolve as elderly couples have become more open to this option to ascertain their independence.

Though scholarly researchers have conducted studies on elderly life in aged care homes, there is no evidence of research on elderly couples’ mundane life in aged care homes specifically addressing the complexities of institutional interference in the togetherness, end of life, privacy, sexuality and intimacy of their physical and emotional necessities.

This study employs an in-depth systematic literature review to address the issue and unveils important insights on the body of knowledge. The findings reveal the complexity of elderly couples’ challenges in dealing with institutional interference, as well as the importance of autonomy and privacy.

MGU Receives the Grade A Green Office Award of the Kerala Government

The MGU has made remarkable reforms in environmentally responsible activities on campus as part of the green protocol activities of Haritha Kerala Mission, Government of Kerala.

The University appointed Dr. Mahesh Mohan, an assistant professor in the School of Environmental Sciences, as nodal officer for the Green Protocol.

Dr. Mahesh Mohan regularly runs a variety of green protocol awareness programs for staff and students. Under the green protocol activities, disposable plates and glass were banned and steel plates and glasses were imposed. Solid waste was collected and sorted from its source.

The university has established two collection centres for the collection and storage of plastic



waste and other non-degradable waste.

The Haritha Kerala Mission, the nodal agency of the Government of

Kerala to keep the green protocol in the state, audited all the green protocol activities and recognised MGU as Grade A Green Office.

Skills Development Programmes under the UGC National Skills Qualification Framework

have been Launched

The Directorate for Applied Short-Term Programmes has announced the Skill development programmes (full-time) under the UGC-National Skill Qualification Framework (NSQF) Scheme.



The Directorate of Short-Term Applied Programmes (DASP) of MGU is committed to the development of qualified human resources through short-term applied academic programmes. It is structured with a clear vision to allow takers to be professionally equipped, to take advantage of job opportunities and to realize career

advancement. There are many applied and specialized programs at the University. The programmes offered by DASP intend to be applied and job-oriented in specialised areas and to enhance the skills and competences of candidates for professional excellence. The programs are open to all aspirants, including regular students and professionals, and have no age limitations.

The DASP extended its academic

activities with the start of three full-time degree programs approved by the UGC-NSQF (National Skills Qualifications Framework) for which courses began on 18 January 2021.

For more information about courses & admission, please visit

www.dasp.mgu.ac.in



What is meant by the NSQF?

Prof. Robinet Jacob
Director, DASP

The National Skills Qualifications Framework (NSQF) is a competency-based framework that organizes qualifications according to a series of knowledge, skills and aptitude. The NSQF levels, graded from one to ten, are defined in terms of learning outcomes which the learner must

possess regardless of whether they are obtained through formal, non-formal or informal learning. National Occupational Standards (NOS) are statements of the skills, knowledge and understanding needed for effective performance in a job role and are expressed as outcomes of

competent performance. They list down what an individual performing that task should know and also are able to do.

These standards can form the benchmarks for various education and training programs to match with the job requirements.

MGU is heading for the Country's Largest Solar-Powered University

Ms. Janani C V conducted her MA thesis research under the supervision of Dr. Rajesh Many using analytical frameworks of the university innovation system to understand the MGU's innovation capability in producing green energy. The main

objective of the research was to locate and analyze the feasibility of the development of a fully Solar Photovoltaic university campus at MGU.

The development and promotion of such a sustainable green concept will be an important step toward

transforming the university campus into an energy-efficient and ecologically sustainable community. The annual electricity consumption of the MGU prior to the installation of the solar panel and after the installation of the plant was analysed.



Ms. Janani C V

A survey conducted as part of MA Dissertation by Ms. Janani C V from the School of Gandhian Thought and Development Studies reveals the findings that solar panel set up in the university leading towards sustainable power generation.

According to Janani's research, MGU has installed solar power panel in the year February 2019 from then onwards the power generation through solar has been alive. The electricity generating capacity of the plant is 1600 units/day. The type of solar panel diffused in the university is on-grid. An on-grid system is more attractive than off-grid system. The solar panels installed in the university are "connected" with the Kerala State Electricity Board (KSEB). where all the generated power flow to, the National Grid from its supplies for day-to-day use. For example, if we are installing 1000W plant in the university and the load university requires is only 500W, so the remaining power would flow into the grid. In the event that the university load is 1500W and it generates only 1000W, the 500W required would come from the Electricity Board.

MGU comes under the high-tension consumer that is HT II (A) GENERAL. As it is not like normal

household consumption, the energy produced from the installed solar power station meets the requirement at least up to 50% of conventional energy. The production capacity of the power plant is 1,600 kWh per day. By installing a solar power station at the university, the university benefits in two ways, one by financial means and the other by the environmental aspect. Each year the university gets rebates and an incentive from the KSEB, when compared to off-grid. The on-grid panels do not need batteries or frequent maintenance and the maintenance charge is really lowered when compared to off-grid. This means that the university benefits financially. An average Kilowatt-hour produces just over one pound of Carbon Dioxide (CO₂). We could therefore, assume the average amount of CO₂ emissions from the conventional energy we use. For a solar panel, it produces power directly from the sun. Therefore, there is no carbon emission. Around 4 crores were

spent on the installation of a power plant, which is fully financed by the Rashtriya Uchchar Shiksha Abhiyan (RUSA). MGU with a massive solar grid on a university roof is an easy way to set up a green energy brand and offer an advantage for students to promote sustainability. The green energy innovation system is constituted at MGU through the solar panel installed in the eight buildings - University Library Building, School of Chemical Science, School of Applied Physics, School of Environmental Science, School of Business Management, School of Behavioural science, School of Computer Science, and University Administrative Building. As part of the expansion plan, more buildings on campus are proposed for the installation of solar panels to drive the university towards sustainability.

To find out more about Janani's research, please contact

Ms. Janani C V

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Human Ecological Studies among Indigenous Communities in Attappady Indicates that Traditional Tribal Agroecosystems are Undergoing a Major Shift

The ecologist, Dr. G. Christopher from the Advanced Centre of Environmental Studies and Sustainable Development (ACESSD) finds that the traditional agroecosystems in the Western Ghats of Kerala, especially in the region of Attappady undergoes a significant change due to factors like intense commercial banana cultivation, human-animal conflicts and soil erosion

Attappady valley is a complex landscape of undulating terrain interwoven with human cultures, climatic zones, soil types and associated habitats. The valley is situated north of Palakkad gap in the Western Ghats, between the southern slopes of Nilgiri Biosphere Reserve and Vellingiri hill ranges. The North-western zone adjoining to the Silent Valley National Park gets high rainfall whereas the Southern stretch of Kallamala-Pettikal-Sholayur gets moderate rainfall and one can see its associated vegetation formations and cropping systems. The eastern Attappady is the rain-shadow region and is comparatively drier than the other parts of the valley. Three distinguished tribal community viz. Kurumbar, Irular and Mudugar living in 189 settlements across the valley. Large numbers of Tamil and Malayalam speaking non-tribal migrants are also settled in the valley. As per the 2011 census, the non-tribal population (57%) outnumbered the tribal population.

In the tribal farming systems of Attappady, there are seasonal, annual and perennial crops could be seen. Usually, cultivation of seasonal crops including traditional millets or other crops were planned according to the onset of South-west monsoon in June. Seeds of millets, slope paddy, amaranth, and pigeon pea were sown together. However, Kurumbar sow maize of different varieties starting from January



Attappady in Western Ghats of Kerala.
© Dr. G. Christopher

due to the cool climate in the upper reaches.

In this recent study, the researcher grouped the crops into two major categories, viz. food crops and non-food crops. The food crops include grains, fruits, tuber crops, vegetables, pulses, spices and condiments and oil seeds. Non-food crops include plantation crops like rubber, oil seeds, fibre and other commercial items. The proportion of commercial crops and mono-cultural systems is predominant in all the three tribal agricultural systems. Leasing the land to non-tribals for banana cultivation is increasing. It involves high chemical inputs, pumping of ground water through bore wells, and solar electric fences to protect crops from wild animals. Apart from the socio-cultural impacts among the tribal population, the outcome of such intense commercial cultivation upon the fragile

mountain ecosystems and other associated components is yet to be understood in detail. Natural live fences were the typical traditional form of fence to protect and demarcate large agricultural fields. The live green vegetative fences consists of native trees, shrubs, creepers, herbs and associated fauna. Thus it serves as micro habitats and supplied various kinds of edible and medicinal plants and raw materials for household implements.

The increasing solar electric fences replaced such natural green fences and cause further conflicts. The human-animal conflicts, soil erosion as well as depletion, loss of pollinators, wide presence of exotic earth worms, increasing invasive species and exotic ornamental plants are all the current issues of changing agro-ecosystems in Attappady.



Tribal Agroecosystems of Attappady

Dr G. Christopher, Research Scientist, Advanced Centre of Environmental Studies and Sustainable Development, MGU

An agroecosystem is basically a natural resource system managed by human communities primarily for producing food as well as non-food goods and environmental services. It includes dynamic association of crops, pastures, livestock, flora and fauna, atmosphere, soil, water and so on.

Integration of socio-cultural, economic and ecological factors makes agro-ecosystems complex when compared with natural ecosystems. Accordingly the tribal agro-eco-systems of Attappady has its own peculiarities and complexities based on its inhabitant's cultural and socio-economic diversity. The traditional tribal cultivation of

Attappady is largely millet-based and multi-crop systems with pulses, vegetables and greens. Seasonal as well as prolonged fallows are common phenomena which contributes to pastoral activities and source of diverse wild edibles. It involves less or least external inputs and own as well as community labour.

The produces were largely used for own consumption. In a broad sense the tribal agricultural pattern of Attappady could be classified into shifting cultivation and settled cultivation. The remote, steep and wet slopes of Kurumbar areas of Thodikki, Galasi and Anavai, where some forms of shifting or slash and

burn cultivation is still practiced. However, the Mudugar and largely the Irular settlements of the dry plains practice settled cultivation with millets, pulses, vegetables and also commercial crops like oil seeds and cotton.

The settled cultivation sometimes involved bullocks for plough, hired labour, chemical inputs and sometimes with seeds purchased from outside and linking it directly with market.

To find out more about the research project, please contact

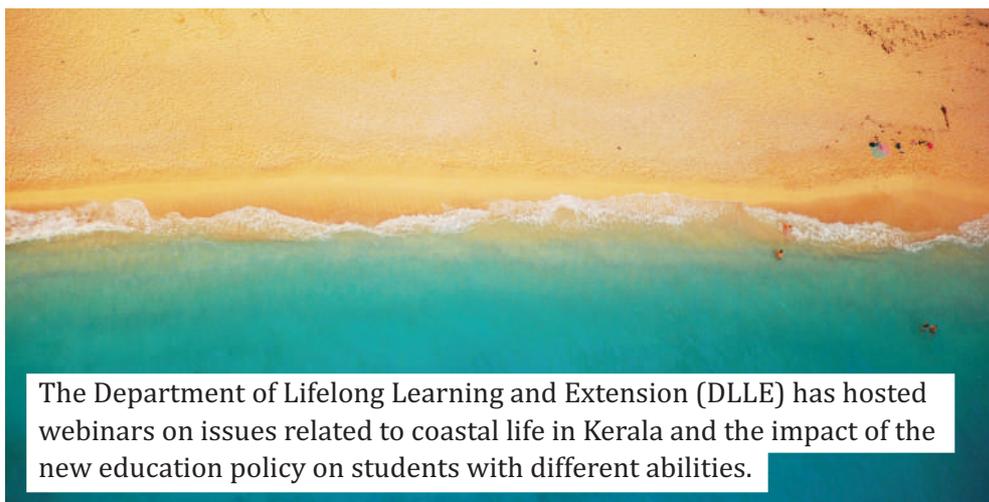
Dr. G. Christopher

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Coastal Life in Kerala:

Issues, Challenges and Alternate Approaches

DLLE is a statutory university department that uses a variety of resources for developmental and lifelong learning. The activities of the department include Gram Vikas Kendra, personality development center, projects and surveys, various short-term courses (weekends) and outreach activities. All academic and extension programs of the department are carried out in strict compliance with the University Regulations and the UGC directives. The department organizes several short courses as weekend programs. The purpose of the classes is to empower ordinary people in society. No formal qualification is required for entry into the organic farming course. For admission to other courses, a Plus Two or equivalent is required. Exams take place after 20 contact classes for the certificate course and 30 for the degree.



The Department of Lifelong Learning and Extension (DLLE) has hosted webinars on issues related to coastal life in Kerala and the impact of the new education policy on students with different abilities.

The DLLE has recently organised a 3-day online conference on issues, challenges and alternative approaches in coastal life in Kerala in collaboration with the Coastal Students Cultural Forum. The conference is part of the documentary film project "Kaiviralthumpil Kan-

nullavar" (financed by the Government of Kerala) that will be released in March 2021.

The Department also hosted another webinar on the impact of the 2020 National Education Policy on the education of students with different capacities.

Studies AI and Robotics in Companies and Their Impact on Sustainable Growth and Profitability

The School of Management and Business Studies (SMBS) announces the upcoming ICSSR sponsored national seminar on "Artificial Intelligence and Robotics in Business Organisations: A New Era for Sustainable Growth and Profitability (NSAIRBO 2021)" during April 7-8, 2021

As a continuation to the previously held webinar on the topic "Reinventing Enterprises with Artificial Intelligence" in 19th November 2020, the SMBS organizes an upcoming ICSSR sponsored national seminar on "Artificial Intelligence and Robotics in Business Organizations: A New Era for Sustainable Growth and Profitability (NSAIRBO 2021)" in April, 2021. All interested participants must submit a 300-word abstract by February 15, 2021. All submissions will be reviewed and the authors of the



accepted abstracts will be required to submit the complete paper

(between 3,000 and 5,000 words) no later than February 28.

Explains How Ethnography Matters for Social Science Research



Prof. Sanal Mohan, School of Social Sciences, MGU

In connection with the Human Geography Lecture Series at the IUCSSRE, Prof. P. Sanal Mohan of the School of Social Sciences delivered a thoughtful talk on the significance of Ethnography in social science research

Ethnography is viewed as "an emergent disciplinary phenomenon". In disciplines where culture has assumed significance, ethnographic practices have become indispensable. Ethnography in its various dimensions has become defining element of academic enquiries. Some of these fields are, historical ethnography, cultural poetics, cultural criticism, and the analysis of everyday life, among others. Culture has become a significant

component in all these discussions. In Indian social sciences, particularly in social anthropology, field work oriented research became very important. Ethnography deals with culture as constructed and often treats it as a contested terrain. Obviously it has dimensions of power involved in it. A critical understanding that ethnography provides would enable us to disentangle culture from the fetishized position bordering religious in

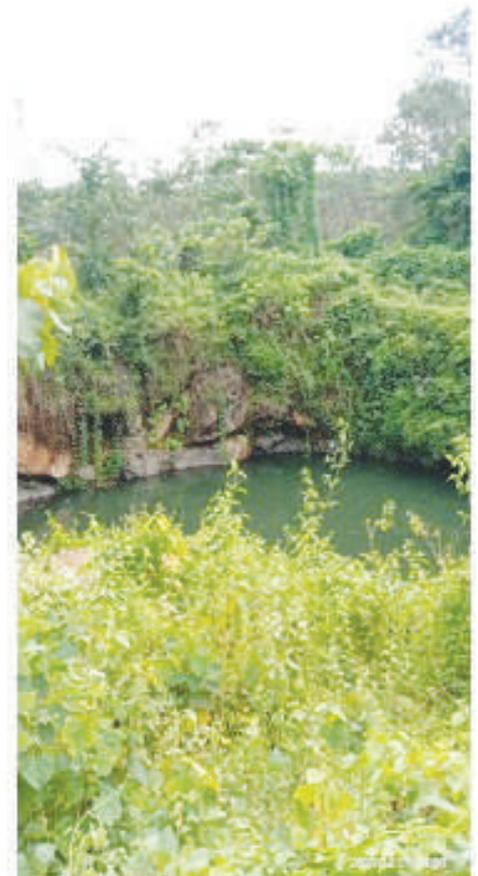
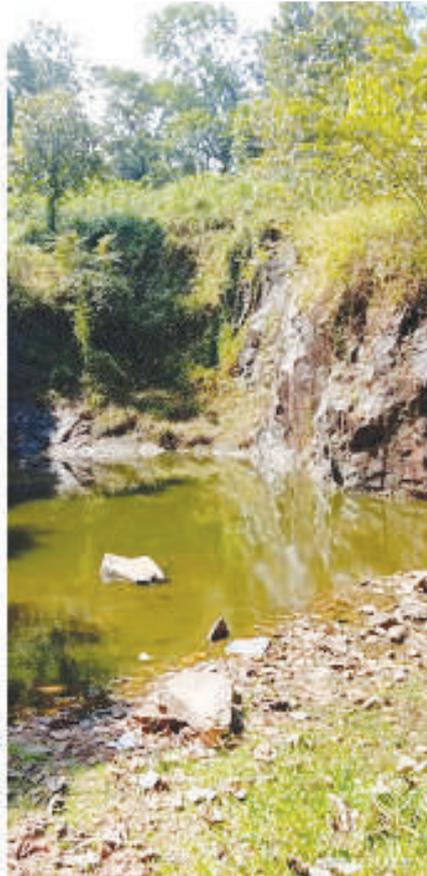
contemporary discourses in India. Therefore, it is important to understand culture as something that evolves out of the everyday practices of human beings and not something divinely ordained. We also need to examine knowledge production as developing out of the everyday practices of human beings. Prof. Sanal Mohan also spoke about subjects related to 'subaltern studies and alternative histories' and 'archive and the historian'.

Instigated a Project to Map the Spatial Distribution of Rock Quarries in Ernakulam, Kottayam and Idukki Districts of Kerala

MGU's School of Environmental Sciences (SES) has launched a quarries mapping project in Kerala with funding from the Department of Environment and Climate Change (DoECC), Government of Kerala. Dr. Baiju K.R and Dr. Mahesh Mohan from SES received funding of ₹ 30,17,200 to deliver the project.



Fieldwork Locations
© Dr. Baiju K.R and Dr. Mahesh Mohan



The quality of the environment is an important direct and indirect contributor to human health. Rock quarrying is a major issue of business organization; so it destroys the environment in many ways viz., damage to landscapes, traffic, smoke, noise, dust, loss of land, deterioration in water quality, etc. But no much work has been performed along the quantification

or the detailed impacts in the ecology due to quarrying. In the current scenario of increasing natural risks such as landslides and floods in the state of Kerala, the issue has come to be a critical concern.

In this context the Directorate of Environment and Climate Change (DoECC), Government of Kerala has initiated the mapping of the quarries

in the Kerala State.

Within the framework of the project, the School of Environmental Sciences, MGU maps the districts of Ernakulam, Kottayam and Idukki. Work has been underway since November 2020.3 JFRs, 4 technical assistants and 1 GIS expert are employed in the project.

Project's Targets

Development of a comprehensive geospatial database on granite quarries and other crystalline

(abandoned and functional) rocks. To assess the quarry area, applying GIS techniques and field survey and to prepare a base map which consist of quarry proximity with respect to lineament, habitation,

natural drainage, dams and other water bodies, roads, previous landslide etc. Propose an environmental restoration/management plan for unused/abandoned quarries.

MGU initiates eco-restoration programmes with the support of the Forestry Department, the Government of Kerala and the United Nations Development Programme

The UN General Assembly declared 2021-2030 the UN Decade for Ecosystem Restoration. This primarily targets the restoration of degraded and destroyed ecosystems as a proven measure to combat the climate crisis and improve food security, water supply and biodiversity. On this basis, the School of Environmental Sciences at Mahatma Gandhi University has launched eco-restoration programmes in association with the Kerala government's forest department and United Nations Development Programme. The restoration of the degraded riparian forest of the



Chalakkudy River was carried out by the School with financial support from UNDP.

Dr. Mahesh Mohan of the School of Environmental Sciences is heading up the project.

Miyawaki Reforestation Program Begins on the MGU PD Hills Campus

With the support of the Environment and Climate Change Directorate, Government of Kerala, MGU began the Miyawaki afforestation program on the PD Hills campus.

The natural forest cycle is succeeded by perennial grass, herbs and shrubs which are tolerant to sunlight, light demanding as well as fast growing trees, shade loving shrubs and trees, and finally natural forests which will take centuries or more. There are two stages in the current forest reforestation programmes. Planting of one or more species at the start of succession. Once these species are successfully established, they are gradually replaced by intermediary species, either naturally or by planting. This attempts to stimulate the natural process of ecological succession with the aid of various silvicultural practices and normally takes a lot of time.

The increased rate of urbanisation



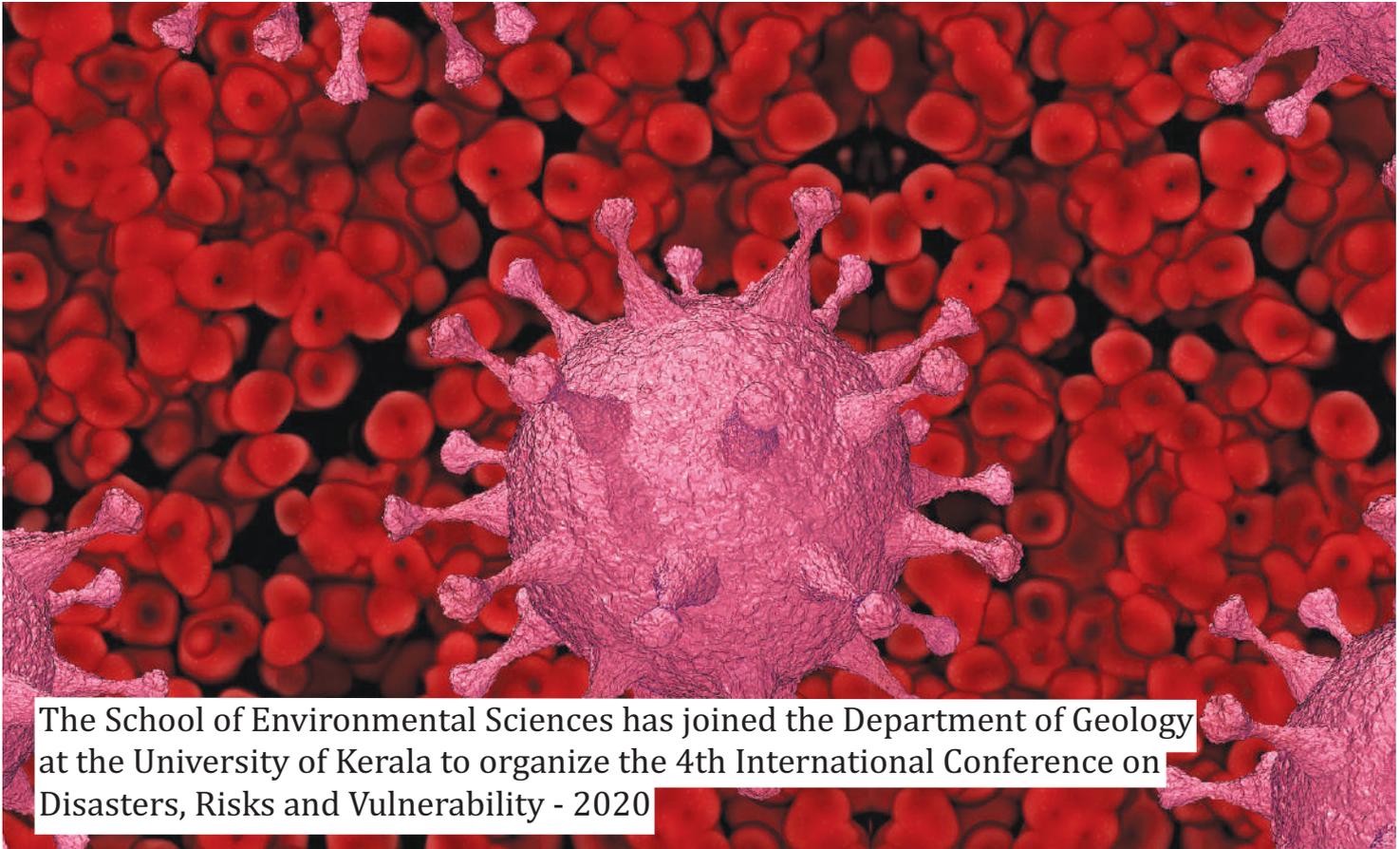
and industrialisation, the improvement of reforestation technique needs to address the current scenario. One reliable forest restoration method is 'native forest by native trees', based on the vegetation-ecological theories by Prof. Akira Miyawaki. The Miyawaki method involves the surveying of potential natural vegetation, recovering top soil and vegetational succession.

Dr Mahesh Mohan is leading the initiative. Now, the University plans to implement projects at affiliated colleges by providing technical support.

To learn more, please contact

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The 4th Disaster Risk and Vulnerability Conference was hosted by MGU



The School of Environmental Sciences has joined the Department of Geology at the University of Kerala to organize the 4th International Conference on Disasters, Risks and Vulnerability - 2020

The world has witnessed a series of catastrophes during the intervening period and displacement. Migration and humanitarian crises are now the most devastating disasters. Each disaster brings upon us the heavy task of carrying out an autopsy, and inevitably the harsh reality of the lessons that are not learned becomes obvious. In this context, the School of Environmental Sciences has organized the Conference on Disasters, Risks and Vulnerability (DRVC) since 2011. The conference gains importance as avenues where practitioners from various fields that touch upon disasters could occur together and listen to each other, share ideas and experiences and talk about possible success stories that could be duplicated elsewhere. The

papers presented in the conference range from those using technology to tackle disasters or mitigate their effects to those that look at post disaster interventions using GIS-based disaster management. In the current COVID-19 scenario, the conference was held virtually. The conference was in continuation of the successful Disaster, Risk and Vulnerability conferences conducted in 2011, 2014, and 2017 at the School of Environmental Sciences and Department of Geology, University of Kerala.

Leading scientists from around the world have given keynote speeches. Some of the stalwarts of the conference were Dr. Surya Prakash, Head GMR Division, National Institute of Disaster Management (NIDM), Ministry of Home Affairs, Govern-

ment of India; Dr. Girish Gopinath Associate Professor, Department of Remote Sensing and GIS Kerala University of Fisheries and Ocean Studies; Dr. Shibu K Mani Associate Professor, Christ University, Bangalore; Dr. Rupert Allan, Humanitarian and Open Street Map Team; Dr. Edbert Brian Hsu Associate Professor & Director, Critical Event Preparedness and Response, John Hopkins University, Maryland USA; Prof. Dr. Franz-Josef Behr, Stuttgart Technology University of Applied Sciences, Germany; Dr. Sunil P. S, Associate Professor Cochin University of Science and Technology, Kochi. Presentations from scholars and students from around the world were also a major attraction of the conference. The full conference presentations were

compiled in a report volume and are published by MGU. The event of DRVC 2020, materialized from the generous support and sponsorship from, the Kerala State

Disaster Management Authority (KSDMA); Applied Geoinformatics for Society and Environment (AGSE), Germany; The Advanced Centre of Environmental Studies

and Sustainable Development (ACESSD), Mahatma Gandhi University; and Centre for Humanitarian Action and Emergency Response Training (CHAERT), Kerala.



Mr. Mahesh Mohan published a research paper titled “Restoring Degraded Riparian Forest Ecosystems of the Western Ghats for Ecological Sustainability” in the Journal of Restoration Ecology

The Riparian Ecosystems of the Western Ghats are highly diversified tropical forest ecosystems. The synergic effect of various threats may adversely affect and reduce the capacity of these Riparian Ecosystems to resilience, even though they have specific adaptations for living in extreme conditions. These diversity-rich Riparian Ecosystems provide critical ecological services

such as influencing environmental processes, acting as habitats for both terrestrial and aquatic biota, and supporting the livelihood of the surrounding community. Hence the restoration of such damaged ecosystems is highly significant. This article presents a scheme for sustainable restoration of the disturbed Riparian Ecosystems with the involvement of multi-stakeholders. The three-stage

scheme ensures the support and livelihood of the local community, along with the ecological restoration of Riparian Ecosystems using nature-based solutions with a scientific approach. The restoration will enhance the ecosystem services, climate change adaptations, and resilience, as well as the carbon sequestration capacity of the tropical region.

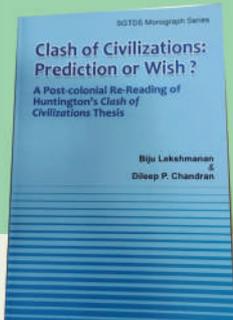


Dr. Binu P, from the School of Environmental Sciences, received postdoctoral scholarship from the Czech Academy of Sciences

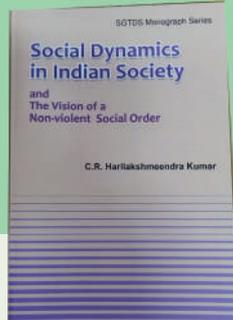
Dr. Binu P was selected as a postdoctoral fellow at the Bone Molecular Physiology Laboratory, Physiology Research Institute, Czech Academy of Sciences, Prague, Czech Republic. She completed her Doctor's degree under the

supervision of Prof. Harikumar Nair, Professor, School of Biosciences, MGU. Currently, Dr. Binu is a postdoctoral fellow with the School of Environmental Sciences under the supervision of Dr. Mahesh Mohan.

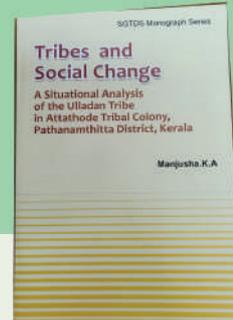
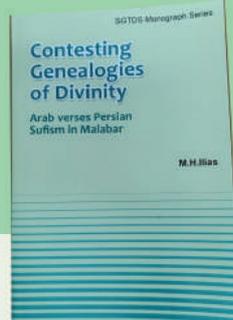
SGTDS Codifies its Internal Scholarly Works into a Series of Monographs



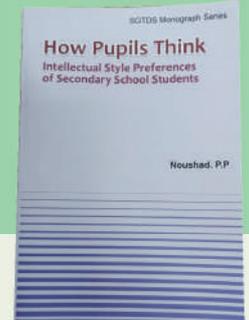
The School of Gandhian Thought and Development Studies (SGTDS) brings together the results of their faculty research in a series of monographs.



The first series of monographs focuses on themes such as the historical analysis of Arabic and Sufism in the Malabar region of Kerala, societal changes in tribal



communities, intellectual style preferences of school students, non-violent social order in Indian society, and clash of civilisations.



Writing Self and Narrativizing Performance

Dr. Rajesh Komath of the School of Social Sciences, MGU, gave a lecture on “Writing Self and Narrativizing Performance” during the Human Geography Lecture Series at IUCSSRE

The talk was on an auto-ethnographic mode of writing culture putting self in context. The researcher, as a traditional performer of Theyyam, a ritual folk form from the north of Malabar, told his story of life becoming the god and goddesses of the villages. This narrative itself deals with the secret art of performance and its socio-poetics. The self is an epistemological perspective which has been systematically introspective and written on.

This written text, in turn, becomes a narrative text of the performance or to be like god and goddesses of the people. There are three preconditions for writing about oneself with respect to others.

- Complete member of the community one wishes to study,
- the consistent and continuous presence or visibility of the self in the created ethnographic account,
- researcher should be well-informed about the social theoretical concerns within the social sciences. With these aspects in mind, Dr. Rajesh Komath told his life story as an active dancer of the Theyyam that brought out the following points.

The Theyyam as a folk genre and performance is the creative and the ritual invocation of the people who

had been killed and silenced by the hegemonic structures of social power.

The life of the Theyyam performer as a vulnerable social being living on the margins of society as an untouchable body expresses his own vulnerable life putting the life of the persons, male and female who had been killed and subjected to social atrocity, humiliation and exploitation. Thus, the Theyyam is a creative and ritual expression of dissent and resistance of the oppressed.

The energy of the performer to articulate these lives in the form of dance, songs and possessed state of mind comes from this social isolation of the dramatis personae memorialised as the Theyyam. The dancer impersonates his past as the text while society looks on the performance of the performer.

Even before social reformers critique unequal caste order and the injustices inflicted upon lower castes and classes, the Theyyam like



Dr. Rajesh Komath as a Theyyam performer.
© Dr. Rajesh Komath

Pottan has questioned the irrelevance of caste hierarchy. It has negated the hegemony of the Vedic tradition in the expressive mode of the Theyyam.

Thus, the Theyyam or the self of the dancer is a story of the failed people who stood against social inequalities and injustices. Therefore, this mode of writing self is, in a way, writing culture and society.

The mythical narrations of the Theyyam and its subaltern critical standpoint as the politics of the performance have never been able to separate in its cultural geography of north Malabar.

To learn more,
please contact

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Smt. Manjusha K A from School of Gandhian Thought and Development Studies, submits the research report titled “Human Rights and Tribal Development: A Comparative Study on the Malai Pandaram Tribe of Pathanamthitta and Kollam Districts in Kerala” to the Indian Council of Social Science Research

Tribals remain excluded from the benefits of the Kerala development model. The Malai Pantaram tribes from the Pathanamthitta and Kollam districts were socially excluded. It is extremely regrettable that the number of scholarly studies relating to the tribes of Malai Pantaram is very small. In light of this, the research of said Malai Pantaram Tribe is an urgent necessity to disseminate the exclusion of the tribes of the Malai Pantaram. There are 37 tribal groups in Kerala spread over various districts and each tribe is unique in its features and characteristics. Each tribal group is a

religion in itself and has its own traditions. The custom will cease with conversion to any religion. Their rights are violated by a lack of basic amenities, unawareness of their rights, undesirable state intervention and public exploitation, discrimination in the workplace and educational institutions, distorted cases by the authorities, vigorous Malayalam teaching and ignorance of their folklore, indigenous medicine and language. State, activists, political parties, scholars, business houses, and scientists as a whole should come forward to solve the problem of the right of the tribe to

live comfortably in accordance with their life will. Prior to developing policies and programs for tribes, the government must change its mindset and include them. The tribes of Malai Pantaram struggle hard to live in peace. They know that they have been exposed to abuse and exclusion, but this exploitation is crucial for them to accept and others see it as part of the socialization process.

If you would like more information about the study, please contact

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Molecular Taxonomy: PCR Workshop

Given the emerging significance and scope of the application of PCR in molecular taxonomy, ACESSD conducted a three-day practical workshop on PCR techniques and its advanced application in molecular taxonomy. Participants included PG students, researchers and entry-level teachers. The experts demonstrated the techniques and interacted efficiently with the participants.

Being one of the largest earthworm repositories in India, the earthworm research wing of ACESSD conducted this workshop as a new beginning in the pitch of earthworm molecular taxonomy, encouraged the budding researchers and students to explore some of the exciting possibilities offered by PCR application in genomic level identification of earthworms.



The Data Science Conference

Convened at MGU

The School of Computer Science hosted an international webinar on data science: connecting methodologies and tools to application-based research and innovation on November 27, 2020

AI in Model Calibration and Prediction of Cancer cells

Dr. Mabel, Technical University of Munich, Germany
Dr. Pankaj Moses, Valtech Innovations Lab, Denmark



Data science is a part of computational Science integrated with statistics, computing technology and artificial intelligence. It is a relatively new emerging multi-disciplinary area undergoing deep and serious research on intelligence. This field of research produces innovative value added products beneficial to the development of society from the data itself. One of the keynote speakers Dr. Pankaj Moses, Senior scientist, Valtech Innovations lab, Denmark, pointed out the importance of increasing the research potential in

the application of AI in various medical related problem solving such as Model Calibration and Prediction of Cancer cells, Autonomous Driving using Video Mining, Sensor Fusion with GPS and Cloud. He also provided information on various e-resources for acquiring Big-data sets for innovative research in various AI related domains. Dr. Mabel the second speaker, Post Doctoral Fellow (Laura Bassi) at the Chair of Numerical Analysis, Technical University of Munich, Germany presented the mathematical background of the Model

Calibration and Prediction of Cancer cells, Autonomous Driving using Video Mining. She said that our students have to fruitfully utilize the opportunities globally available. She provided information on the opportunities in Northeastern's programmes and international education that promoted global research, teaching and learning which results in developing globally-minded individuals. They also extended the possibilities of collaborative research and student exchange programmes by providing research level internships.



Wins an Award for Best Paper on Satellite Imagery

Mr. Jyothish V. R. and **Ms. Greeshma M S**
 School of computer sciences

The research paper "An Integrated Approach for Building Footprint Extraction from Satellite Imagery" authored by Jyothish V. R., Greeshma M S and Bindu V R, bagged the Best Paper award in 4th International Conference on Intelligent Computing & Communication. It was organised by the Engineering School at Dayananda Sagar Univer-

sity, Bengaluru. This work provides an innovative and efficient algorithm for extracting the building footprint from satellite imagery. The proposed hybrid approach formulates the building pixels in an efficient way, exploiting eccentricity parameter, in order to extract the exact shape of buildings and includes superpixel generation

and parameterization such as axis ratio, eccentricity, color and segment area which have been used to extract the true building footprint. The qualitative and quantitative evaluations demonstrated the effectiveness of the proposed algorithm relative to other existing methods in terms of accuracy, completeness and measure F-measure.

Publication Updates from School of Computer Sciences



Greeshma, M. S., & Bindu, V. R. (2020). Super-resolution Quality Criterion (SRQC): a super-resolution image quality assessment metric. *Multimedia Tools and Applications*, 79(47), 35125-35146.

Recently, image super-resolution has reinforced image resolution enhancement approaches in real-time and ensuring visual quality of super resolved images has evolved as a key research problem. Most quantitative benchmarks rely on full reference metrics which would work in the presence of a reference image. However, the unavailability of ground truth images in real world applications and the size constraints of low resolution and high resolution images often pose major challenges to such metrics. In order to address these problems, this

work proposes a super-resolution image quality index (SRQC – Super-resolution Quality Criterion), which can effectively quantify the efficiency and performance of image super-resolution algorithms. SRQC benchmark evaluates the quality score of a super resolved image according to the perceptual concepts of low-level spatial features in high sharpness space and curvelet based quality-aware features from focal energy bands, which can be used to capture the quality preservation of an SR image. The proposed metric is reference-

less, the significance being that the assessment does not require ground-truth image. Explicitly, the SR image is assessed in the curvelet domain which is suitable for the no-reference super-resolution image quality assessment based on human perception. Experimental scores illustrate that the SRQC is more competent in modeling the features from curvelet transform, thus quantifying the quality score of the super resolved image and outperforming the formerly reported image quality assessment metrics.

Jyothish V. R, Bindu V. R, Greeshma M. S (2020). An Integrated Approach for Building Footprint Extraction from Satellite Imagery, Lecture Notes in Computer Science, Springer (in Press)

Satellite imaging has numerous applications in several fields such as urban planning, disaster detection and recovery, agriculture development, 3D GIS and many more. One of the major challenges of satellite imaging is to extract the building footprints that are vital for disaster planning and recovery. Existing algorithms retain quantitative scores; however, they fail to preserve the shape of building footprint. To address this problem, a

building footprint extraction algorithm from satellite images is proposed; the objective is to formulate the building pixels in an efficient way, exploiting eccentricity parameter, in order to extract the exact shape of buildings. The proposed hybrid approach comprises of superpixel generation and parameterization such as axis ratio, eccentricity, color and segment area which have been used to extract the true building footprint.

The qualitative and quantitative evaluations demonstrate that the proposed algorithm can extract the building footprint more efficiently over other existing methods, in terms of correctness, completeness and F-measure. In addition, the dice similarity coefficients of extracted building footprints are evaluated, which shows the influence of color parameter for effective extraction providing better results.

Linz Tom, Bindu V. R. (2020). Dynamic Time Slice Task Scheduling in Cloud Computing, Lecture Notes in Networks and Systems – Springer (in Press)

Task scheduling is an integral part of cloud computing. The dynamic nature of cloud systems imposes great difficulty in scheduling tasks. There exists a wide variety of scheduling

algorithms and parameters to be optimized. It is hard to find an optimal solution because of the conflicting property of the metrics. In this work, a dynamic time-slicing of

round robin is proposed and compared with First come First Served and Round Robin. By this method average waiting time and number of context switches are reduced.

Krishna Presannakumar, Anuj Mohamed (2020). An Enhanced Method for Review Mining Using N-gram Approaches, Advances in Intelligent Systems and Computing, Springer (in Press)

In the current scenario when a person wants to purchase a product, they try to discover information concerning the product. For finding such information, they use reviews about the products on the internet. This information always influences the purchase of products. The proposed work introduces a method for the classification of reviews

using the relevant aspects of the product. The novelty of the work lies in exploiting the combination of higher level N-approach for finding the relevant aspects from the product reviews. The most commonly used unigram approach fails to provide adequate accuracy when the dataset is very large. Proposed work uses a higher level of

N-gram, a combination of unigram, bigram, and trigram for the extraction of relevant aspects from the reviews. The proposed method also calculates the polarity score of emoji's in the review for the classification. The experimental analysis shows that the proposed method is better in terms of accuracy and execution time.

Shahna K.U., Anuj Mohamed (2020). A Novel Image Encryption Technique Using Multiple One Dimensional Chaotic Map, Advances in Intelligent Systems and Computing, Springer (in Press)

In cryptography, chaotic systems are commonly used for image encryption due to the complex properties of chaos such as sensitivity to initial conditions, unpredictability, and ergodicity. An image encryption method using a one-dimensional chaotic map and Josephus permutation sequence is depicted in this paper. Double

scrambling is carried out in the pixel permutation process to enhance security. Josephus permutation sequence is used for first-level scrambling.

For the second level of scrambling, a novel method is implemented using the keystream generated from a chaotic Tent map.

The keystreams generated from the

Logistic map are used in the diffusion phase. Multiple one-dimensional chaotic maps are used to generate strong keys in the encryption and decryption process. Experimental results and security analysis show that the proposed encryption scheme can resist various attacks and ensure high security.

Bineesh Jose, Pushpalatha K P (2020). Intelligent Handwritten Character Recognition for Malayalam Scripts Using Deep Learning Approach, Annual International Conference on Emerging Research Areas, IOP Science: Materials Science and Engineering, (ISSN:1757-8981E-ISSN:1757-899X-SCOPUS), Proceedings - ISBN: 978-93-5426-381-1.

Machine Learning, especially Deep Learning has been incorporated into Pattern Recognition and Image Processing for the Handwritten Character Recognition (HCR) research which is always a hot area of research. Foreign scripts are enriched with Handwritten

Character Recognition (HCR) studies. But very less research can be seen for HCR in Indian scenario, especially in Malayalam script. This paper provides an overview of different feature extraction and classification techniques used for Handwritten Character Recognition

of Malayalam Scripts using Deep Learning Approaches. This work identifies the latest major research works using Deep Learning Approaches on feature extraction and classification techniques used for Handwritten Character Recognition of Malayalam Scripts.



Sexual Health and Hygiene of Persons with Intellectual Disabilities

Dr. P T Baburaj

Hon. Director, Inter University Centre for Disability Studies

Inter University Centre for Disability Studies (IUCDS) at MGU conducts research in disability and rehabilitation studies.

IUCDS emphasizes a holistic approach to the total rehabilitation of people with disabilities and

promotes research and extension activities in the main areas of disability.

As part of this initiative, IUCDS has recently conducted several webinars and training programmes on topics such as 'Dis-

ability Inclusive Disaster Risk Reduction'; 'Sexual Health and Hygiene of Persons with Intellectual Disabilities'; 'Autism Management in Ayurveda'; and 'Child Centric Disaster Risk Reduction';

From Invisible to Visible: Female Workforce in Kerala Model of Covid Resistance



The School of Indian Legal Thought (SILT) of the MGU organised a round table discussion on the role of the female workforce and its contribution to building the internationally recognized Kerala model of COVID-19 resistance

The work participation and contribution of female workforce is historically being undermined in a patriarchal social structure. There have been struggles from different social movements of women and policy and legislative initiatives to address this invisibilisation of female workforce or gendering of workforce, especially in the post globalisation era.

During the Covid 19 pandemic has witnessed and experienced a unique moment by acknowledging active participation and leadership of women in fighting the virus, which is hardly explored through academic interventions. In this context, School of Indian Legal Thought, Mahatma Gandhi University initiates the discussion on the topic of female workforce and their contribution in building the globally acclaimed “Kerala Model” of resistance against the Covid 19. This round table

discussion intends to amplify and listening the voices of women from different streams of working women, who acted in the key roles to aggressive testing, tracing and quarantining in the process of preventing the pandemic in its unique own ways with all limitations. The active roles of women from the health minister to the 26,000 ASHA workers (accredited social health activists) across the state on the ground; they are the frontal warriors in this fight, many of the studies reiterated. Apart from the health minister, in the key roles- both the director of health services (DHS) and the director of medical education (DME) are women. Out of 14 district medical officers (DMOs) in the state, 11 are women.

Female doctors in the state health services outnumber the men (65:35) and this has been the trend for nearly two decades.

Similarly, the number of female medical students in the state is more than double the number of male students. When it comes to nurses and paramedics, there is total domination by women. All of them have joined hands in the fight against Covid-19. The gender factor becomes more prominent down the ladder. Thousands of nurses, junior health inspectors (JHIs), junior public health nurses (JPHNs) and ASHA workers are tied down by their gendered roles but are still putting up a brave fight.

The leading role of local self-governments along with 25 lakh active Kudumbashree members helped to contain the spread in several ways such as to promote the Break the Chain campaign and responsible for running community kitchens across the state that ensured that no one went hungry during lockdown.

SILT organized a National Colloquium titled “Why are farmers agitated about the three farm laws by the Union Government?”



Participants: Prof.D.Narasimha Reddy, Dean School of Social Sciences (Rtd) University of Hyderabad, Chaired by Prof.T.Haque, Distinguished Faculty, Council for Social Development, New Delhi, Response by Siddik Rabiyyath, Director, Inter university centre for Alternative Economics

At a time of an unprecedented agitation by farmers across the country and particularly around the nation’s capital, SILT organises a national colloquium to discuss the issues of legal reform and agricultural policy. Colloquium propose that the Indian government should repeal the recent Farm Acts which are not in the best interests of

the small and marginal farmers of the country, and about which a broad section of farmer organizations have raised very critical objections. The improvements and changes are required in the agricultural marketing system for the benefit of millions of small farmers, but the reforms brought by these Acts do not serve

that purpose. They are based on wrong assumptions and claims about why farmers are unable to get remunerative prices, about farmers not having freedom to sell wherever they like under the previously existing laws, and about regulated markets not being in the farmers’ interests.



SILT Decodes the Indian Farm Laws 2020

The School of Indian Legal Thought organized a lecture by Dr. Jacob Joseph from the National University of Advanced Legal Studies (NUALS) on the important and timely topic “Decoding Indian Agricultural Laws 2020”

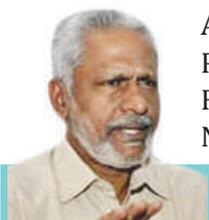
Making a Central Act which overrides and undermines the role of state government in regulating agricultural markets is a flawed approach, both from the point of view of Centre-State power balance and also from that of the farmers’ interests. State government machinery is much more accessible and accountable to farmers, right down to the village level, and hence state regulation of markets is more

appropriate than bringing a large part of commodity sales and trade under the ambit of the central govt Act, by establishing “trade areas”. As per the Ministry of Agriculture in July 2019, more than 20 states had already amended their APMC Acts to allow for private mandis, e-trading, electronic payments, e-NAM, etc, with all of them functioning under the regulation of the state government. For any such

reforms or new mechanisms to succeed, there has to be a buy-in from all the stakeholders in the market including farmers, traders, commission agents, etc, and this process can be handled with more sensitivity and responsiveness to local realities by the state government, rather than through a drastic and blanket legislative change at the Central level.

Updates on recent academic activities within SILT

National webinars about the concepts and principles of Administrative Law



An Introduction to Administrative Law, Prof.Jayakumar, 17th October 2020, Former Vice Chancellor, NUALS



Public Administration and Rule of Law – Relevance of Administrative Law , Prof. K.C.Sunny 19th October 2020, Vice Chancellor, NUALS

Frontiers in Nanoscience and Nanotechnology or Material Science - For a Better World!

International and Inter University Centre for Nanoscience and Nanotechnology (IIUCNN) along with the emerging School of Nanoscience and Nanotechnology (SNSNT) and School of Pure and Applied Physics (SPAP) at MGU, organised two sets of international webinars on the theme 'Frontiers in Nanoscience and Nanotechnology or Material Science- For a Better World'

The first series of webinar on the topic of 'Frontiers in Nanoscience and Nanotechnology or Material Science' brought marquee of the subject together on a virtual platform to discuss about the promising research trends, challenges, proposed solutions etc., in order to meet the growing needs and securities of current fast paced human development.

The meeting took place over the month of November, 4-10, 2020. Prof. Antoine Rudolphe from University of Lyon, France; Dr. Muhammad Y. B Bashouti from Ben Gurion University of Negev, Israel; Prof. Parasuraman Padmanabhan from Nanyang Technological University, Singapore; Prof. M. R. Anantharaman

from Cochin University of Science and Technology, India; Dr. Swastika Banerjee from University of San Diego, USA; and Dr. Rana Saha from Max Plank University, Germany were the resource persons for this series.

The second round of discussions on this topic was held throughout the month of January, from January 6 to 27, 2021.

In the conference series, Dr. K. P. Jayachandran from University of Lisbon, Portugal; Dr. Brahmanada Chakraborty from Bhabha Atomic Research Centre (BARC), India; Prof. Alex Schechter from Ariel University, Israel; Prof. Murukeshan Vadakke Matham from Nanyang Technological University, Singapore were the resource persons.

Publishes Breakthrough Research into Electromagnetic Pollution



Mr. Avinash R Pai, a researcher with the International and Inter University Center for Nanoscience and Nanotechnology, recently published his research findings in Carbohydrate Polymers (IF:7.18), Elsevier Journal. It was called Ultrafast heat dissipating aerogels derived from polyaniline anchored cellulose nanofibers as sustainable microwave absorbers. This work includes the use of sustainable vegetable-based cellulose nanofibre aerosols to suppress electromagnetic (EM) pollution. These biodegradable aerosols are extremely lightweight and may absorb 95% of excess EM radiation from electronic gadgets such as mobile phones, Wi-Fi and microwave ovens, etc.



Publishes the Results of a Joint Project with MRF Tyres on the Rubber Industry

Ms. Abitha V K, Senior Research Fellow, School of Chemical Sciences, MGU

Ms. Abitha V. K is a senior researcher working under the leadership of Prof. Sabu Thomas. She has written extensively in refereed journals and is currently the editor of several books. She recently published the paper "Carbon black distribution in natural rubber or butadiene rubber blend composites: Distribution driven by

morphology" in Composites Science and Technology (Elsevier, Impact Factor 7.094). In this work one of the difficult problems in the rubber industry, partitioning of the carbon black filling agent used in rubber blends was analyzed. Morphological partitioning of fillers into rubber-rubber blends is seldom performed. The morphological

partitioning of CB into rubber mixtures can be applied to the tyre industry as it will determine the end-use properties of the product. Consequently, the manuscript clearly deals with the concept of morphological partitioning of CB fillers in natural rubber or butadiene blends. Abitha was a student in the joint MRF tyre collaboration project.

BIIC Strengthens Its Entrepreneurial Ecosystem

To enhance MGU's entrepreneurial activities, the Business Innovation and Incubation Centre (BIIC) signs various MoUs with organisations such as the Farmers' Society; Kerala Agri Development and Sustainable Producer Company Limited (KADS-PCL); Agro Bio-Tech Research Centre Ltd (ABTEC); and

the National Institute for Entrepreneurship and Food Technology Management (NIFTEM). It has also mediated the filing of 22 University patent applications, which are currently being examined. Based on its academic leads, MGU has also been funded for 15 crore from the RUSA for the development of ecosystem for the innovation and

startups. The implementation of this initiative is carried out through the MGU Innovation Foundation, the Section 8 company registered by the University.

The MGU Innovation Foundation is in the process of setting up the infrastructure for innovation and startups in mobile applications and Nanotechnology.



Why did BIIC start at the University?

Dr. Radhakrishnan E K, Director, Business Innovation and Incubation Centre (BIIC)

The Business Innovation and Incubation Centre (BIIC) was set up in 2016 to promote innovation and entrepreneurship culture among students. BIIC offers administrative, academic, technical and IP support to innovators as well as an industrial exhibition in association with the Confederation of Indian Industry (CII). BIIC emerged as a smooth catalyst in converting the university's contributions to commercialization as well as the cre-

ation of entrepreneurs. The Centre was set up with a seed capital of one crore from the government of Kerala and is the first of its kind initiated by the state to promote a culture of invention and entrepreneurship among students. BIIC works with innovators to commercialize their business ideas and concepts. BIIC has already supported 121 student start-ups, submitted 22 patents and issued 1 patent. The BIIC is currently incubating 5 startups, 4 of which are

bio-startups. The Centre, in collaboration with an industrial mentor, AgriBiotech Research Center Limited, has developed a bio-nano product for the agricultural application known as "NANO POWER". It acts as an immunoelector for developing immunity against various fungal phytopathogens in plants. Over the past two years, BIIC has registered 4 partnerships and 1 company to develop various products.



MGU Alumnus Receives the Shanti Swarup Bhatnagar Prize-2020 in Chemical Sciences

The faculties of the School of Chemical Sciences congratulate their former Prof. Subi Jacob George, the recipient of Shanti Swarup Bhatnagar Prize-2020 in Chemical Sciences

An online meeting was organised to felicitate Prof. Subi Jacob George, recipient of Shanti Swarup Bhatnagar Prize 2020 in Chemical Sciences, who is an alumnus of the School of Chemical Sciences, MGU, on 14th October 2020. Pro-Vice Chancellor Prof. C.T Aravindakumar

made the welcome address. Introductory remarks were given by the Vice-Chancellor Prof. Sabu Thomas. Prof. V.N. Rajasekharan Pillai, Vice Chancellor, Somaiya Vidyavihar University, Mumbai, delivered the Key-note address. Adv. P. Shanavas, Member,

Syndicate; Prof. K. S. Devaky, Prof. Suresh Mathew and Prof. Beena Mathew, School of Chemical Sciences felicitated Prof. Subi Jacob George. After the reply remarks, Prof. Subi Jacob delivered a special lecture in the topic "A dynamic world beyond the molecules".

Latest from the School of Pure and Applied Physics

School of Pure and Applied Physics (SPAP) invented a phosphor exhibiting better radiative properties, confirming its suitability in the design of various optoelectronic devices such as LEDs and display panels

The researchers of SPAP developed a phosphor exhibiting better radiative properties, confirming its suitability in the design of various optoelectronic devices such as LEDs and display panels. The details of this research are available in *Materials in Electronics* 31 (24), 22452-22466 (2020). The SPAP has also published more than 5 peer reviewed articles and has awarded 3 doctoral degrees during this tenure. Further, two SPAP alumni, who completed their doctoral degree here, have joined as Assistant Professors in different colleges.

SPAP, in joint collaboration with the IUCAA, Pune conducted an online workshop on Ultraviolet Astronomy from 5th to 7th December 2020. Prof. Kanak Saha from IUCAA and Prof. K Indulekha from SPAP co-ordinated the workshop. Prof. Somak Ray Chaudhury (Director, IUCAA, Pune), Prof. Annapurni Subramaniam (Director IIP, Bengaluru), Prof. Swara Ravindranath (Space Telescope Science Institute, USA) and Prof. Kanak Saha (IUCAA, Pune) were the resource persons.

Accomplishment of Students

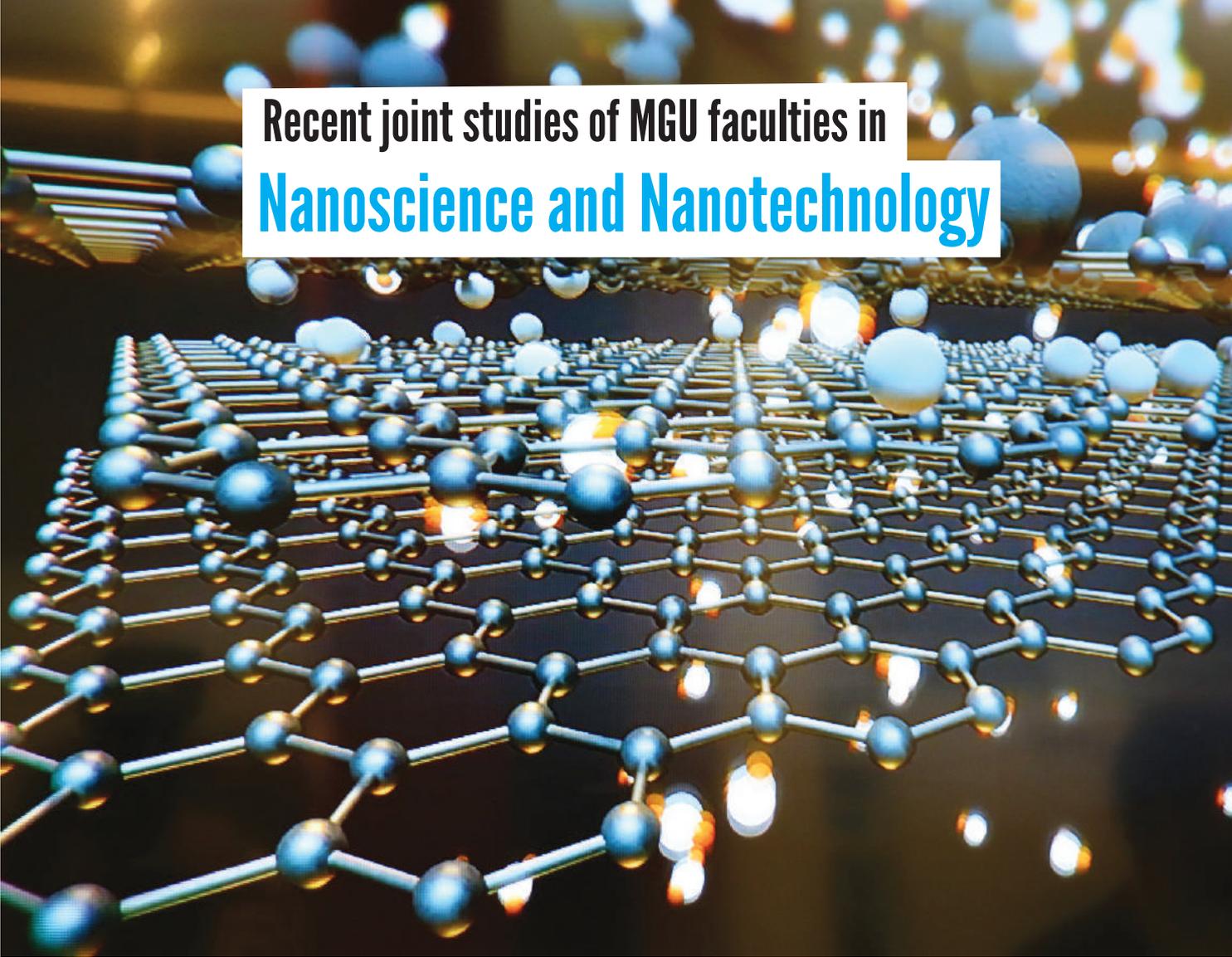
- ▶ Krishnapriya, T., Adon Jose, Twinkle Anna Jose, E. Sreeja, N. V. Unnikrishnan, and P. R. Biju. "An insight into the luminescent properties and Judd–Ofelt analysis of Eu³⁺ doped CaZn₂(PO₄)₂ phosphors." *Journal of Materials Science: Materials in Electronics* 31, no. 24 (2020): 22452-22466.
- ▶ Jose, Adon, T. Krishnapriya, Twinkle Anna Jose, Cyriac Joseph, N. V. Unnikrishnan, and P. R. Biju. "Effective sensitization of Eu³⁺ ions on Eu³⁺/Nd³⁺ co-doped multicomponent borosilicate glasses for visible and NIR luminescence applications." *Ceramics International* (2020).
- ▶ Simon, Sanu M., V. P. Prakashan, M. S. Sajna, M. A. Sunil, A. C. Saritha, P. R. Biju, Cyriac Joseph, and N. V. Unnikrishnan. "Studies on electro spraying synthesis and mechanism of sol-gel derived TiO₂-ZrO₂-poly vinyl pyrrolidone composites as bactericidal coatings." In *AIP Conference Proceedings*, vol. 2269, no. 1, p. 030093. AIP Publishing LLC, 2020.
- ▶ Sebastian, Jismon, SubashGopi, E. Sreeja, Adon Jose, T. Krishnapriya, and P. R. Biju. "Luminescence characteristics of Dy³⁺ doped borofluoro-phosphate glasses for white emission applications." In *AIP Conference Proceedings*, vol. 2269, no. 1, p. 030057. AIP Publishing LLC, 2020.
- ▶ Sharma, Gopal, Anshul Uppal, Sumati Anthal, Madhukar Baburao Deshmukh, Priyanka Pandharinath Mohire, Tanaji Ramchandra Bhosale, Chellappanpillai Sudarsanakumar, and Rajni Kant. "Synthesis, X-ray structure, and DFT analysis of a binary complex of 3, 3'-[(3-benzimidazolyl) methylene] bis (4-hydroxy-2H-1-benzopyran-2-one): 5-Methyl-1, 3-thiazol-2 (3H)-imine." *European Journal of Chemistry* 11, no. 4 (2020): 324-333.
- ▶ McPeak, Joseph, Dinu Alexander, Cyriac Joseph, Sandra S. Eaton, and Gareth R. Eaton. "Electron Spin Relaxation of Tb³⁺ and Tm³⁺ Ions." *Applied Magnetic Resonance* 51, no. 9 (2020): 961-976.



Winner of the World Academy of Sciences Young Scientists Award

Dr. Ajith Parameswaran, an esteemed alumnus of the SPAP and an Associate Professor in the International Centre for Theoretical Sciences (ICTS), TIFR, India, received the Young scientists

from developing countries award of the World Academy of Science for prediction of the gravitational waves during a collision between two black holes.



Recent joint studies of MGU faculties in Nanoscience and Nanotechnology

Snigdha, S., Nandakumar Kalarikkal, Sabu Thomas, and E. K. Radhakrishnan.
"Polymer–Water Interactions in Hydrogels." *In Nano Hydrogels*, pp. 127-133.
Springer, Singapore, 2021

Hydrogels are water/polymer systems that are in high demand due to their broad-spectrum applications in the industrial and bio-medical sectors. A basic hydrogel is a polymer network capable of absorbing a large

quantity of water.

Water–polymer interactions play a vital role in maintaining the structural integrity, physical properties and overall applicability of the hydrogel system. This chapter

focuses on the various water–polymer interactions within the hydrogel matrix, techniques to analyze these interactions and the effects of these interactions on the property of the hydrogels.

Bicy, K., Nandakumar Kalarikkal, Arul Manuel Stephen, Didier Rouxel, and Sabu Thomas. "Effects of nanofillers on morphology and surface wetting of microporous polypropylene composite membranes." *Materials Chemistry and Physics* 257 (2021): 123742.

Microporous polypropylene (PP) nanocomposite membranes suitable for various applications such as energy storage, water purification, membrane separation, etc., were

prepared by melt mixing of polypropylene and natural rubber (NR) subsequently followed by etching of rubber phase. Nanoparticles having spherical shape

(Al₂O₃), irregular shape (TiO₂), and 2D platelet morphology (Cloisite 30 B (C-30 B)), were used to the influence of nanoparticles on pore morphology and wetting properties

of PP. Morphology of PP membrane was investigated by SEM and TEM analysis and the study reveals that all the prepared membranes possess a co-continuous porous structure with a minimum percentage porosity of 62 ± 2 . Mechanical studies showed that the nanoparticles have a significant effect on tensile strength, strain to failure, and Young's

modulus. DSC results indicate that the nanoparticles do not make any significant change on the melting temperature of polypropylene. Polarized optical microscopic studies reveal that nanofillers enhances spherulite growth by acting as a heterogeneous nucleating agent. Contact angle measurements using two different test liquids (distilled

water and Dimethyl sulfoxide (DMSO)), reveals that Al₂O₃ added PP exhibits good wettability in both the test liquids.

The present studies reveal that the shape, properties, and active surface area of the nanofillers greatly influence the morphological mechanical and wetting properties of microporous PP.

Bhavitha, K. B., Srinivasarao Yaragalla, CH China Satyanarayana, Nandakumar Kalarikkal, and Sabu Thomas. "Natural Rubber/Graphene Nanocomposites and Their Applications." *In Graphene Based Biopolymer Nanocomposites*, pp. 203-220. Springer, Singapore, 2021.

The current review focuses on giving a basic understanding of graphene structure, preparation methods, their role in fabricating and the mechanical performance of elastomer and biopolymer composites. Since the physical

properties and the performance of graphene reinforced elastomer or biopolymer composites predominantly depend on the rate of dispersion of graphene in the matrix, the physical and chemical interaction of polymer chains with the graphene

and the orientation of the graphene within the matrix, here, a thorough study of these topics is carried out. Moreover, the current challenges and future perspectives involving in graphene biopolymer/elastomer composites are also discussed.

Cyriac, Jincemon, Saji Augustine, Nandakumar Kalarikkal, Shubharaj Mukherjee, Maudud Ahmed, and P. M. G. Nambissan. "Dysprosium-substitution-induced structural changes of multiferroic nanocrystalline bismuth ferrite and the investigation through positron annihilation and other studies." *Physica B: Condensed Matter* 599 (2020): 412431.

This study focuses on the effects of substitution of Bi³⁺ ions in bismuth ferrite (BiFeO₃) nanocrystals by dysprosium (Dy³⁺) ions with special emphasis on the role of defects on its physical properties. X-ray diffraction studies showed a structural transformation from the distorted rhombohedra (R3c) to stable orthorhombic

(Pnma) phase at Dy³⁺ concentration $x = 0.15-0.20$, although no strain was involved as the ionic radii of Dy³⁺ (0.92 Å) is smaller than that of Bi³⁺ (1.17 Å). The crystallite sizes, unit cell volume and the band gap energies reduced with increase in x whereas the dielectric constant drastically increased at $x = 0.2$. A

strong magneto electric coupling is also observed. Positron lifetime and coincidence Doppler broadening studies gave clear indications of the transformation at $x = 0.2$ and further indicated that vacancy type defects can be used as tools to identify the structural property changes during cationic substitution.

Surendran, Anu, Jürgen Pionteck, Mikhail Malanin, Roland Vogel, Nandakumar Kalarikkal, and Sabu Thomas. "Miscibility, microstructure, and in situ cure analysis of epoxy-SAN-cloisite 20A nanocomposites." *New Journal of Chemistry* (2021).

Reaction induced phase separation is a characteristic of thermoset/thermoplastic blend systems. Herein, we report the effect of organically modified cloisite 20A nanoclay on the miscibility and curing parameters of an epoxy blend system containing diglycidyl ether of bisphenol A (DGEBA) and poly(styrene-co-acrylonitrile) (SAN) and cured with diamine-

odiphenylsulphone (DDS). The examined blend compositions were chosen based on the difference in the microstructure. The epoxy/5 phr SAN blend and the epoxy/5 phr SAN/3 wt% cloisite 20A nanocomposite showed a dispersed SAN phase in the epoxy matrix. The epoxy/15 phr SAN blend and the epoxy/15 phr SAN/3 wt% cloisite 20A nanocom-

posite showed a double phase structure. Quantitative analysis of the epoxide conversion during the curing reaction was done by in situ FTIR spectroscopy.

The epoxide conversion obeyed first order kinetics in the initial stages of curing. Enhanced viscoelastic effects by the nanoclay decreased the rate of epoxide conversion, which is evident

from the in situ cure analysis.

Finally, the growth of the complex viscosity during curing was determined by in situ rheometry and theoretically analysed by fitting with

the Williams–Landell–Ferry equation.

An exponential growth in complex viscosity was observed which was induced by crosslinking. Acceleration

of the curing reaction by the nanoclay contributed to the increase in the complex viscosity for the nanocomposites compared to the blends.

Joseph, Blessy, Saravanan Krishnan, V. K. Sagarika, Abhimanyu Tharayil, Nandakumar Kalarikkal, and Sabu Thomas. "Bionanocomposites as industrial materials, current and future perspectives: a review." *Emergent Materials* (2020): 1-15.

The use of biopolymers in industrial applications remain elusive due to their hydrophilicity, poor barrier properties, etc. It has been of great interest to the research community to modify the inherent nature of bio-based materials by incorporating nanoscale fillers into the matrix. The resulting bionanocomposites show versatility as future biomaterials, providing a deft alternative to plastics. In general, bionanocomposites are made up of a matrix

which is a biopolymer (continuous phase) and the reinforcing agent (dispersed phase), consisting of particles with dimensions in the range of 1–100 nm. The increased research in this field is driven by the biodegradable, biocompatible, and renewable nature of biomaterials. Bionanocomposites find broad applications in food packaging, automobile industries, electronic industries, cosmetics, textile industries, water purification sectors,

tissue engineering, etc. A range of approaches have been utilized for the preparation of bionanocomposites including solution casting and 3D printing. However, much more green and sophisticated processing techniques should be developed for industrial applications. Furthermore, precise control over geometry, porosity, internal architecture, etc. is still challenging and need to be overlooked carefully.

Kappadan, Shabina, Sabu Thomas, and Nandakumar Kalarikkal. "BaTiO₃/ZnO heterostructured photocatalyst with improved efficiency in dye degradation." *Materials Chemistry and Physics* 255 (2020): 123583.

BaTiO₃/ZnO (BTZ) heterostructure was fabricated by the hydrothermal method in which BaTiO₃ nanoparticles were anchored on hexagonal rod-shaped ZnO. Structural and morphological properties of the prepared heterostructure were characterized by X-ray diffraction (XRD), Fourier transform infrared (FTIR) spectroscopy, Raman spectroscopy, X-ray photoelectron spectroscopy (XPS), UV-Vis absorption

spectroscopy, Field emission scanning electron microscopy (FESEM), Transmission electron microscopy (TEM), etc. The present study confirmed that BaTiO₃ and ZnO coexist in the heterostructure. To explore BTZ heterostructure as a photocatalyst, photodegradation of methylene blue (MB) dye was carried out under UV irradiation. Compared with BaTiO₃, BTZ heterostructure has exhibited improved photocatalytic activity and it is ascribed to

the effective charge carrier separation due to the formation of heterojunction between BaTiO₃ and ZnO. Electrochemical impedance spectroscopy is used to evaluate charge transfer properties of the heterostructure and the results support an efficient separation of charge carriers and enhanced photocatalytic activity. The study demonstrates that BTZ heterostructure act as a promising candidate in the field of water purification.

Bicy, K., Nandakumar Kalarikkal, Arul Manuel Stephen, Didier Rouxel, and Sabu Thomas. "Facile fabrication of microporous polypropylene membrane separator for lithium-ion batteries." *Materials Chemistry and Physics* 255 (2020): 123473.

Microporous polypropylene (PP) membranes are fabricated by melt mixing and are employed as a separator for lithium-ion batteries. Microporous PP having different

porosities and pore sizes are prepared by mixing it with different types of rubbers (Natural Rubber (NR), Styrene Butadiene Rubber (SBR), and Acrylonitrile Butadiene

Rubber (NBR)). SEM analysis reveals the formation of co-continuous morphology of PP by the extraction of rubber phase from the blend. The size shape and distribution of pores

obtained with different rubber gives an insight into the nature of the interaction of these materials and PP. Mechanical studies reveal that tensile strength and elongation at break depends on the pore size and pore density. Physical properties such as electrolyte uptake, wettability, and

porosity of the membranes are also measured and NR etched PP shows better porosity (62%), wettability and electrolyte uptake (140%) than SBR and NBR etched PP. The ionic conductivity of NR etched PP was measured as a function of temperature and shows a conductivity

greater than the celgard separator. Finally, a 2032 type of coin cell composed of Li/LiFePO₄ was assembled and the cycling performance was analyzed at different C-rates. Cycling studies prove that the performance of the new membranes was superior to the celgard separator.

Kaliyathan, Abitha Vayyaprontavida, Ajay Vasudeo Rane, Miroslav Huskic, Matjaz Kunaver, Nandakumar Kalarikkal, Didier Rouxel, and Sabu Thomas. "Carbon black distribution in natural rubber/butadiene rubber blend composites: Distribution driven by morphology." *Composites Science and Technology* 200 (2020): 108484.

Rubber-rubber blends [RRB's] of natural rubber [NR] and butadiene rubber [BR] filled with carbon black [CB] were compounded on a two-roll mixing mill. Partition of CB in RRB's is a challenging problem in the rubber industry. Therefore, the present study aims to quantify CB's partitioning in NR/BR RRB's at different blending ratios using relative damping height measurements from the dynamic mechanical analysis [DMA]. To support the findings from the DMA, structural and morphological analyses were carried out using solid state nuclear

magnetic resonance [Solid State NMR] and transmission electron microscope [TEM] respectively. Constrained regions in neat (unfilled) NR/BR RRB's were analysed for the first time by dynamic mechanical analysis and this was ascribed to the entanglements between NR and BR chains at the interface.

The $\tan\delta_{max}$ analysis confirmed the presence of 80% of CB partitioned towards BR phase in 70/30 NR/BR blends. For 50/50 NR/BR blends, 6.4% of CB is partitioned towards BR phase and 38% of CB was partitioned

towards BR phase in 30/70 NR/BR blends. This indicated preferential migration of CB to one of the phases based on rubber blend composition. Solid State NMR studies were in agreement with DMA analysis. TEM images of CB filled rubber blends represent a near to homogenous state of dispersion, where in the identification of individual rubber phases becomes more difficult at the nanometre scale. The CB networking and its migration to the dispersed phase was evident from the TEM analysis.

Mayeen, Anshida, Shemim Sajitha Subair, Kala Mooleparambil Sukumaran Nair, Sabu Thomas, and Nandakumar Kalarikkal. "Morphological and electrical properties of calcium ferrite loaded polyvinylidene fluoride-hexafluoro propylene nanofibers." *In AIP Conference Proceedings*, vol. 2287, no. 1, p. 020002. AIP Publishing LLC, 2020.

Calcium Ferrite – Polyvinylidene Fluoride – Hexafluoro Propylene (CFO-PVDF-HFP) composite nanofibers were prepared by electrospinning method.

Magnetostrictive CaFe₂O₄ nanoparticles were added to PVDF-HFP ferroelectric polymer in different concentrations. A systematic study on the structural, morphological,

electrical properties of the electrospun nanofibers were carried out. X-ray Diffraction were conducted to evaluate the ferroelectric β -crystalline phase of the composite fibers.

The enhancement of the electrical properties of the electrospun nanofibers could be observed after the addition of nanoparticles in the

polymer matrix. The prepared CaFe₂O₄ – PVDF-HFP nanofibers possess excellent dielectric constant at room temperature. The excellent dielectric constant and low loss of these composite nanofibers make them applicable in modern energy storage devices.

Nancy, Parvathy, V. Pravitha, Sabu Thomas, and Nandakumar Kalarikkal. "Fabrication of strongly fluorescent graphene quantum dots via liquid phase laser ablation." *In AIP Conference Proceedings*, vol. 2270, no. 1, p. 110029. AIP Publishing LLC, 2020.

Graphene quantum dots (GQDs), the zero dimensional (0D) single nanostructures have many exciting

technological applications such as bio imaging probes, sensors, light emitting devices, solar cells etc.

Here we are proposing a new, one pot, facile and ecofriendly synthesis approach for fabricating

GQDs via Pulsed Laser Ablation (PLA) of an organic solvent without any catalyst. It is a promising synthesis choice to prepare GQDs because of its fast production, lack of byproducts & further

purification and also the control over the product by accurate tuning of laser parameters. We have employed a 355nm Nd:YAG laser for the ablation. We found that the obtained (GQDs) exhibits

greater fluorescence and less toxicity than the other standard quantum dots and which is expected to have potential applications in optoelectronics and light-harvesting devices.

Joseph, Blessy, V. K. Sagarika, ChinnuSabu, NandakumarKalarikkal, and Sabu Thomas. "Cellulose nanocomposites: Fabrication and biomedical applications." *Journal of Bioresources and Bioproducts* 5, no. 4 (2020): 223-237.

Cellulose is a linear biopolymer which is composed of nanofibrils, thus having a large surface area. This low-cost, low-density, high-specific-surface-area, easily processable polymer is found in nature in the form of plants, bacteria and tunicates. Cellulose has outstanding characteristics including low cytotoxicity,

biocompatibility, good mechanical properties, high chemical stability, and cost effectiveness which make them suitable candidates for biomedical applications. The manipulation of cellulose at nanoscale resulted in nanocellulose having exceptional physicochemical properties. Therefore, cellulose nanocomposite is a fascinating area

of research which has applications in biomedical fields like wound healing, bone tissue engineering, three dimensional printing, drug carriers, medical implants etc. This review is mainly focused on the developments in the generation of cellulose nanocomposites and their potential applications in the biomedical field.

Rakhimol, K. R., Sabu Thomas, NandakumarKalarikkal, and K. Jayachandran. "Nanotechnology in controlled-release fertilizers." *In Controlled Release Fertilizers for Sustainable Agriculture*, pp. 169-181. Academic Press, 2021.

Traditional or conventional release of fertilizers leads to the wastage of about 50% of the used fertilizers to the soil, water bodies, and to the environment. Only very small portion of the applied fertilizers will benefit the plants. This leads to the repeated use of fertilizers and in turn increases the labor and cost. To minimize the loss of

fertilizers by enhancing the availability of fertilizers to the plants, scientists have adopted many modern techniques. Among these techniques, the most important and powerful technique is the development of nanotechnology for the controlled release of fertilizers and pesticides in the agriculture fields. Develop-

ment of nanocarriers, nanofertilizers, and nanosensors has improved fertilizer efficiency with minimum wastage. However, nanotoxicity is a major concern in developing nano-based fertilizers. In this chapter, we discuss about the different types of nano-based fertilizers, methods of preparation, advantages, and nanotoxicity.

Raj, Indu, SandhyaGopalakrishnan, Jiji Abraham, Hanna J. Maria, MiranMozetic, T. Aby Mathew, Sabu Thomas, and NandakumarKalarikkal. "Self-assembled PMMA/ZnO nanocomposites with anti-staining and liquid barrier properties—their physicochemical perspectives and clinical implications as a biomaterial for Maxillofacial prosthetic rehabilitation." *Journal of Polymer Research* 27, no. 11 (2020): 1-10.

Wettability, stainability and diffusion properties of polymer (PMMA) based nanocomposites (PMMA/ZnO) have been explored with critical significance to their physicochemical perspectives and clinical implications in the maxillofacial rehabilitation of cancer and trauma patients. Wetting and diffusion of artificial saliva through the neat polymer

and nano composites have been investigated in detail. The same protocol was adopted for water diffusion studies at different temperatures. Transportation mechanism and surface wettability and stainability by commonly used beverages like tea, coffee and turmeric on these composites are studied in detail. Inferences are correlated with morphological

analysis by Atomic Force Microscopy (AFM) and surface roughness parameters and density measurements.

No studies have been reported till date about correlating wetting enhancement to retentive qualities and diffusion resistance to anti-stainability of the prostheses in the biomedical field. Findings of the present study is highly relevant

and promising as these membranes/composites offer better retention and adaptability for the prostheses on tissue base which stimulates blood circulation in that

region which prevents further bone resorption. Anti-staining potential offer more acceptance and durability for the maxillofacial prostheses especially

intra orally.

This nano formulation is a highly durable, cost effective esthetic substitute for the conventional polymer PMMA.

Elayaperumal, E., M. Malathi, G. Murugesan, Anshida Mayeen, and Nandakumar Kalarikkal. "Observation of room temperature multiferroicity in CuO-doped Sr₃Bi₄Ti₆O₂₁ lead-free ferroelectric ceramics." *Journal of Materials Science: Materials in Electronics* 31, no. 21 (2020): 19232-19241.

Room temperature multiferroicity was achieved in CuO-doped Sr₃Bi₄Ti₆O₂₁ (SBT6) lead-free bismuth layered structure ferroelectric ceramics. On addition of CuO, a feeble magnetization with highest saturation magnetization of ~ 3 memu/g and least coercivity of 676 Oe was obtained for x = 0.5 mol% sample.

The effect of magnetic field on the

ferroelectric properties was investigated, which reveals the presence of magnetoelectric (ME) coupling indirectly and the maximum remnant polarization of 12.16 $\mu\text{C}/\text{cm}^2$ at 1 kOe was obtained. Moreover, from direct measurements (ME studies), coupling between ferromagnetic and ferroelectric phases was also achieved at room temperature.

Further, the presence of feeble ME effect decreases upon increasing CuO doping concentration, especially at higher doping concentration.

The induced spontaneous magnetization, oxygen vacancies and strong magnetic superexchange interaction of CuO played a key role in achieving room temperature multiferroicity.

Pai, Avinash R., T. Binumol, Deepu A. Gopakumar, Daniel Pasquini, Bastien Seantier, Nandakumar Kalarikkal, and Sabu Thomas. "Ultra-fast heat dissipating aerogels derived from polyaniline anchored cellulose nanofibers as sustainable microwave absorbers." *Carbohydrate Polymers* 246 (2020): 116663.

Electromagnetic (EM) pollution is ubiquitous and has soared to a great extent in the past few decades. The use of plant sourced cellulose nanofibers to fabricate sustainable and high performance electromagnetic shielding materials is foreseen as a green solution by the electronics industry to address this unseen pollutant. In this view, we report a facile and

environmentally benign strategy to synthesize ultra-light and highly conductive aerogels derived from cellulose nanofibers (CNF) decorated with polyaniline (PANI) via a simple in-situ polymerization and subsequent freeze drying process devoid of any volatile organic solvents. The obtained conductive aerogels exhibited density as low as 0.01925 g/cc

with a maximum EMI shielding value -32 dB in X band region. These porous shields demonstrated strong microwave absorption behavior (95%) with minimal reflection (5%) coupled with high specific EMI SE value ~1667 dB.cm³.g⁻¹ which make these aerogels a potential candidate for use in telecommunication, military and defense applications.

Padmapriya, D., D. Dhayanithi, A. Rashid, M T Rahul, Nandakumar Kalarikkal, M. Muneeswaran, and N V Giridharan. "Composition-dependent structural, electrical, magnetic and magnetoelectric properties of (1-x) BaTiO₃-x CoFe₂O₄ particulate composites." *Bulletin of Materials Science* 43, no. 1 (2020): 1-8.

Multiferroic composite with the general formula (1-x)BaTiO₃-xCoFe₂O₄ (x = 0.05, 0.15, 0.25, 0.35 and 0.45) has been synthesized by a standard solid-state reaction route. Powder X-ray diffraction analysis confirms the existence of ferrite (spinel CoFe₂O₄) and ferroelectric (tetragonal BaTiO₃) biphasic

without any impurity phases in the sintered composites. Microstructure of the composite displays two different grain sizes and shapes studied from SEM analysis. The composites show both ferroelectric and ferromagnetic ordering: the saturation magnetization (M_s) and retentivity (M_r) of the composite are improved with the increase in

ferrite phase, while leakage current, ferroelectric and dielectric properties of the composites show a drop.

Existence of coupling between ferroelectric and ferromagnetic ordering measured through magnetodielectric (MD) and magnetoelectric (ME) studies reveal an increase in % MD and ME

coefficients with an increase in ferrite content.
An enhanced ME coupling

coefficient of $17 \text{ mV cm}^{-1} \text{ Oe}^{-1}$ has been realized at a dc magnetic field of 5 kOe with a ac frequency

of 50 Hz in $(1-x)$ BaTiO₃-xCoFe₂O₄ ($x = 0.45$) composite.

Joseph, Blessy, Jemy James, Yves Grohens, Nandakumar Kalarikkal, and Sabu Thomas. "Additive Manufacturing of Poly (ϵ -Caprolactone) for Tissue Engineering." *JOM* (2020): 1-12.

The ability to design polymers with a controlled degradation profile and mechanical and processing properties has opened opportunities for developing novel polymer-based drug delivery devices, sutures, implants, etc. While numerous polymers are employed in biomedical applications, only a few, like poly (ϵ -caprolactone) (PCL), polylactides, etc., are non-toxic and resorbable. PCL,

a biodegradable polyester having a low melting temperature and superior viscoelastic properties, represents an ideal candidate for 3D printing. Additive manufacturing (AM) or 3D printing has evolved as a cutting edge manufacturing technology that finds many applications in tissue engineering. Researchers have embraced 3D printing to fabricate PCL composites that find promise in

soft and hard tissue engineering. AM allows great deal of freedom in manufacturing complex internal and external geometries with high precision. This review aims to identify the possibilities that the field of AM can contribute towards the development of sustainable, eco-friendly, bio-polymeric systems for biomedical applications with a special emphasis on PCL composites.

Bertorelle, Franck, Srestha Basu, Hussein Fakhouri, Martina PerićBakulić, Pierre Mignon, Isabelle Russier-Antoine, Pierre-François Brevet, Sabu Thomas, Nandakumar Kalarikkal, and Rodolphe Antoine. "Covalent anchoring of atomically precise glutathione-protected gold nanoclusters on graphene oxide nanosheets." *Nano Express* 1, no. 3 (2020): 030005.

This paper describes the development of a novel method of producing nanocomposites consisting of gold nanoclusters anchored on graphene oxide nanosheets in a cost-effective and reproducible manner. The novelty of the technique hinges on the covalent functionalization of atomically precise subnanometer gold clusters protected by glutathione (Au₁₅SG₁₃ and Au₂₅SG₁₈) on to graphene oxide (GO) nanosheets

according to the 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide hydrochloride crosslinking method, using the existing carboxylic groups present both at the surfaces of the nanoclusters and the GO nanosheets. The atomic precision of glutathione-protected gold nanoclusters was evidenced by electrospray ionization mass spectrometry. The formed hybrid nanocomposites were characterized by TEM measurements and

exhibit nonlinear optical properties characteristic of GO, in particular a strong second harmonic scattering response as well as a multi-photon excited fluorescence spectrum characterized by a broad band in the visible range between 350 and 700 nm. Atomically precise nanoclusters covalently linked to GO nanosheets are therefore promising for new applications in the areas of optoelectronics and photovoltaics.

Rajakumaria, R., Abhimanyu Tharayila, Sabu Thomasa, and Nandakumar Kalarikkal. "Toxicity of graphene based nanomaterials—A general overview of origin, exposure and mechanisms." *Analytical Applications of Graphene for Comprehensive Analytical Chemistry* 91 (2020): 281.

Graphene materials in bioimaging, Graphene materials for biosensing, Biodistribution of graphene materials, Biodegradation of graphene 4.

Exposure analysis ofGBNs, Respiratory exposure, Parenteral exposure, Enteric route, Dermal exposure, Intravitreal exposure, Brain exposure, Testis

and ovary exposure, Toxicity mechanisms of GBNs, Physical destruction, ROS production, Mitochondrial damage, DNA damage, Inflammatory response.

Joseph, Blessy, Neethu Ninan, Rahul Madathiparambil Visalakshan, Clement Denoual, Richard Bright, Nandakumar Kalarikkal, Yves Grohens, Krasimir Vasilev, and Sabu Thomas. "Insights into the biomechanical properties of plasma treated 3D printed PCL scaffolds decorated with gold nanoparticles." *Composites Science and Technology* 202 (2021): 108544.

Tissue engineered constructs having desired biomimetic and mechanical properties emerged due to the complexities involved in conventional skin grafting. They facilitate tissue regeneration without compromising mechanical properties. Herein, we report the fabrication of polycaprolactone (PCL) scaffold by fused deposition modeling and immobilization of gold nanoparticles onto the polymer surface after modifying the PCL surface using plasma polymerization. 3D printed PCL scaffolds inlaid with gold nanoparticles (Au-PCL) were characterized for their structural and mechanical properties using FESEM, and nano-indentation. The surface chemistry was analyzed

using X-ray photon electron spectroscopy (XPS), wettability was determined using water contact angle studies and surface topography was imaged by atomic force microscopy (AFM). The surface modification of 3D printed scaffolds significantly improved their hydrophilicity suggesting that hydrophobicity which restricts the use of PCL in biological applications could be overcome by plasma modification. Nanoindentation studies showed that Au-PCL scaffolds exhibited remarkable enhancement in mechanical properties with reduced Young's modulus of 1.81 GPa. Biocompatibility was assessed by measuring cell viability, cell attachment and immune response.

In vitro biocompatibility studies indicated good attachment of viable cells onto the gold nanoparticles incorporated 3D printed network. Immune response studies indicated that scaffolds did not enhance the production of pro-inflammatory cytokines such as TNF- α , IL-8 and IL- β . Collectively, plasma modification and surface immobilization of gold nano-particles onto the 3D printed PCL scaffold is a simple and cost-effective technique to enhance the mechanical properties and biocompatibility of hydrophobic scaffolds like PCL, thereby making this technique a very promising tool for futuristic applications of scaffolds.

Joint Research Projects Underway in the Fields of Nanoscience and Nanotechnology

- Bio-filler-Interfaced Electrospun PVDF Hybrid Piezoelectric Generator for Mechanical Energy Harvesting. The project is done in collaboration with UNIVERSITÉ DE MONTPELLIER & University of Lorraine, France. The project is funded by SPARC scheme of MHRD-Govt. of India.
- Study of urea oxidation electrocatalysis for energy conversion from waste. The project is done in collaboration with Ben Gurion University of the Negev & Ariel university, Israel. The project is funded by SPARC scheme of MHRD-Govt. of India.
- Vachellianilotic acid based biocompatible hybrid nanostructured coatings/films for seeds and fruits. The project is done in collaboration with North Carolina State University & Kansas State University, USA. The project is funded by SPARC scheme of MHRD-Govt. of India.
- Nanoscale contrast agents for diagnostic biomedical imaging, The project is done in collaboration with Nanyang Technological University (NTU), Singapore. The project is funded by SPARC scheme of MHRD, Govt. of India.
- Advanced Nanocomposites for Micro and Nanosensors Applications, Under the PICS scheme with Prof. Didier ROUXEL, Institut Jean Lamour- UMR CNRS n°7198 - Université de Lorraine- BP 70239 - 54506 Vandœuvre-lès-Nancy Cedex, France.
- Physics of Cavitation Bubbles and Hydrogen Generation during Liquid Phase Laser Ablation, BRNS/BRFST-DAE, Govt. of India
- Design and application of magnetically responsive self-assembled Polymer nanocomposites, DST-Nano Mission, Govt. of India.
- Heavy Ion/Gamma ray Engineered Vertically Oriented Graphene Hybrid systems for Environmental Remediation, UGC-DAE-CSR Kolkata Centre Project.
- Graphene-Silica conjugated epoxy nanocomposites for protective coating and repair applications, DRDO, Ministry of Defence of the Government of India (Co-PI).
- Gamma Ray/Heavy Ion Assisted Cross linked Silicone Rubber Based EMI Shielding Materials, UGC-DAE-CSR Kolkata Centre Project (Co-PI).

Kerala Becomes a Privileged Place Where Migrant Workers' Children can Continue Their Higher Education

On 7th September 2020, the migration policy initiative under the School of International Relations and Politics (SIRP) at MGU held an interview with Ms. Payal Kumari and family to highlight a significant achievement of Ms. Payal Kumari, who won day first rank in BA Degree examination (history archaeology stream). She was studying at Marthoma College in Perumbavur and the daughter of a migrant worker from Bihar. Her brothers and sisters also pursue advanced studies at different levels. Payal Kumari's family decided to continue educating their children in Kerala because of the favourable conditions. The interview was carried out by Mr. Bijulal and Mr. Navas. M. Khadaraz. The vice-chancellor of the university Prof. Sabu Thomas, on the occasion of congratulating Ms. Payal Kumari, offered full support for her ongoing education. For a video of the interview, visit <https://youtu.be/pkSNceRo4EQ>. The migration policy initiative is headed by Mr. Bijulal, who is currently in consultation with experts in the field of migration studies. Preliminary activities of the initiative are underway with the collaboration of local NGOs, Asha Workers, Kudumbasree and civil society workers. The study of migration policy is part of SIRP's social lab experiment.

Developing opportunities for migrant workers to interact with the local communities and promoting education of children of interstate migrant families are important areas of the social experiment in relation to migration policy studies. The community model of interaction to



Ms. Payal Kumari with Family
© Dr. Bijulal

improve the education of migrant workers is organized to understand and prioritize inclusive educational strategies of other marginalized sections of societies. Furthermore, the migration research initiative at SIRP completed the first edition of the international webinar series on "Transitions in International Migration Governance: Towards Inclusive and Rights Based Public Policy" from September to December 2020. This session was comprised of fourteen lecture-cum interactions, organized by the Centre for West Asian Studies at SIRP, Dr. M.V Bijulal is the chairperson of the Centre. The panellists include internationally renowned legalist Ad. Pranath Bhushan, activist lawyer K.R. Subhash Chandran, academic scholars (Prof. S. Irudaya Rajan, Prof. Praveena Kodoth, Ms Munjeera Jefford) global human rights activists (Rafeek Ravuthar, Benoy Peter), frontline journalists (Rejimon Kuttappan), labour policy experts like (M.P. Joseph), etc. As a precursor to the webinar series

academic discussions were held from April 2020 through focused group discussions on the Global Compact on Migration. The webinar series on completion of the second episode from February to April 2021 is expected to make collaborations with several foundations and experts, both from academic and civil society, across the universe. These academic and field based associations are already contributing to the conceptual aspects of the upcoming Centre for Studies in Migration at the School of International Relations and Politics. A list of members of the expert committee made up of international experts, journalists, civil society activists, lawyers, workers and researchers is finalised. Discussions about MOUs are also ongoing. The centre is planned as an academic and activity hub to facilitate various scholarly activities that will help theoretical as well as social interventions on the questions on migration, with special focus on Interstate and International aspects, focusing on Kerala and south Asia.



SIRP Engages in Discussion about Ecologies and Water Moments



Exploring the Making of a 'New Ordinary Citizen' in India through Urban Process

Dr. Mathew A Varghese, Assistant Professor, School of International Relations and Politics

Dr. Mathew A Varghese had an article 'Vicharams: Evental Pointers, Possibilities and Intensities in Liminal Phases' published in the journal *Samyuktha: A Journal of Gender and Culture* (Vol. 20, No. 1, 2020.) ISSN: 2393-8013 during this period. 'Naagarika Prakriyakal: Athirukalum Apavaata Idangalude Srishtiyum' (Trans: Urban Processes: Of Boundaries and Exceptions) was a resource lecture he gave at the Dialectics Research Forum (DRF), Kalady University, 13-01-2020.

Web-based lectures and interactives were organised and coordinated by Dr. Mathew under three different thematic heads that are also his areas of academic and research interests, viz. 1. 'Urban Series', 2. 'Engagements with Ecologies' as well as 3. 'Ways of

Knowing'. 'Shaheen Bagh Protests and Street Festivals in DLF City, Gurgaon: Exploring the Making of a 'New Ordinary Citizen' in India through Urban Process', by Prof. Sanjay Srivastava (British Academy Global Professor at University College London) featured earlier as a keynote talk in the Urban Studies Series initiated and currently running. 'Using the Hydrosocial Cycle and Governmentality as a Lens to Explore the main 'Water Moments' in Durban, South Africa' by Patrick Martel (University of KwaZulu-Natal, South Africa) and 'Liquid Linear Places: Rivers and Canals in the UK' by Maarja Kaaristo (Manchester Metropolitan University, UK) were part of the Engagements with Ecologies' series organised at the Inter University Centre for Social Science Research

and Extension (IUCSSRE) as an adjunct faculty.

'Why do I Make Films on Climate Change, Displacement and Gender' was a talk by Priya Thuvassery (Independent Film Maker and Television Producer) organised through the IUCSSRE jointly with Kochi Collective for the 'Engagements with Ecologies' series. 'Disease Decisions and Disputable Evidence' by Shinod N K (University of Hyderabad), 'Sovereignty and State' by Prof. A K Ramakrishnan (JNU, New Delhi), 'Seeing Ghosts: Postcritical Ethnography in the American South' by Caroline G. Whitcomb (Augusta University, USA) were part of the resource talks in the methodological and inter-institutional student platform called 'Ways of Knowing' collective.



Take a Look Back at Kerala's Past, Present and Future

Prof. C. Vinodan, Director, School of International Relations and Politics

Dr. Anju Lis Kurian and Dr. C. Vinodan have published a book which analyses the multifaceted perspectives of Kerala's past, present and future. This volume is published by Nova Science Publishers, Inc.,

Newyork. The book is a compilation of 17 chapters which promulgate the rich traditions, biodiversity, politics, governance, climate change and health of Kerala, outlining the past, present and future. The book is helpful for

those who seek answers about the multicultural society ladder and success stories with an in-depth and panoramic approach. You can purchase the book at <https://bit.ly/2YKJZD2>.



Investigates International Relations in the 21 Century

Dr. Lirar, Assistant Professor, School of International Relations and Politics

Dr. Lirar Pulikkalath organised an International Webinar on 'Migrants and Displaced Persons Amid COVID-19: Issues, Challenges and Policy Options' during 15-17 October 2020. The event was organized by the Centre for Indian Diaspora Studies (CIDS), School of International Relations and Politics, in collaboration with the Department of Social Sciences, FLAME University, Pune and Global Research Forum on Diaspora and Transnationalism (GRFDT), New Delhi. The International Webinar discussed themes related to human mobility and migrant

communities amid COVID- 19 pandemic in three thematic sections; 1) COVID- 19 and Internal migration, 2) COVID- 19 and International labour migration, and 3) COVID- 19 and forced migration. Resource persons from different parts of the country and abroad delivered talks on various aspects related to migration in times of COVID 19 pandemic. The insights and observations generated from the webinar will be useful inputs for policy-making, academia and the civil society. Dr. Lirar also organised an International Online Lecture series on "International

Relations in the 21 Century: Existing and Emerging Issues" exclusively to honour the founding Pillars of the School of International Relations and Politics. The event was organized by the KPS Menon Chair for Diplomatic Studies, SIRP. The series of talks were held between 15 and 24 December 2020 discussed and debated the existing and emerging issues in contemporary international relations from multi-theoretical perspectives. Dario Battistella, from France, delivered the keynote address and Ambassador KP Fabian was the chief guest in the valedictory session.



Receives Award for Best Socially Relevant Film at the 4th Lohitadas International Film Festival 2020

Abhiram Krishna M, a first-year Master's student

Several students and researchers from the School of International Relations and Politics qualified NET exams conducted by the UGC and went further into higher studies during this period. Students have been into active writings and online publishing. Arjun S Mohan's 'Azadi - A thickly political reading' appeared in Standpointindia.in (October 2020) and his 'Reforms or retrograde moves in agriculture' appeared in Global-

southcolloquy (December 2020). This as well as Derry Paul T M's 'Inclusive 'Kerala Model': Challenges' that appeared in Globalsouthcolloquy deserve special mention and were pertinent to the times we live in. Some were also into filmmaking and documentaries. 'The short film 'Lungs of Gazipur' by Abhiram Krishna M, a first year Masters student received awards for the 'Best Socially Relevant Film' category at

the 4th Lohitadas International Film Festival 2020. His films were also part of entries elsewhere, like the Indian Film Festival Melbourne 2020. Meanwhile Arjun S was part of Bengal Yaatra conducted by Zero Foundation Barasat during the time of a pandemic. There were several extracurricular activities that were engaged pursuits, like the above from the School's student community.

IUCSSRE Disseminates

Academic Dynamism Across the University

IUCSSRE conducted a series of discussions on development issues such as water moments, climate change, gender issues, ethnography in social sciences, fiscal analysis and local governance

A series of conferences, seminars and workshops went on at Inter University Centre for Social Science Research and Extension (IUCSSRE), under different thematic headers and in web-platforms enlivened under pandemic conditions. Engagements with Ecologies series organised with Mathew Varghese, faculty, SIRP and adjunct faculty at IUCSSRE had at first Patrick Martel, from the School of Environment and Development Studies, University of KwaZulu-Natal, South Africa talking on Using the hydrosocial cycle and governmentality as a lens to explore the main 'water moments' in Durban, South Africa. This was followed by Maarja Kaaristo, Manchester Metropolitan University, UK, who spoke on Liquid Linear Places: Rivers and Canals in the UK. The talk by Priya Thuvassery, a Delhi-based independent documentary maker on the theme Why do I Make Films on Climate Change, Displacement, & Gender, in the series was in collaboration with the Kochi Collective. Dr. Aparna Eswaran (ICSSR Post-doctoral fellow, JNU) was the discussant.

A Human Geography lecture series too got organised. "Ethnography in Social Sciences" delivered by Prof P. Sanal Mohan, former Director KCHR and Professor, School of Social Sciences, opened the series. This was followed by Dr. Rajesh Komath, Co-ordinator, KR Narayanan Chair and Associate Professor, School of Social Sciences, MGU on "Writing Self and Narrativizing Performance".

Dr. K. Mathew Kurian Memorial



Ms. Priya Thuvassery

Lecture' and Colloquium has been an annual event. This time the web colloquium was titled "COVID Kerala: What Next?" The Memorial Lecture and keynote presentation was by Dr. B. Ekbal, former Vice Chancellor, University of Kerala and Member, Kerala State Planning Board. Thematic addresses were delivered by Dr. K.P Aravindan, Medical Director of Micro Health Laboratories, Kozhikode and former Professor and Head, Dept of Pathology, Govt Medical College, Kozhikode and Dr. Joy Elamon, Director General, Kerala institute of Local Administration (KILA). Dr. A.K Jayasree, Professor and Head, Department of Community Medicine at the Academy of Medical Sciences, Pariyaram chaired the colloquium. Dr. Sabu Thomas, Vice Chancellor, Mahatma Gandhi University inaugurated the memorial lecture and colloquium.

In the context of the Budget 2021-22, there was another colloquium on

"Macroeconomic Theory in the Context of the Budget 2021-22" organised in association with the KN Raj Centre for Planning and Centre-State Financial Relations. The keynote was delivered by Dr. Jayan Jose Thomas, Faculty, IIT Delhi and Member, Kerala State Planning Board. Dr. Johny Johnson, Professor and Hon. Director, KN Raj Centre and Dean, Faculty of Management Sciences chaired the session. The discussants of the colloquium included DR. V. Mathew Kurian, Joint Director, KN Raj Centre, Dr. Jose J. Naduthotty Faculty, KN Raj Centre and others.

In the local governance extension programmes, the IUCSSRE associated with the webinar on "Block Panchayats among Local Governments" organised by State Resource Group, Government of Kerala. A webinar on "Nedumangad 'Model' and Block Panchayats: Lessons from Local Development" was organised in association with

the State Resource Group, Government of Kerala on 7 November 2020. Resource persons included Dr. K.N. Harilal, Chairman, State Resource Group and Member, State Planning Board, Dr. Manju S. Nair, Director Centre for Agroecology and Public Health, and faculty, Department of Economics, University of Kerala, B. Biju, President, Nedumangad Block Panchayath, R. Subhash, President, All Kerala Block Panchayat Association, K.B. Madan Mohan, Executive Coordinator, All Kerala Grama Panchayat Association. Dr V. Mathew Kurian, Hon. Joint Director, KN Raj Centre, MG University, Dr. Jos Chathukulam, Director of the Centre for Rural Manage-



Dr. Maarja Kaaristo

ment and former Ramakrishna Hegde Chair, Institute for Social and Economic Change, Bangalore, Dr. Rajesh Many, Dr Vipinkumar, Dr. Mathew Varghese and others spoke at the session. Officials of the Block Panchayats of Kottayam, Idukki, Pathanamthitta and Ernakulam districts also took part in the Webinar. In Opportunities and Challenges to Local Governance: An International Comparative Perspective, in association with the Institute for Sustainable Development and Governance (ISGD), the keynote was delivered by Sri. John Samuel, former UNDP Governance Advisor and President, Trancivic International and ISGD. Dr. S. Shaji, faculty, Department of Political Science, University of Hyderabad and others spoke at the session.



Publications from IUCSSRE

Prof. K. M. Seethi,

Hon. Director, Inter University Centre for Social Science Research and Extension

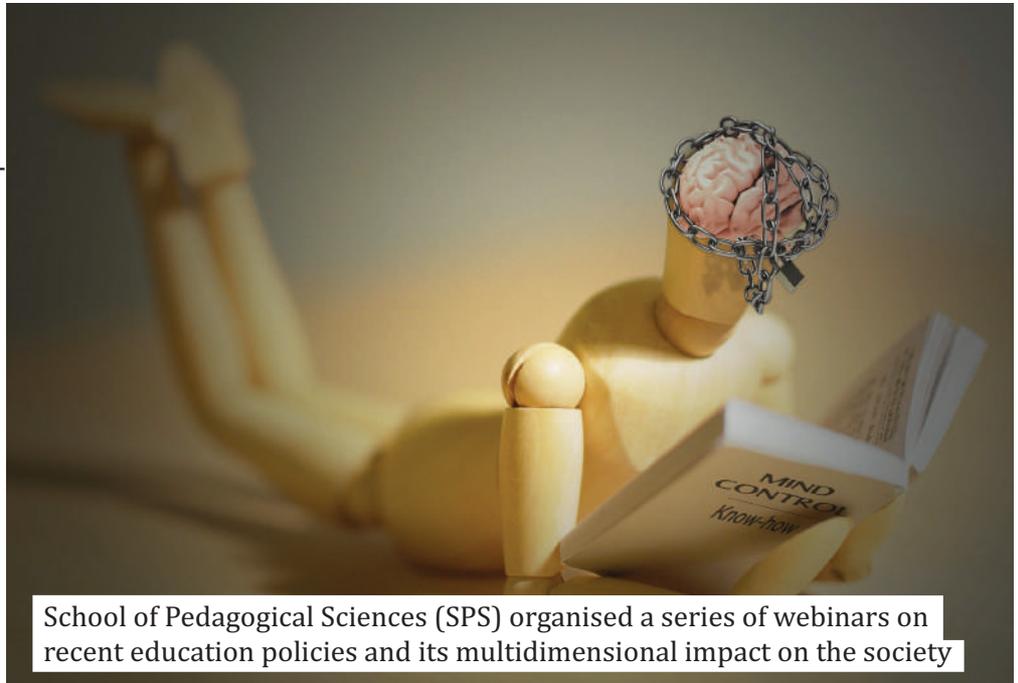
Among the papers and articles published by IUCSSRE Faculty Prof. K. M. Seethi, Hon. Director of the centre, have had several significant contributions that cover different facets of socio-political life and order. ‘Un-Trumping’ America,” that came both in South Asia Analysis Group, and in Eurasian Review, analysed the new US President Joe Biden’s policy initiatives that commence with a spate of executive orders to rescind the policies of the previous administration—that ranged from revisiting the climate change policy (which included rejoining the Paris Agreement), the management of the COVID-19, reentering the World Health Organization (WHO), to halting the controversial border wall and sensitive immigration issues. It also tries to examine the scope of the

return of ‘Liberal Internationalism’ in American foreign policy. There were others like, “The Enrica Lexie case and the stakes of coastal states in India,” (Sri Lanka Guardian/South Asia Analysis Group), “Pakistan: Fanatic Outrage and Shrine demolition,” (Indian Defence Review (IDR)), Sugathakumari: The Poet of Empathy,” and “Between Jihadism and Islamophobia: Is France still burning? (both in Open), “Land jihad? The reality of land scam in Jammu and Kashmir,” (Policy Circle), “Many Voices, Still Many Worlds”, “Spectre of Jihadi violence in France”, “Why Older Persons Matter Today” (all in Global South Colloquy) that added on to the significant academic perspectives on pertinent issues. Dr. Seethi also gave a memorial talk

on “Gandhi’s philosophy” in an event organised by All India Peace and Solidarity Organisation (AIPSO), Kottayam. He officiated as a resource person and delivered a special lecture on “Origin and evolution of Human Security” at the Webinar on “Human Security” organised by the School of Social Sciences, Central University of Hyderabad. “Revisiting The idea of Islam and Democracy” at the International Webinar on West Asia amidst COVID 19: Changes and Challenges for India organised by the Centre for West Asian Studies, School of International Studies, Jawaharlal Nehru University, New Delhi was another event officiated and chaired by him. There was also the Madhu Limaye Memorial Lecture organised by Lohia Vichara Vedi, Kerala.

Discusses the Core of the National Education Policy 2020

SPS at MGU organized a one-week national webinar on 'National Education Policy 2020' (NEP 2020) from 2nd to 6th November 2020. Hon. Vice Chancellor of Mahatma Gandhi University Prof. Sabu Thomas inaugurated the webinar and has mentioned some of the recommendations of NEP 2020, that make drastic changes in the education sector. In the Key note address on 'NEP 2020: Broader Linking Issues related to Governance' by Prof. N.V. Varghese, Hon. Vice Chancellor, NIEPA New Delhi, gave a detailed explanation about the different dimensions of the NEP 2020 like massification and difference in condition of states with respect to previous policies, multidisciplinary approach and new approach to internationalization. Prof. Vasudha Kamat, Member, NEP 2020 Draft Committee, and Former Vice Chancellor, SNDT Women's University in her invited lecture focused mainly on the instilling of values, skills, respecting constitution, making a global citizen, transformation of Higher Education Institutions, multidisciplinary institution, phasing out of affiliation system and change in the assessment pattern. In the second day there were two sessions; Special Lecture on 'NEP 2020: Proposed Curricular, Pedagogical & Assessment reforms' by Prof. Ramachandran, Advisor, India-Africa Institute of Educational Planning and Administration (IAIEPA). Prof. Ramachandran spoke about need for holistic development, development of complex problem-solving skills, other skill such as creative thinking, team spirit, skilled communication,



School of Pedagogical Sciences (SPS) organised a series of webinars on recent education policies and its multidimensional impact on the society

and cognitive flexibility. In the second session, Prof. PK Sahoo, Former Vice Chancellor, University of Allahabad and Dean, Faculty of Arts, University of Allahabad, gave detailed description about technological context and application in education, curricular reforms, holistic development, development of cognitive process, value development and assessment. The third day of the webinar, Prof. Chandra Bushan Sharma, School of Education, IGNOU, New Delhi, delivered Special Lecture on 'Making of NEP 2020'. Prof. Sharma spoke about comparison of previous policies and NEP 2020, consideration for less privileged and disabled, private participation in education, importance of mother tongue, transformation of pre-schools and teacher education. The fourth day of the webinar Prof. M.A. Sudhir, UGC Emeritus Professor, Gandhigram Rural Institute-Deemed to be University made a special lecture on 'NEP

2020, Reflections on Teacher Education'. Prof. Sudhir gave clear understanding about the teacher education programme on the basis of NPE 2020 especially about reforms at school education and teacher education.

In the last day of the webinar, Prof. Jasim Ahmed, IASE, Jamia Millia Islamia, New Delhi delivered a special Lecture on School Education & NEP2020. The main points of this invited lecture were long lasting changes in education according to NEP 2020, educational issues and concerns, changes that will brought by NEP 2020, ECCE, foundational literacy and numeracy, curtailing drop outs and developing skills.

The SPS also recently conducted the webinars on the topic 'Inter-disciplinary and Trans-disciplinary Education: Approaches and Reflections' in collaboration with Directorate of Minority Welfare, Government of Kerala on 28 to 31 October, 2020.

Recent Joint Papers from Faculties of Chemical Sciences



Sasi, Soorya, Sunish K. Sugunan, P. Radhakrishnan Nair, K. R. V. Subramanian, Raji George, T. Nageswara Rao, and Suresh Mathew. "High power flexible supercapacitor electrodes based on a surface modified C60- β Ni (OH) 2 nanocomposite." *Materials Today Communications* (2020): 101825.

Poor performance of the binder materials that bind the electroactive materials and a current collector in pseudocapacitors often set back the mechanical properties and energy storage capacity of these devices. Development of binder-free supercapacitor electrode is, thus, of paramount importance. In this communication,

we report a proof-of-principle concept of developing a new class of binder-free, flexible pseudocapacitor electrodes based on a composite of 2,4,6-tris(dodecyloxy)phenyl-N-methylfulleropyrrolidine derivative and β -Ni(OH)₂ nanorods. These electrodes deliver a specific capacitance of 675 F/g, 91.18 % of which is retained over

1000 charge-discharge cycles. We demonstrate that these electrodes can achieve specific energy and specific power of 661.5 Wh/kg and 8.8 KW/kg respectively. Based on our studies, we propose that further improvement in the capacitance can be achieved through optimization of the electrode components.

Abraham, Thomas, and Beena Mathew. "Silver phosphate based flower-like MoS₂/BiFeO₃ nanocomposite with enhanced activity for the detection of tetracycline." *Materials Chemistry and Physics* 260 (2021): 124103.

Silver orthophosphate doped with flower-like MoS₂/BiFeO₃ binary composite was developed for the augmented and precise sensing of the antibiotic tetracycline. The in-situ developed silver orthophosphate modified composite showed

excellent electrocatalytic activity due to its low resistance which favoured the redox probe mechanism. The limit of detection and the linear range of the composite were found as 4.57 pM and 10–90 pM corroborating the pronounced

sensing capacity. The practical application of the sensor was analyzed with liquid milk samples spiked with tetracycline. More than 97% of tetracycline was detected which established its high demand in the analytical industry.

Priyanka, Ragam N., Thomas Abraham, Subi Joseph, Jaise Mariya George, Neena J. Plathanam, and Beena Mathew. "Fast and efficient degradation of water pollutant dyes and fungicide by novel sulfur-doped graphene oxide-modified Ag₃PO₄ nanocomposite." *Environmental Science and Pollution Research* (2021): 1-14.

The sulfur-doped graphene oxide (sGO)-integrated Ag₃PO₄ composite displayed very high catalytic activity toward prominent water pollutants like textile dyes and fungicide under sunlight. The optimum amount of sGO doping was found as 5% for degradation. The novel composite degraded 99% of methylene blue (MB) in only 5

min of sunlight exposure, which is 16 and 8 times faster than Ag₃PO₄ and 5% GO-Ag₃PO₄. High mineralization was observed for MB with a total organic carbon (TOC) removal of 98% in 30 min. The composite mineralized rhodamine B, methyl orange, and acid red 18 dyes with a TOC removal above 95%. Moreover, a toxic dithiocarbamate fungi-

cide thiram was degraded in 1 h with a TOC removal of 82% leaving less toxic thiourea. The formation of sGO-Ag₃PO₄ n-n heterojunction increases charge transport and photocatalytic activity of the composite to incredible extent along with hollow morphology and in situ formed Ag nanoparticles (AgNPs).

Neetha, Mohan, Thaipparambil Aneja, C. M. A. Afsina, and Gopinathan Anilkumar. "An overview of Ag-catalyzed synthesis of six-membered heterocycles." *ChemCatChem* 12, no. 21 (2020): 5330-5358.

Heterocyclic chemistry is an immensely expanding field in organic synthesis owing to its potency in various disciplines like natural products chemistry, pharmaceuticals, drug discovery

and industry. Silver catalysis has gained much attraction in recent years mainly in the scenario of heterocyclic synthesis. Among heterocycles, the six membered heterocycles are the most popular

and widely applied in various fields. This review discusses on the investigations on various silver-catalyzed synthesis of six-membered heterocycles and covers literatures up to 2020.

Radhika, Sankaran, Mohan Neetha, Thaipparambil Aneja, and Gopinathan Anilkumar. "Microwave-assisted Amination Reactions: An Overview." *Current Organic Chemistry* 24, no. 19 (2020): 2235-2255.

C-N coupling reactions were found to be attractive among researchers owing to the importance of C-N bond formation in heterocyclic synthesis. Hence C-N bond formation via amination reaction with the assistance of microwave radiations gained significant attraction re-

cently. Microwave-assisted reactions are greener, faster and generally efficient compared to the conventional thermal reactions offering better purity of the product with enhancement in the yield. It was surprisingly revealed that, several new advancements in amina-

tion reactions were highly influenced by this greener technology. This first review on microwave-assisted amination reaction focuses on the novel amination strategies emerged with the help of microwave methodology and covers literature up to 2019.

Kanchana, U. S., Elizabeth J. Diana, Thomas V. Mathew, and Gopinathan Anilkumar. "Palladium-catalyzed cross-coupling reactions of coumarin derivatives: An overview." *Applied Organometallic Chemistry* 34, no. 12 (2020): e5983.

Coumarins are omnipresent in several plants and exhibit a plethora of pharmacological properties, making them an important scaffold in organic synthesis. Naturally, the chemistry of this motif has attracted ever-increasing attention,

among which palladium-catalyzed coupling reactions are the most prevalent one. Numerous useful, easy, and concise syntheses and reactions have been achieved using palladium-catalyzed coupling reactions. This review focuses on

recent advances in palladium-catalyzed cross-coupling reactions such as Suzuki, Heck, Stille, Sonogoshira etc. reactions of coumarin derivatives and covers the literature from 2001 to 2020.

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Diana, Elizabeth J., U. S. Kanchana, Thomas V. Mathew, and Gopinathan Anilkumar. "Recent developments in the metal catalysed cross-coupling reactions for the synthesis of the enone system of chalcones." *Applied Organometallic Chemistry* 34, no. 12 (2020): e5987.

For the last two decades, chalcones and their derivatives have attracted special interest among researchers due to their pharmaceutical properties. Numerous research works have been still going on to

improve the methodologies of chalcone synthesis. Chalcone has displayed a remarkable curative efficiency to cure numerous diseases and it continues to show promise for new drug investiga-

tions. This review highlights the metal catalysed cross-coupling reactions for the synthesis of chalcone and its derivatives from 2009 to 2020.

Saranya, Salim, Thaipparambil Aneeja, Mohan Neetha, and Gopinathan Anilkumar. "Recent advances in the iron-catalysed multicomponent reactions." *Applied Organometallic Chemistry* 34, no. 12 (2020): e5991.

Iron-catalysed reactions are widely used in organic synthesis owing to its benefits over other metals. Among the important organic reactions, multicomponent reactions play a significant role due to its greener aspects like high atom economy, minimal amount of by-product, economic feasibility etc. For the past few years,

iron-catalysed multicomponent reactions have attracted the attention of several chemists which lead to the invention of some fine chemistry.

The majority of iron-catalysed multicomponent reactions results in the synthesis of heterocyclic compounds having biologically active natural products,

pharmaceutical etc. These developments in the iron-catalysed multicomponent reactions are the focus of this review. This is the first review in this topic which covers the literature up to 2020, and it encompasses the different methods for the synthesis of acyclic, carbocyclic and heterocyclic compounds.

Philip, Rose Mary, Sankaran Radhika, P. V. Saranya, and Gopinathan Anilkumar. "Applications of tert-butanesulfinamide in the synthesis of N-heterocycles via sulfinimines." *RSC Advances* 10, no. 69 (2020): 42441-42456.

Chiral sulfinamides are among the best known chiral auxiliaries in the stereoselective synthesis of amines and their derivatives. The most extensively used enantiopure tert-butanesulfinamide emerged as the gold standard among many others

over the last two decades. The present review attempts to provide an overview of tert-butanesulfinamide mediated asymmetric N-heterocycle synthesis via sulfinimines and covers literature from 2010–2020. This methodology

offers general access to structurally diverse piperidines, pyrrolidines, azetidines, and their fused derivatives that represent the structural motif of many natural products and therapeutically applicable compounds.

Harry, Nissy, Sankuviruthiyil M. Ujwaldev, and Gopinathan Anilkumar. "Recent advances and prospects in the metal-free synthesis of quinolines." *Organic & Biomolecular Chemistry* (2020).

Quinolines are a predominant class of nitrogen containing heterocycles with wide applications in the medical and industrial fields. Owing to their significant importance, numerous

synthetic protocols have emerged in the past two centuries.

Metal-free synthesis of quinolines has recently gained attention in view of toxic metal-free druggablequinoline

synthesis.

In this context, this review focuses on the recent advances in the metal-free synthesis of quinolines and covers all the reports from 2016–2020.

Saranya, Salim, Mohan Neetha, Thaipparambil Aneeja, and Gopinathan Anilkumar. "Recent Trends in the Iron-Catalyzed Cyanation Reactions." *Advanced Synthesis & Catalysis* 362, no. 21 (2020): 4543-4551.

The review focuses on the iron-catalyzedcyanation reaction. This is the first review on this topic and covers literature till 2020 and comprehends all the works

published in this field detailing the scope and limitations.

The cyano compounds are important organic moiety and are widely used in synthetic or-

ganic chemistry; this review aims to help understand the various aspects of Fe-catalyzedcyanation reactions and its scope.

Sruthi, Pambingal Rajan, P. Uma Sankar, Thachora Venu Saranya, and Saithalavi Anas. "Facile Synthesis of Dihydroquinolines via Palladium Catalyzed Sequential Amination and Cyclisation of Morita-Baylis-Hillman Alcohols." *ChemistrySelect* 5, no. 43 (2020): 13598.

Quinolines and its derivatives are significant class of heterocyclic compounds which are identified as the key component in many natural products and biologically important molecules. We describe herein a facile method for the synthesis of quinoline derivatives

from Baylis-Hillman Alcohols via Palladium Catalyzed intramolecular aryl amination followed by allylicamination pathway. The reaction between a series of Baylis-Hillman alcohols and amino compounds (Tosyl, aliphatic and aromatic amines)

under optimized reaction conditions with $d(PPh_3)_2Cl_2/DPPP$ catalyst system, afforded the corresponding 1, 2-dihydroquinolines in good to excellent yields. A tentative mechanism for the reaction is also proposed.

Book Chapters

"Application of Green Technology for Energy Conservation and Sustainable Development", E. P. Aparna, K. S. Devaky, Book: Chemistry and Chemical Engineering for Sustainable Development, ImprintApple Academic Press, eBook ISBN:9780367815967

In the modern era of technology, energy conservation and environmental protection is the most burning global issue, and it has a major role in our everyday life.

Minimal use of fossil energy can

be attained through energy preservation and the novel ideas and practical use of renewable energy like sunlight, wind, water, tides, geothermal heat, and so on. As Einstein said, "Neither energy can be created nor destroyed,

rather we can alternate."

The present chapter discusses the potentials of green technology to solve problems related to conventional energy sources in the environment.

“Green Catalysis, Green Chemistry, and Organic Syntheses for Sustainable Development”, Divya Mathew, Benny Thomas, K. S. Devaky, Book: Chemistry and Chemical Engineering for Sustainable Development, ImprintApple Academic Press, eBook ISBN: 9780367815967

Green catalysts offer an environmentally attractive catalyst–solvent system under mild reaction conditions for chemo-, regio-, and stereoselective design of products and processes. The fundamental pillars of green chemistry thus reduce the practice and generation

of hazardous materials. The design and application of new catalytic systems achieve the dual goals of environmental protection and economic benefit. Green catalysis offers benefits like lower energy requirements, increased selectivity, decreased practice of processing

agents, and platform for less toxic materials. Green catalysis and synthesis addresses environmentally benign process by providing the ease of separation of product and catalyst, thereby eliminating the necessity for separation through distillation or extraction.

“Nature’s Green Catalyst for Environmental Remediation, Clean Energy Production, and Sustainable Development”, Benny Thomas, Divya Mathew, K. S. Devaky, Book: Chemistry and Chemical Engineering for Sustainable Development, ImprintApple Academic Press, eBook ISBN:9780367815967

Green chemistry is the design and application of chemical processes to reduce the practice and generation of materials hazardous to human health and the environment. The exclusion of widely dispersed anthropogenic pollutants is one of the main concerns for a sustainable improvement for our

planet. Comparing to traditional physicochemical methods, bioremediation is the safest, least troublesome, and most economic treatment. Enzymatic bioremediation has risen as an attractive alternative to traditional methods. Nowadays exciting new opportunities for biocatalysis toward the

production of renewable and clean energy sources are rapidly emerging. Based on the premise that these alternatives can contribute to a cleaner environment, especially when using renewable agricultural products, the demand for these energies is increasing.

Mary Xavier, Marilyn, S. Mohanapriya, K. S. Divya, Nayarassery N. Adarsh, P. Radhakrishnan Nair, and Suresh Mathew. "Exploring The Effect of Precursors of Polymeric Carbon Nitride Nanosheets on their Photo and Electrocatalytic Applications." *ChemistrySelect* 5, no. 41 (2020): 12679-12689.

In the present study, we have performed a case study to understand the ability of bulk polymeric carbon nitride (P-CN) derived from various precursors such as urea, melamine, and dicyandiamide namely UCN, MCN and, DCN respectively via thermal condensation process and also their corresponding thermally exfoliated nanosheets such as TE_UCN, TE_MCN, and TE_DCN. Compared with the bulk P-CN, all the thermally exfoliated samples retained higher surface area and shows superior photogenerated charge carrier transfer and separation. Among the thermally

exfoliated P-CN nanosheets, TE_UCN gives highly porous nanosheets with a specific surface area of 179 m²/g, and large band gap (3.01 eV). Despite its poor electronic band structure, the large surface area of TE_UCN has contributed more to the excellent photogenerated charge carrier separation, which resulted in their highest photocatalytic property against the degradation of an organic dye rhodamine B(RhB) under natural sunlight. The electrochemical experiments on all the three samples of nanosheets of P-CN revealed that

TE_UCN is the best electrode material for supercapacitors. TE_UCN displays excellent capacitance properties in 0.5 M H₂SO₄ electrolyte with a specific capacitance of 128.7 F/g. Finally, the electrocatalytic activity investigation of the samples of P-CN nanosheets revealed that TE_DCN has more catalytic activity towards HER. This study demonstrates that texture, electrochemical capacitance, electro and photocatalytic properties of nanosheets of P-CN can be improved by the judicious choice of the precursor molecules.

Explains How to Achieve Societal Well-Being by Using Plants for Food, Feed, Bioenergy, Health Care, Biofertilizers and Habitat Restoration



BIIC hosted the Sixth International Conference on the Sustainable Use of Tropical Plant Biomass (SUPTBM) on the Virtual Platform from 14-15 December 2020

The event was jointly co-ordinated by the School of Biosciences and the Inter-University Centre for Organic Farming and Sustainable Agriculture (IUCOFSA) of the MGU in association with the Lund University, Sweden and Anand Agricultural University, Gujarat. Under the theme 'utilisation of plants for foods, feeds, bio-energy, healthcare and medicine, bio-fertilizers, habitat restoration and development of environment friendly products for the wellbeing

of the society' the event provided a scientific as well as industrial forum to promote, collaborate and collectively endeavor to solve the complex problems associated with effective utilization of plant biomass, scientific inputs in value addition and waste management.

During the two days of the conference, more than 100 people attended, 22 invited talks were delivered and 20 paper presentations were posted out by more than 45 researchers from different states like India, Sweden,

Sri Lanka and Poland.

The event provided an opportunity for young people to showcase their work in the allied regions and explore recent developments in this area.

A special panel discussion took place between the academic and industrial community on the utilization of biomass for a safer future and it provided insight into the emerging trends and opportunities in innovation and entrepreneurship that can make Kerala sustainable one.



National Institute of Plant Science and Technology (NIPST) is an interdisciplinary centre at MGU that focuses primarily on the research areas of plants and their relations with the environment towards the development of plant-based eco-technologies.

Prof. Jisha M S, Co-ordinator, National Institute of Plant Science and Technology, School of Biosciences

NIPST hosted an international two-day web conference entitled “Bioinventiyon 2020” on recent advances in biosciences in collaboration with the Research Directorate of the SAFI Institute of Advanced Study (SIAS) on November 5 -6, 2020. The conference was to provide an overview of the latest technologies and untapped areas of research in

various fields of biological sciences, including plant sciences, microbiology, biotechnology, etc. There were two important presentations by eminent speakers Dr. Keith R Davis (Co-founder of the VP Plant Research, SativaGen Inc Bloomington, USA) and Dr. Vijay K. Juneja (Lead Scientist (Microbiologist, GS-15), Eastern Regional Research Center,

USA). Dr. Keith gave a keynote speech on the theme of “Plant Gene Function Discovery Using the High-Throughput Gene Function Factory”. Dr. Vijay hosted a session on “Microbial modelling of pathogens in food and their applications to food safety”. An e-book with summaries of the participants' work has been published.

MGU Excels in Sporting Events

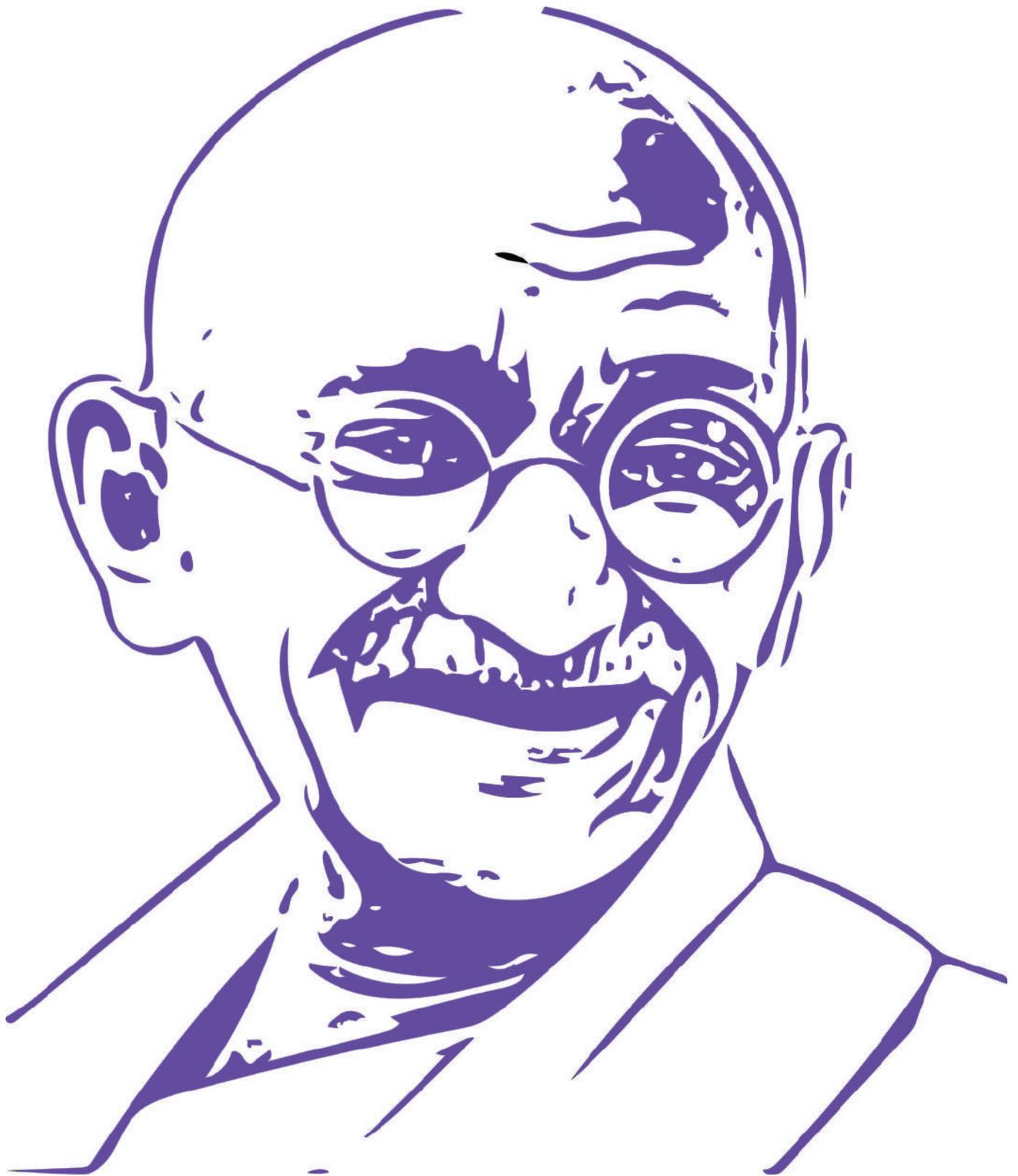
MGU is well known for its national and international sporting achievements since the establishment of the School of Physical Education and Sports Sciences (SPESS). It has made numerous outstanding

sports persons over the period – 12 Olympics, 28 Asian Games, 41 Common Wealth Games, 14 Arjuna Awardees, and 58 people at World University Games. MGU also won the Athletics, Volleyball (M&W),

Basketball (M&W), Badminton, Softball and Handball Championships in the South Zone and all of India's inter-university tournaments. Currently the SPESS conducts PhD and M.P.E.S programs in Physical Education.



Khelo India- Volleyball (W)



“A man is but the product of his thoughts. What he thinks, he becomes.”

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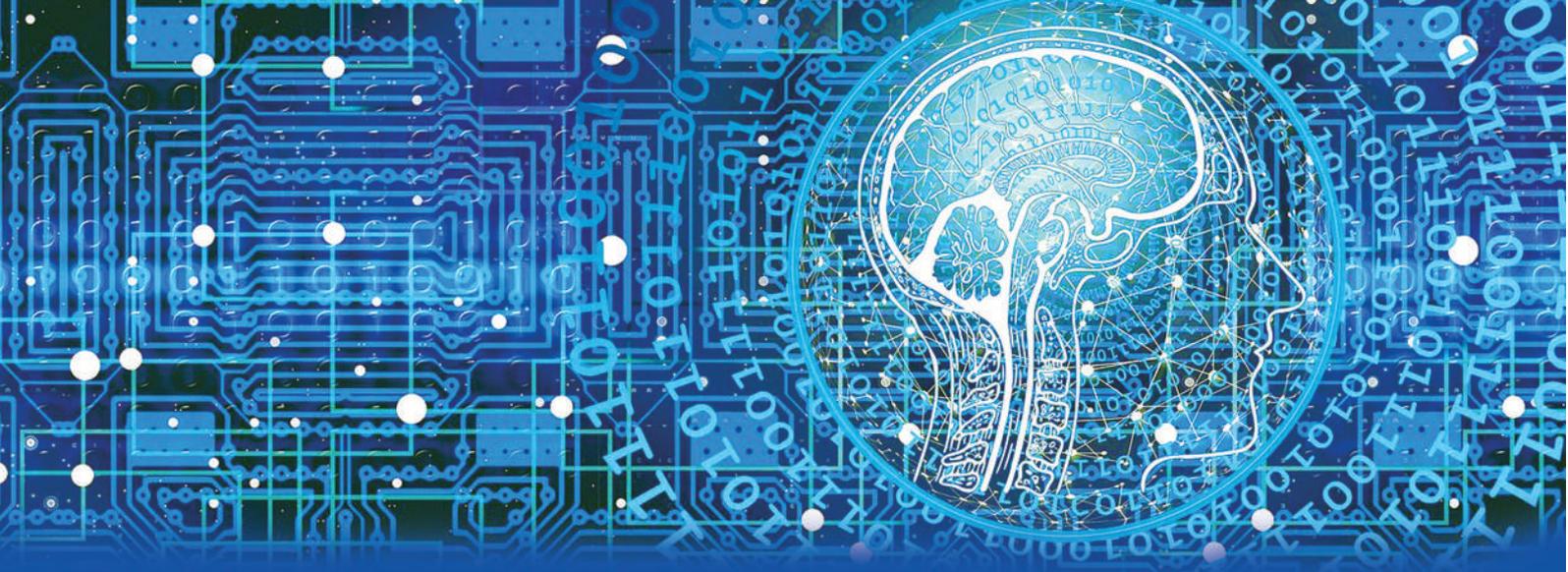
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