Innovation Portfolio

- **Snapshots of Innovations from University of Kerala**
- **Summaries of Ph.Ds. awarded in 2016**

Internal Quality Assurance Cell (IQAC)
University of Kerala
2017

Innovation Portfolio

- **Snapshots of Innovations from University of Kerala**
- **Summaries of Ph.Ds. awarded in 2016**

Internal Quality Assurance Cell
University of Kerala
2017

IQAC of University of Kerala produces documentation on various aspects of functioning of the University for Self-assessment and further action. This compilation of innovation from laboratories of the University is aimed at understanding innovation profile of the University.

Internal Quality Assurance Cell, UoK, 2017

Preface

Innovation is the buzz word today both in academia and industry and every academic institution is required to understand and promote its innovation activities. The University of Kerala has taken many steps in this regard. It has, first of all, attempted to arrive at a working definition of innovation. This was discussed and adopted by its Research Council in 2016. In 2017, it constituted the Kerala University Innovation Council. Both these have given clarity and direction to innovation activities. As advised by the Innovation Council, this compilation is being brought out. The snapshots of innovation in Part A is only a sample as many faculty members could not contribute write-ups due to their busy schedule. It is hoped that a sequel to this compilation will ensure comprehensive coverage.

Summary of PhDs awarded based on research work done in University Departments is also included in this compilation. All Ph. D dissertations are archived in the Kerala University Library (with over 4000 dissertation so far) and also being uploaded into the *Shodhganga* on-line repository maintained by UGC. However it is practically impossible to get an overview of the research reported in these theses, spread over nearly 50 subjects in voluminous reports running to over 50,000 pages in total. Any assessment of the research work therefore remains to be enabled by a convenient compilation. The Internal Quality Assurance Cell of the University of Kerala has therefore chosen to compile summaries of all PhD theses in a standard format.

It is hoped that the compilation will serve the purpose of giving visibility to innovative research in the University and encourage its adoption by the industry or society.

Vice-Chancellor &
Chairman, IQAC

Contents

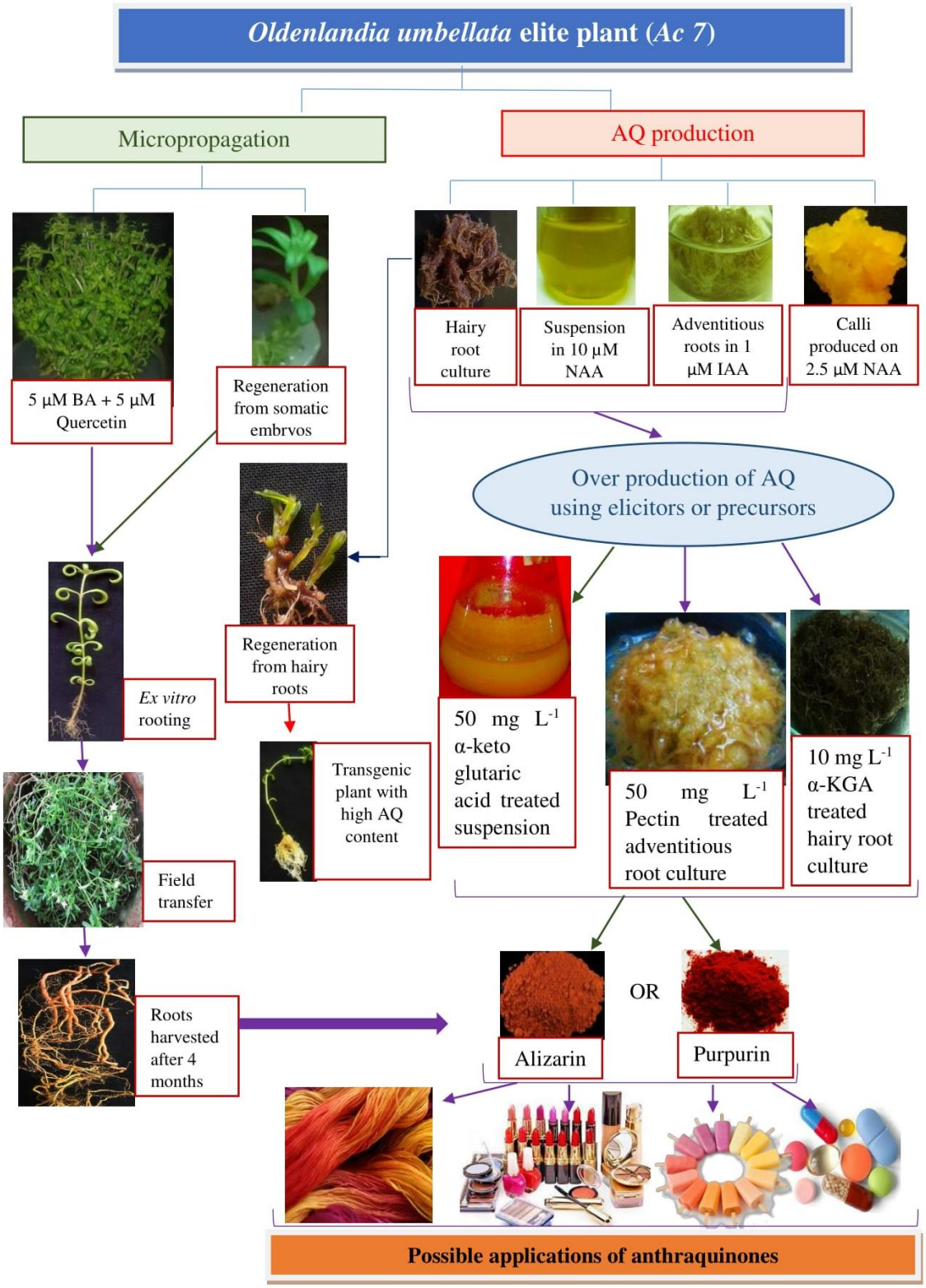
Part A
Snapshots of Innovative Research from University Departments

1. Crop Enhancement of Annatto: a natural food color resource[1]

Annatto is a natural food colorant extracted from seed coat of *Bixa orellana* L., (*Kurangu Manjal),* a small tree cultivated in tropical and subtropical regions of the world. Annatto is one of the 13 basic pigments derived from natural sources that are currently permitted for food colouring by the US-FDA. Annatto is extensively used to colour cheese, ice creams, other dairy products, alcoholic and nonalcoholic beverages, baked foods, meat and meat products, fish products, snack foods and gravies. Annatto dye is widely accepted in foodstuffs rather than their synthetic counter parts. Brazil is the world's largest producer of annatto seeds followed by Peru. Recent production statistics records a global production of annatto seeds 14,500 metric tons per year. This woody shrub has now naturalized in our State and is growing as an ornamental crop. Unavailability of superior planting material is a serious problem which hinders mass cultivation of *B. orellana* in our state. Evolving suitable methods to produce high quality planting materials will promote the plant from the place of an ornamental to a cultivated crop.

A project with an aim to improve *B. orellana* crop in the state was implemented recently by the Department of Botany, University of Kerala and following contributions were made: 1. Various yield traits of candidate plus trees (CPTs, 30 Nos.) of *B. orellana* sampled from Kerala state was analyzed. CPT-21 showed maximum seed output (2.96kg/year) and total bixin content (30.75g/tree/year) and thus designated as 'plus tree'. Two times higher seed yield than average yielder. 2. Improvement in seed germination by GA_3 (50 ppm) treatment. 3. Rooting of hardwood and softwood cuttings other cloning methods for the multiplication of plus tree materials of annatto through vegetative means. 4. Standardization of tissue culture protocol for adult plants for mass multiplication of elite mother plant. 5. Observation on reproductive characters and standardization of controlled breeding 6. The project as such contributed to improvement of *B. orellana* in the state. This will ensure the production of high quality planting materials of annatto and will make cultivation a more profitable venture.

[1] Dr E A Siril, Dept of Botany & team of researchers (awarded Dr. S. Vasudev Award by KSCSTE in 2012, Cash prize of Rs. 50,000/-)



Overall representation of present work in *O. umbellata* L.

2. *In vitro* production of natural dye – Anthraquinone- from Chay root [2]

Anthraquinones (AQs) are the second largest group of herbal dyes used in textile industries. AQ compounds also have many other industrial and pharmaceutical uses. *Oldenlandia umbellata* L., (*Parpadaka Pullu)* is one of the under exploited natural source of alizarin type of AQs. Study was conducted to develop efficient methods for the production of AQ from chay root (JÀ¸nSI¸pÃv).

A preliminary screening on the basis of AQ content of *O. umbellata* accessions from different localities of Kerala and Tamil Nadu resulted in identification of superior accession (3.74 mg g^{-1}dw AQ). Tissue culture based propagation and methods for maintenance of cultures were developed initially using suitable culture media and plant growth hormone combinations.

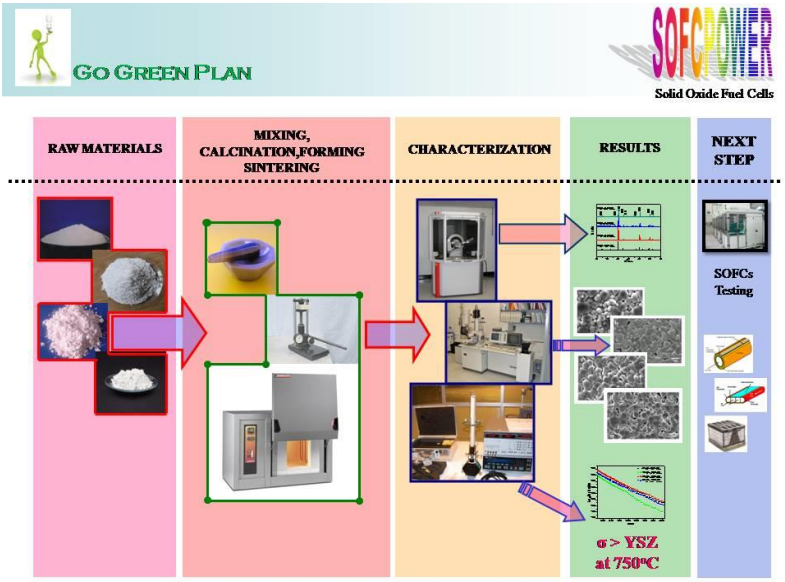
In vitro production of AQ was achieved through callus, suspension, adventitious root and hairy root cultures. Hairy roots were induced from *in vitro* derived leaves of *O. umbellata* using wild type *Agrobacterium rhizogenes* (strain MTCC 532). Hairy roots produced were excised and used for raising hairy root lines (L_1 - L_{10}) and L_3 screened as superior (31.84 mg g^{-1}dw). Transformation of *Ri* plasmid from *A. rhizogenes* was confirmed by PCR amplification of genes specific for *rol* A, B and C from *Ri* plasmid of bacteria. Hairy root line, L_3 was subcultured in hormone free media and produced 8 times higher AQ than naturally growing plants. Transgenic plants were regenerated from hairy roots. Enhanced AQ production was achieved by the use of various elicitors, precursors or inhibitor treatment. Addition of a precursor, α- keto glutaric acid (10 mg L^{-1}) in hairy root lines produced 52.85 mg g^{-1} dw AQ. Precursor mediated AQ production was about 14 times higher than the AQ present in source plant. Suitable methods have been developed for micro propagation and AQ production from *O. umbellata.* The developed method can be implemented for the large-scale production of AQ by appropriate modifications.

[2] Dr. E. A. Siril, and team of Researchers, Dept of Botany

3. Enhancing Ionic Conductivity Of Intermediate Temperature Solid Oxide Fuel Cell Electrolyte[3].

One major reason to go for Solid Oxide Fuel cells (SOFCs) innovations as a part of Go Green plans is that the sources used to power electricity are natural resources such as coal, gas and oil. These types of resources are quickly disappearing because they are being used at a much faster rate than they can be replenished. While there are a number of ways in which to go green, SOFCs offers many reasons which compels us to take the time to understand it deeply. Research on SOFCs Electrolytes will hopefully motivate others to follow this very popular and important trend.

One of the major reasons for increase in global temperature is a contaminated atmosphere due to human activities. It is high time to change and be the change, since a planet B is impractical. In the 21st century, the demand for clean and sustainable energy sources has become a strong driving force in continuing economic development and hence in the improvement of human living conditions. But the conventional alternate energy resources such as solar panels, wind mills etc have so many problems related to stability, convenience and portability. In that respect, fuel cells have been recognized to form the cornerstone of clean energy technologies due to their high efficiency, high energy density and low or zero emissions. Research in the field of fast oxide conductors is very active, fostered by the current development of Solid Oxide Fuel Cells (SOFCs) and the needs for electrolytes working at intermediate temperatures. A large number of ceramic materials have been proposed as solid oxide ion conductors which find applications in SOFCs and oxygen sensors.



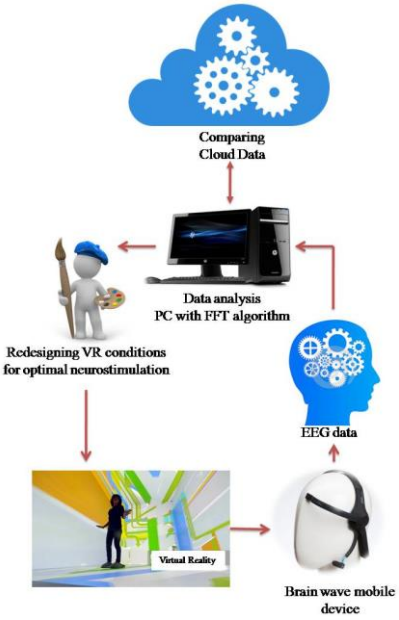
We aim to synthesis an intermediate temperature SOFCs electrolyte which could have an improved efficiency in its ionic conductivity by 10% with respect to commercial available electrolyte. The research progress in certain cubic solid solutions of $La_2Zr_2O_7$ and on some novel family of fast oxide ion conductors (Na doped LAMOX), which have high ionic conductivity, high mechanical and thermal stability resulting in an oxygen ion permeating structure that has both high performance and is cost effective.

[3] Dr. Sibi K. S., Dept. of Physics

4. Studies On Spatio – Temporal EEG Spectral Analysis[4] Using Non – Invasive Optogenetic Tools

EEG studies on non-invasive optical stimulation as a powerful tool to test the role of a specific brain region in cognition, behaviour, and disease. We plan to develop a computer program that allows any brain researcher to upload a brain scan of a subject and then design a virtual brain stimulation experiment that targets a specific brain region.

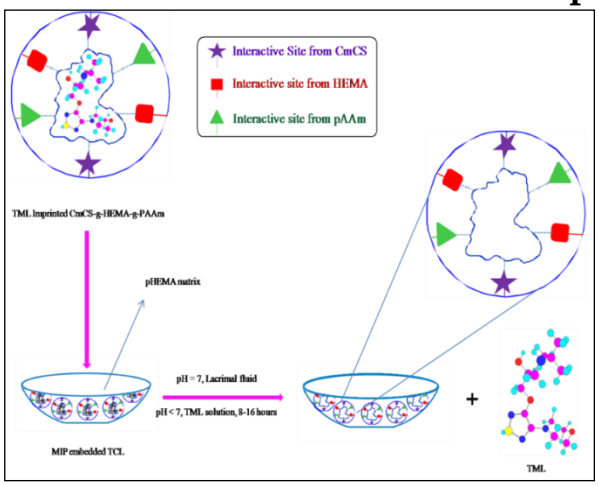
Aimed at revolutionizing our understanding of the brain, it is the need of the time for "improvement of existing non-invasive neuromodulation" techniques. There is presently great interest in Electroencephalogram studies which are portable, easily deployable, well tolerated, and carries the promise of targeted neuromodulation using optical stimulus. Computational models of EEG waves predict individual brain current flow for a given electrode configuration, and predict that optimized targeting of environments which can achieve more focused stimulation for desired results.



Through innovations in neuromodulation with various virtual environments, this proposal removes existing barriers and will allow researchers to individually tailor the virtual stimulus for desired targets so as to optimize clinical outcomes and address specific research hypotheses. Only as a result of algorithmic optimization can the modelling process be set up. We plan to divide the project into two steps: a cloud-based computationally intensive processing on servers and then simulations taking just seconds by researchers using client software on conventional PC. These innovations result in a process that previously required extensive expertise and labour, super-computers and numerous iterations instead being reduced to a single step, requiring seconds on a conventional PC. In addition, we plan to supply the EEG protocol for in vivo mapping of electrical flow. Our approach is unique in integrating the scalability, rigor, and transparency of opens-source with highly assessable GUI control software, while being exceptionally robust and flexible.

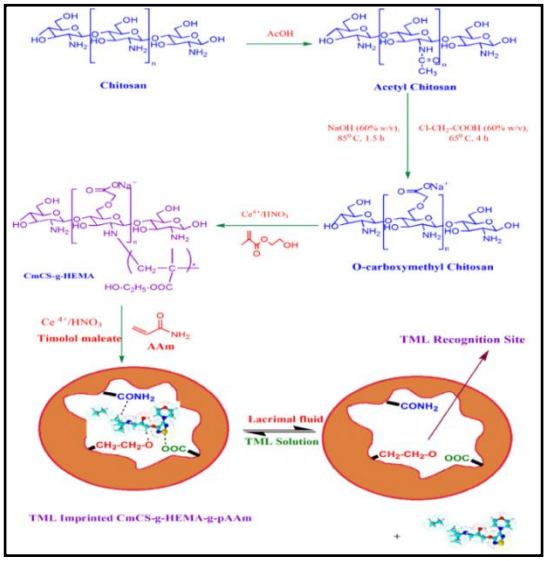
[4] Dr. Sibi K. S., Dept. of Physics

5. Realizing an Economical and Effective Treatment for Glaucoma *via* Reusable Therapeutic Contact Lenses[5]



Over 14 million people worldwide suffer from glaucoma. Loss of vision due to glaucoma is permanent. But proper treatment can prevent further vision loss if detected at an earlier stage. So the goal of any glaucoma treatment is to prevent further vision loss by dropping intra ocular pressure (IOP) and thereby, minimizing the optic nerve damage. Various non-surgical procedures for its treatment include eye drops, drug eluting contact lens, direct injection to the eye, etc. However, conventional eye drops increase the lacrimal drainage leading to greater drug loss and thereby demanding increased frequency of drug administration. Taking patience compliance into consideration, drug eluting therapeutic contact lens (TCL) seems to be the best alternative for glaucoma treatment. In addition, they can increase the residence time of the drug and do not require the aid of a trained personnel as well as possess good penetration of low molecular weight, hydrophilic drugs such as timolol maleate (TML). Since the introduction of TML ophthalmic solution in 1974, its clinical usefulness has been under extensive investigation. It acts as a beta-adrenergic blocking agent which reduces IOP in patients with chronic open angle glaucoma.

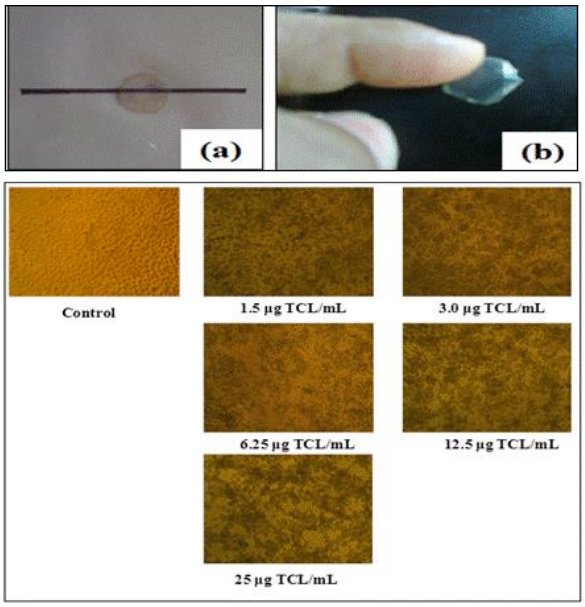
With advancements in bio implants, localized and controlled delivery of bioactive drugs is gaining fast development. Among them, therapeutic contact lenses (TCL), especially those based on poly hydroxy ethyl methacrylate (pHEMA), have gained much attention in the field of ocular drug delivery due to their optical clarity, greater mechanical strength and lesser protein adsorption. However, even most advanced of these works report TCLs that fall in the category of 'Use and throw' materials having only a very limited life span. The use of lenses with variations in dimensions, bring about inconsistency to drug dosage and also adds to the total cost of treatment. Thus, a single lens capable of sustained drug delivery and that can be re-used is highly desired. Keeping in mind the above facts and our interest to develop a novel cost effective one-time medication for glaucoma, a molecularly imprinted copolymer capable of sustained TML release with drug reloading Scheme for the Preparation of TCL ability by simple soaking procedure was designed and developed.



All the materials chosen for the fabrication of TCL, like chitosan, hydroxy ethyl methacrylate and acrylamide, were highly biocompatible. Based on the well-established free radical polymerization techniques, carboxymethyl chitosan was grafted onto hydroxy ethyl methacrylate and was further reacted with acrylamide to form a copolymer with specific binding sites. When these sites were occupied by TML, the specific functionalities of the

[5] Dr. T.S. Anirudhan, Dept. of Chemistry

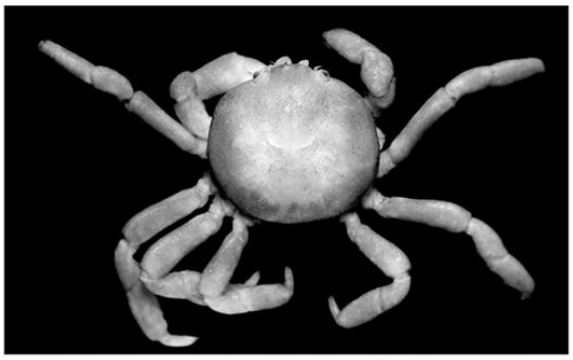
copolymer could form strong as well as reversible hydrogen bonds with it. However, when soaked with lacrimal fluid having the composition of human tear, these hydrogen bonds could be weakened resulting in the elution of TML. Due to the presence of strong binding affinities of TML with the cavity of the copolymer, it could easily get bound by simply dipping the drug eluted film in a solution of TML at pH less than 7.0.



The commercial feasibility of the fabricated film in terms of average visible transmittance, mechanical strength as well as physiological acceptance in eye cell lines are depicted in the figure shown aside.

The present investigation demonstrated the use of a reusable TCL that is able to release an anti-glaucoma drug, TML in a sustained manner and could also reload the drug molecules by simply soaking the lens with drug solution. The technique of molecular imprinting was used to prepare TML imprinted CmCS-g-HEMA-g-pAAm which was embedded onto a pHEMA matrix. The greater affinity of the functionalities helped to maintain the orientation when dispersed onto a highly hydrophilic pHEMA matrix. Since subjected to extended wear, the mechanical stability of the material was critical. Dynamic mechanical analysis revealed almost constant Young's modulus values after each cycle. The amount of drug released after each cycle was sequentially reduced but always followed Higuchi model of drug release ensuring diffusion controlled release mechanism with no polymer degradation. The maintenance of drug activity after each cycle of loading and release was another challenging aspect and the values obtained from DPPH assay showed satisfactory results which decreased only to a few extend when compared to pristine TML. In addition, the cell viability tests of the prepared copolymer showed excellent results with minimum cytotoxicity. In conclusion, the present work deals with the fabrication of a reusable TCL which can offer a more efficient as well as economical pathway for the one-time medication of glaucoma.

6. New Species Discoveries from Dept. of Aquatic Biology & Fisheries[6]



Afropinnotheres retnakarai Peter Ng and Biju Kumar 2015

Carcinoplax fasciata Peter Ng and Biju Kumar 2016

Cistopus platinoidus Sreeja, Norman and Biju Kumar 2015 (named in honour of Plantinum Jubilee of University of Kerala)

Cylindrotelphusa breviphallus Pati, Rajesh, Smrithy Raj, Sheeja, Biju Kumar and Sureshan 2017

Cylindrotelphusa longiphallus Pati, Rajesh, Smrithy Raj, Sheeja, Biju Kumar and Sureshan 2017

Kani maranjandu Biju Kumar, Smrithy Raj and Peter Ng 2017

Karkata ghanarakta Pati, Rajesh, Smrithy Raj, Sheeja, Biju Kumar and Sureshan 2017

Paguristes luculentus Komai, Reshmi and Biju Kumar 2015

Karkata kusumbha Pati, Rajesh, Smrithy Raj, Sheeja, Biju Kumar and Sureshan 2017

Moloha tumida Peter Ng and Biju Kumar 2015

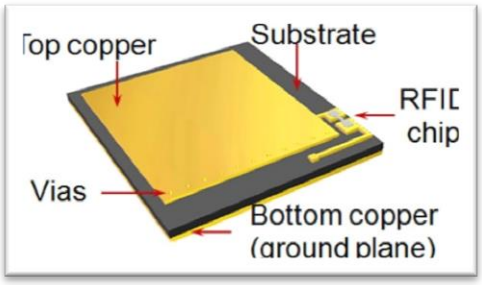
Pilarta aroma Pati, Rajesh, Smrithy Raj, Sheeja, Biju Kumar and Sureshan 2017

Pilarta punctatissima Pati, Rajesh, Smrithy Raj, Sheeja, Biju Kumar and Sureshan 2017

Typhlocarcinus kerala Peter Ng, Suvarna Devi and Biju Kumar 2017

[6] Dr. A. Bijukumar & team, Dept. of Aquatic Biology & Fisheries

7. Microwave Substrate from a Mineral Garnet Reinforced High Density Polyethylene[7]

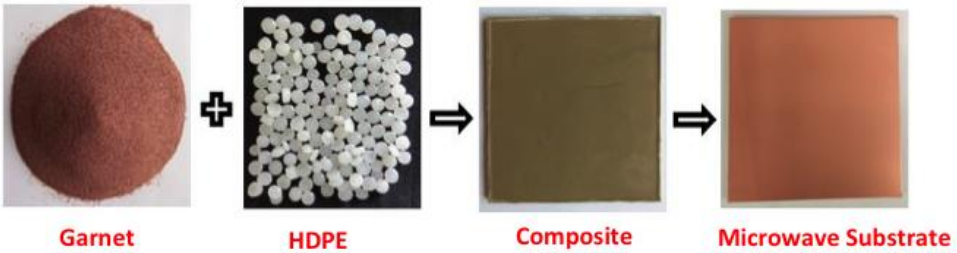


Microwave substrate

Garnets are a class of silicate minerals found extensively on different parts of the world. According to the Indian Bureau of Mines, in India, garnet deposits occur in Andhra Pradesh, Chhattisgarh, Jharkhand, Kerala, Odisha, Rajasthan and Tamil Nadu. Garnet is found to occur in beachsands along with ilmenite, rutile, sillimanite, etc. in the states of Kerala, Odisha and Tamil Nadu.

The total resources of garnet in India, as on 1.4.2010, as per UNFC system are placed at 56.96 million tonnes. They are the major constituents in earth's crust, upper mantle and transition zone. Garnets are classified according to their composition as almandine ($Fe_3Al_2Si_3O_{12}$), pyrope ($Mg_3Al_2Si_3O_{12}$), spessartine ($Mn_3Al_2Si_3O_{12}$), grossular ($Ca_3Al_2Si_3O_{12}$), uvarovite ($Ca_3Cr_2Si_3O_{12}$) and andradite ($Ca_3Fe_2Si_3O_{12}$). Since, garnets are abundantly available, cheaper and natural it will be of great potential if we can use this mineral to develop electronic components.

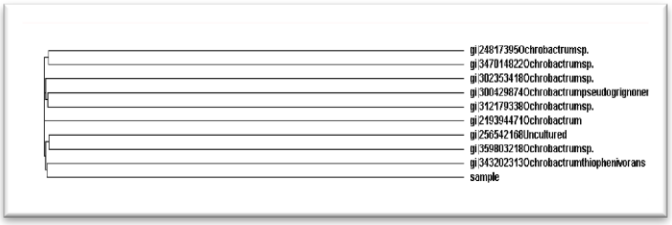
The present project aims to fabricate a cost effective and environment friendly dielectric substrate for microwave antennas using the natural occurring Garnet. Microwave substrates have a wide range of applications in communication systems such as in mobile phones, GPS systems, navigation systems, RADAR, military guidance systems etc. In the present study garnet was obtained from Indian Rare Earth Ltd., Manavalakurichi, Tamil Nadu. The mineral was a solid solution of Almandine and Pyrope. Since, it decomposed above 600 ^oC we have employed a suitable processing technique to develop the microwave substrate. Almandine-Pyrope mineral filled high-density polyethylene (HDPE) composites were fabricated using sigma-blend technique. The experimental work was done with the help from Dr. K. P. Surendran's group at CSIR-NIIST Trivandrum. The dielectric properties, thermal conductivity, coefficient of thermal expansion and tensile strength of the composites were measured. The garnet/HDPE composite showed dielectric constant in the range of $\varepsilon_r \sim 5$ & $\tan\delta \sim 10^{-4}$ at microwave frequencies (5 GHz). The dielectric, thermal and mechanical properties for 50 % garnet loading indicate that the Garnet/HDPE composites are ideal candidate for cost effective microwave substrates.

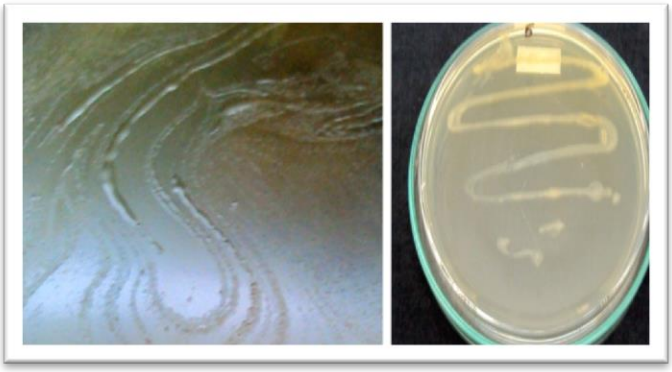


[7] Dr. Subodh. G., Asst. Professor, Dept. of Physics

8. Biodegradation of Chlorpyrifos pesticide by Ochrobactrum thiophenivorans[8]

Soil is a dynamic matrix that support, promote and sustain diversified, complex and important assemblages of microbial communities. The major biochemical transformations in soil are a result of microbial bioactivities. Soil bacteria are found to be the most abundant and dominant group with great nutritional and physiological diversity. However, the intensive cultivation of commercially important crops and excessive application of agro-chemicals especially synthetic pesticides, contaminate and reduce the quality of soil by altering the important biochemical processes of microflora. At the same time, it has been demonstrated that a fraction of soil biota can develop the ability to rapidly degrade certain soil applied pesticides, by a phenomenon of enhanced or accelerated degradation. In the Department of Environmental Sciences, University of Kerala, several chlorpyrifos degrading bacteria were screened, isolated and characterized from the agricultural soils prone to repeated pesticide application. The strain *Ochrobactrum thiophenivorans* found to be completely degrade organophosphorus pesticide chlorpyrifos in liquid media under laboratory conditions. The nucleotide sequence of *O. thiophenivorans*was was deposited in the Gen Bank database under accession number JX 241474. Chlorpyrifos, which was previously thought to be immune to the enhanced biodegradation, has now shown to be efficiently biodegraded by bacterial isolates, especially *O. thiophenivorans*, as evident from GC-MS studies. To enhance the process of biodegradation in soil it is desirable to inoculate soils with cultures efficient in degradation of such pesticide and can be used for bio-augmentation to enhance bioremediation of contaminated soil. Hence, low cost powder formulations of the bacterial strain were prepared to check viablity of cultures for field applications and is in the process of getting patented.

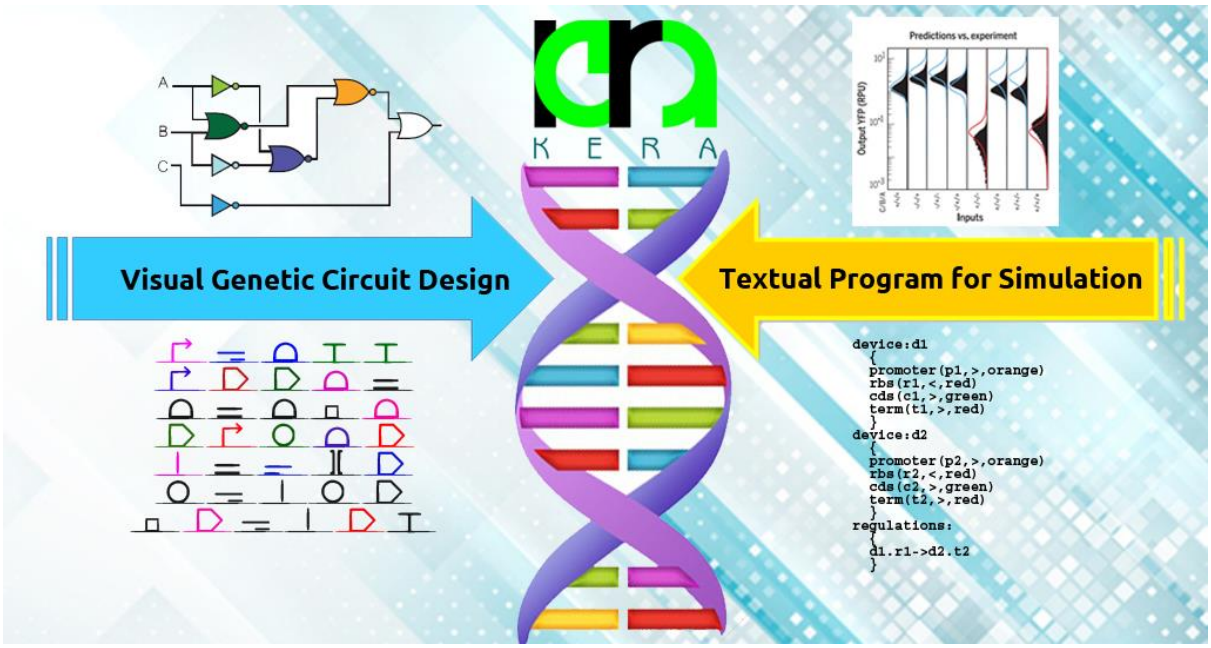




[8] Dr. Salom Gnana Thanga, Professor, Dept. of Environmental Sciences

9. KERA-Programming Language to construct synthetic organisms[9]

Developing synthetic organisms with useful applications has massive potential in the areas of therapeutics, energy, and environment. During the 21st century, the technological advancement has made DNA synthesis a robust technique. These lead synthetic biologists to develop microorganisms which can be employed for some specific task. Researchers have created synthetic organisms and proven the possibilities in the domain. But design, and prototyping of synthetic organisms though wet lab experiments have the limitation as it requires more resources. The native complexity of the biological system is also hindering biologists to construct more innovative synthetic organisms. Computational design and automation can accelerate synthetic biology to deliver more. There are a handful of tools and software which can be used in different steps of the synthetic biology experiment. This not suffices the need of genetic circuit design and automation, as it lacks flexibility.



Kera is a programming language developed by the Dept. of Computational Biology & Bioinformatics that can help to automate the process of genetic circuit design. A synthetic circuit can be designed using in Kera syntax, which is called a model. A model executed by using Kera compiler checks the requirements of the model to work in the lab experiment. Using built-in modules, a user can test the feasibility to put the genetic circuit in a host microorganism. If the model is compiled without any error, the computationally designed circuit can be taken for synthesis and further experiment in the wet lab. The Graphical User Interface helps non-programmers to write textual model. The textual model defined can be visualized as SBOLv glyphs and support SBOL [2]. Kera programming language has been receiving the attention of the community. Kera programming language can be accessed through web at http://keralabs.org/

[9] Dr. P. Umesh, Dr. Achuthsankar S. Nair, Dr. Pawan Dhar, Dept. of Computational Biology & Bioinformatics

10. Soft Computing tools for Bio-sequence Analysis [10]

The Computational Biology Group of the University of Kerala has been developing a number of tools for bio-sequence analysis to provide powerful predictions to life sciences researchers. The approach of the team has been to extract feature vectors from bio-sequences and use soft-computing tools to predict patterns.

The improved gene finding algorithm developed by the group has attracted wide attention with over 100 international citations. As a follow up, a very unique tool was also developed, to recognize short genes. This was developed in view of the fact that most gene finding tools do not take up prediction of short genes. In addition to the tools cited above, focusing on genomic data, the group has also developed tools to analyse proteomic data. The Protein Cellular Localisation Tool is one of them.

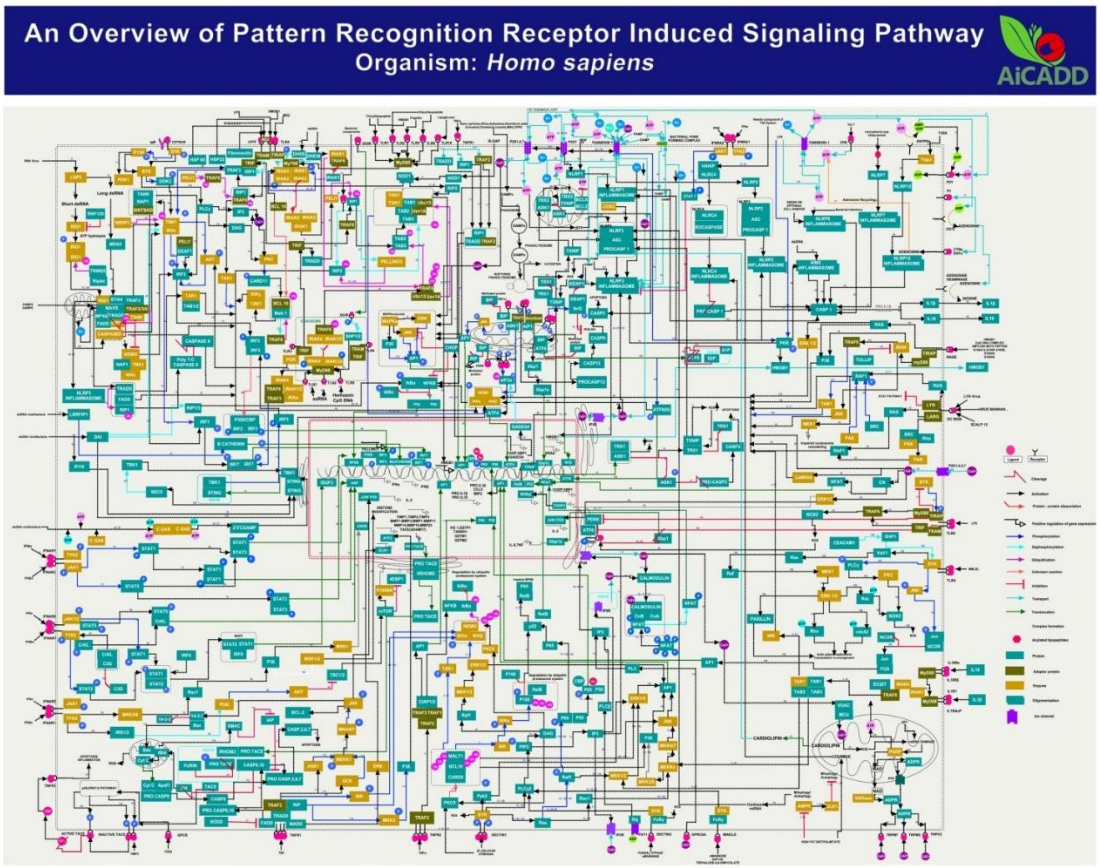
The group has also developed and launched a scientifically designed bio-sequence data set to enable benchmarking of bio-sequence data compression. This data set (published to IEEE Transaction on Computational Biology & Bioinformatics) is expected to be a long-term contribution from the group as it will serve as a much needed bench-mark for research in bio-sequence data compression.

Another major contribution from the group is in re-computing PAM and BLOSUM matrices used in sequence comparisons. Errors in these have been identified and updated matrices have been evolved. Also specialized matrices for hub protein comparisons has also been devised.

[10] Team of Researchers led by Dr. Achuthsankar S. Nair, Dept. of Computational Biology & Bioinformatics

11. Inflammation-Signaling Pathway[11]

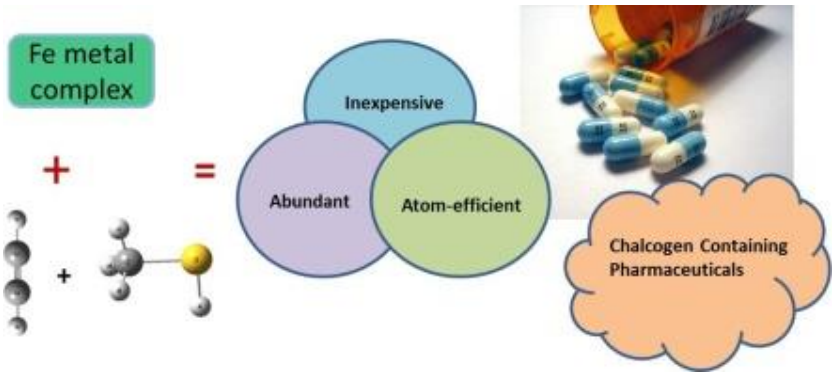
The Centre of Excellence in Ayur-informatics & Computer Aided Drug Design (AiCADD), funded by ministry of human resource development (MHRD), Govt. of India is aimed at "*producing technical as well as research expertise to enable drug discovery from Ayurveda plants endemic to Kerala, so as to more closer to a super drug based on medicinal plants from Kerala.*" Inflammation being a critical contributor of majority of the disease conditions, understanding the major components of inflammation is identified as a thrust area of research. Elucidating the molecular mechanism of IL-1 beta and TNF receptor families and the Toll-like microbial pattern recognition receptors (TLRs), which belong to the IL-1R family might be helpful in identifying novel drug targets. TLRs recognize microbial molecular patterns, hence the term pattern recognition receptor (PRR). IL-1 beta and TNFα represent the pro-inflammatory cytokines that are rapidly released on tissue injury or infection. A signaling pathway which explains the role of each receptors responsible for pattern recognition mediated inflammasome activation has been developed. Approximately 350 molecules are found involved in the signaling network.



[11] Team of Researchers in AiCADD Project, Dept. of Computational Biology & Bioinformatics.

12. Iron Complex Catalysed Atom Economic Hydrochalcogenation Reactions: Efficient Synthetic Approach towards Chalcogen Containing Pharmaceuticals[12]

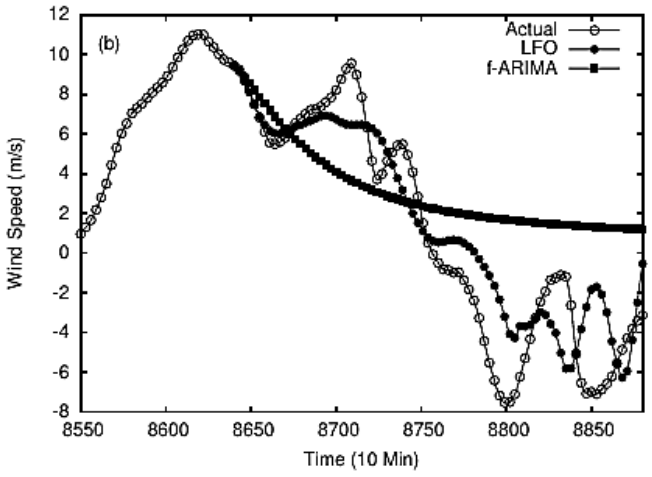
In the last few decades, the role of transition metal complexes as catalysts considerably changed the face of modern chemistry by introducing a large number of synthetic strategies. Many transition metal complexes have been categorized as outstanding catalysts capable of regio, stereo, chemo and enantio selective transformation of many chemical compounds. Until recently, the transition metal catalysts for the efficient and selective formation of C-S bonds through addition reactions were relatively rare, even though compounds with C-S and C-Se bonds find applications in many areas including pharmaceutical and material chemistry. Two kinds of catalytic strategies have been commonly employed for introducing C-chalcogen bonds – cross coupling and addition reactions. Even though the former is the most established method, these cross coupling reactions finally yield a salt as byproduct. Second method is the addition of chalcogenol or dichalcogenide bonds to the triple bond of alkynes. This method would lead to substantial practical advantage in Green Chemistry since there are no byproducts. It is worth recalling that the addition reactions are characterized by 100% atom efficiency. The regioselectivity of the reaction depends on the metal complex, type of the alkyne and nature of the substituents on the alkyne. Vinylsulfides with Markovnikov configuration finds application as building blocks for many pharmaceutical products including 6-mercaptopurine, ranitidine, cimetidine etc. In spite of its utility, regioselective synthesis of Markovnikov isomer is subject to several challenges since the addition of thiol to alkyne mostly proceeds in favour of anti-Markovnikov product. Although many transition metal complexes based on Rh, Pd, Pt etc. have been suggested as catalysts to produce these reagents through addition reactions, the relative toxicity and high price make them unattractive for industrial synthetic transformations. A better, at the same time inexpensive, transition metal catalyst would obviously expand the horizon of medicinal field by providing a cheaper alternative to prepare C-chalcogen containing drugs. Iron complexes catalyzed hydrochalcogenation has been explored computationally using density functional theory methods for the task. Our studies indicated better efficiency for the investigated iron catalysts, with high degree of regioselectivity favouring the synthetically important Markovnikov isomer. The computed turn over frequencies indicate that proper tuning will help make the iron complexes excellent candidates for industrial applications.



[12] Dr. Elambalassery G. Jayasree, Dept. of Chemistry

13. Accurate short-term wind speed prediction models for wind energy production and distribution[13]

The wind is widely recognised as a clean, economically viable and eco-friendly source of electric power. Modelling the underlying dynamics of surface wind fluctuation is significant because of its potential impacts on energy management sector. In many countries, wind energy is being connected to existing electric power grids along with traditional sources and hence it must be used as soon as it enters the grid. Accurate wind power prediction is very much useful to utility operators for various reasons such as, site optimisation, grid balancing, devising best bidding strategy with minimum possible risk, wind turbine optimal control etc. Many research organisations worldwide are working on different aspects of it with the aim of making wind energy technology more cost-effective and reliable. Focus of our work is on the short-term wind speed prediction of one to six hours ahead at intervals of 10 minutes which is very important in maintaining a cost-effective power distribution system. Wind power is a function of wind speed, so an accurate prediction of wind speed leads to improved predictions of wind power in a given wind farm. For a range of wind speeds, the amount of wind energy produced from a wind turbine is proportional to the cube of wind speed, so any small improvement in short term predictions of wind speed can significantly improve predictions of wind power.



Although many time series analysis (ANN, ARMA, ARIMA etc.) and meteorological modelling (NWP, Prediktor etc.) techniques are available to represent the wind speed dynamics, the prediction error could not be reduced significantly compared to the method of persistence. Most of the studies on wind speed prediction reported in the literature are based on statistical methods or the probabilistic distribution of the wind speed data, assuming that the underlying dynamics wind speed fluctuations are stochastic in nature. However, with the advent of chaos theory, it is noted that irregular random-like fluctuations can also arise from a deterministic system with a low dimensional chaotic character. In other words, since the chaotic systems are very much sensitive to the initial condition it may exhibit quite complex behaviour like stochastic systems affected by noise that attributes to the prediction error. Even if the long-term prediction is impossible for a chaotic system, an accurate short-term prediction is always possible using a deterministic model. We investigate the deterministic nature of the underlying dynamics of surface wind fluctuations by carrying out a detailed non-linear time series analysis on wind speed data measured at various locations across Indian sub-continent. The results of the analysis strongly suggest that the underlying dynamics is deterministic, low-dimensional and chaotic across all locations. These results open up the possibility of developing deterministic models capable of accurate short-term

[13] Dr. K. Satheesh Kumar, Dept. of Future Studies.

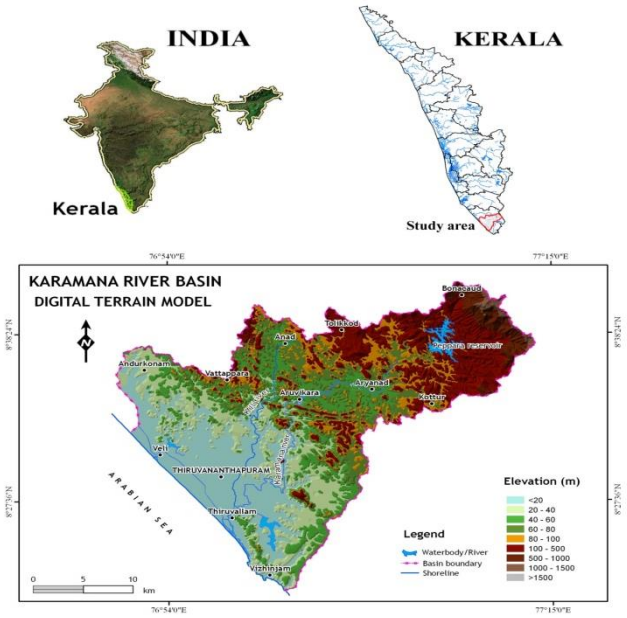
prediction. Interestingly, this is one example of a naturally occurring time series showing chaotic behaviour as most of the chaotic systems are confined to laboratories.

Motivated by the above observations, the research group at the Dept. of Futures Studies headed by Dr. K. Satheesh Kumar investigated further the possibility of developing deterministic prediction models capable of accurate short-term prediction, which is important in various stages of wind energy management such as wind turbine predictive control and wind power scheduling. The statistical analysis of the deterministic model predictions carried out by them, utilizing wind speed measurements at different geographical locations, shows that the predictions are remarkably accurate up to one hour with normalized root mean square error of less than 0.02 and reasonably accurate up to three hours with an error of less than 0.06. Comparison of the results with f-ARIMA model predictions shows that the deterministic models with suitable parameters are capable of returning improved prediction accuracy and capturing the dynamical variations of the actual time series more faithfully. These methods are simple and computationally efficient and require only records of past data for making short-term wind speed forecasts within tolerable margin of errors.

14. Radon Isotope in Water – a Tool for Environmental Health Assessment and Water Management[14]

Radon (^{222}Rn) is a colourless, odourless, inert and radioactive noble gas with a short half-life period ($t_{1/2}$= 3.8 days), emanating from rocks and soils, and is formed as a result of alpha decay of Radium (^{226}Ra) in the Uranium decay series. Out of the 37 radioactive isotopes of radon, ^{222}Rn is the most stable one. It has wide applications in hydrogeological and geological investigations including surface water-groundwater interaction, submarine groundwater discharge, earthquake prediction, locating geological faults, mineral exploration etc. In the water resource sector, it is a reliable tool for assessing the environmental health related to content of radon in water and its concentration should be below 11,000 Bq/m^3 for drinking purpose as suggested by USEPA. It is also useful for surface water and groundwater management as it is enriched by about 2 to 4 orders of magnitude in groundwater relative to surface water. In Kerala, radon application in hydrological studies and its health effects is still in budding phase. Hence, a three years major research project funded by DAE-BRNS, Mumbai, has undertaken in the Karamana river basin, Trivandrum. About 75 sampling sites have been selected grid wise (3×3 km) for detecting radon content in groundwater in Karamana river basin from highland to coastal region during dry season and the water was analyzed using RAD7 radon detector (Durridge Company, USA). Wide spatial variation exist in the basin and a few stations exhibit 4 to 5 times the permissible limits and a well in Bonacaud in the highland region registered the highest value. It is high in wells near to lineaments. This data is useful in groundwater prospecting particularly in water scarce regions, linking river water and groundwater in terms of identifying aquifer recharge areas as well as identification of radon risk areas in the study area.

Onsite measurement of radon concentration using RAD7



[14] Dr. Sabu Joseph & Team, Dept. of Environmental Sciences

15. Multi-Classifier System for Automatic Mitosis Detection in Breast Histopathology Images using Deep Belief Networks[15]

Mitotic count is an important diagnostic factor in breast cancer grading and prognosis. Detection of mitosis in breast histopathology images is very challenging mainly due to diffused intensities along object boundary and shape variation in different stages of mi- tosis. This paper demonstrates an accurate technique for detecting the mitotic cells in Hematoxyline and Eosin (H & E) stained images by step by step refinement of segmentation and classification stages. Krill Herd Algorithm (KHA) based Localized Active Contour Model precisely segments cell nuclei from background stroma. A Deep Belief Network based Multi-Classifier System (DBN-MCS) classify the labelled cells into mitotic and nonmitotic groups. The proposed method has been evaluated on MITOS dataset provided for MITOS- ATYPIA contest 2014 and also on clinical images obtained from Regional Cancer Centre (RCC), Thiruvananthapuram, which is a pioneer institute specifically for cancer diagnosis and research in India. The algorithm provides improved performance compared to other state–of–the–art techniques with average F-score of 84.29% for the MITOS dataset and 75% for the clinical data set from RCC.

The shape of nucleus is quite different in different phases, just as in the telophase a mitotic cell has two distinct nuclei. However, they need to be counted as one single mitosis since they are not separate cells. The detection process becomes time-consuming and extremely difficult due to large variety of shapes, size and low frequency of nuclei undergoing mitosis. In addition, irregular illumination, non-uniform stain variation, and presence of lymphocyte nuclei makes the detection process more challenging. Currently, compared to conventional glass slides, Whole Slide Imaging (WSI) together with Computer-Aided Diagnosis (CAD) greatly improves the consistency and objectivity of histopathology analysis results. The techniques already reported in the literature make use of hand crafted features which specifies morphology and intensity of mitotic nuclei. In such cases, accuracy of detection process is reduced due to large shape variation and indiscriminant nature of nuclei features. Though deep learning techniques provide good recall rate compared to other methods, training a CNN for a real world problem is very much computation intensive and GPU is become a necessity to speed up the training process. Moreover, it demands huge samples of annotated images to learn massive number of parameters.

The accuracy of mitotic evaluation depends up on specific nature of detection, segmen- tation and classification procedures employed in the processing framework. This paper at- tempts to obtain better performance matrices, by careful design of algorithms at each stage starting from initial pre-processing to final classification stage. At the start of mitosis the chromosomes condense and the mitotic nucleus appears denser than the non-mitotic nucleus.

---

[15] Ms. Sabeena Beevi K., Madhu. S. Nair., Dept. of Computer Science, *This work is published in IEEE Journal of Translational Engineering in Health and Medicine, Vol.5, No.1, Article Sequence Number:4300211, pp.1-11, April 2017.*

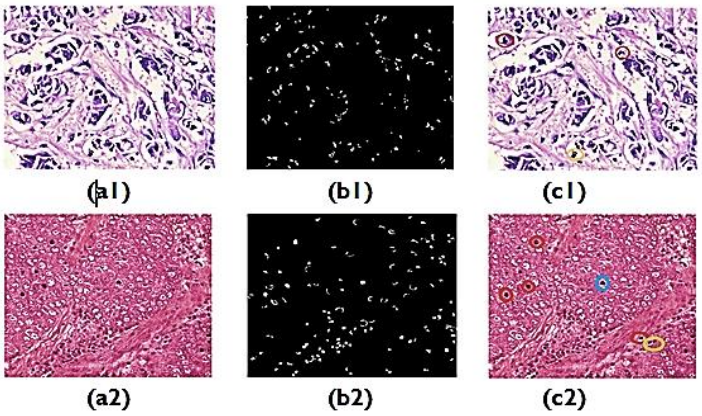


Figure 1: Visual results. (a1), (a2) Original image from clinical and MITOSIS data set, (b1), (b2) Initial contour provided by KHA, (c1), (c2) Classification results (nuclei shown in Red circles: TP, Yellow circles: FP, Blue circles: FN)

At the end of telophase, a furrow appears in the cell membrane which deepens and finally splits the cytoplasm into two, thus producing two new cells. But this change can be manipulated as good features for classification only if the cells are precisely segmented. Hence, Localized Active Contour Model (LACM) is used for segmentation of cells to exploit variation in cell size through the different phase of mitosis. Since the ACMs are susceptible to initial curve placement, an optimal multi thresholding technique based on Krill Herd Algorithm (KHA) is utilized for initializing the nuclear region for accurate contour segmentation. The KHA exhibits superior performance in optimizing nuclei regions by fast convergence. Moreover, a Multi Classifier System (MCS) further improves the predictions from various individual classifiers. Though MCS has been applied for various applications, they are seldom used for mitotic detection. The idea of this work is to incorporate local information for detection and segmentation techniques along with a multi-classifier system for accurate labeling of mitotic cells.

15. Malaria Parasite Detection from Peripheral Blood Smear Images using Deep Belief Networks[16]

Malaria is a fatal epidemic illness that is generated by Plasmodium parasites. According to the WHO, this parasite is responsible for passing to more than two million individuals and approximately 300 to 500 million infection cases annually. An early detection of malaria infection enables specialists to prescribe appropriate medication in a timely manner. Although various new techniques are available for malaria diagnosis, conventional manual microscopy examination of peripheral blood smears is the gold standard and the most prevalent diagnostic technique for malaria. The accuracy of the microscopy diagnosis of malaria depends on the pathologist's expertise in the subject. This procedure is tedious and erroneous due to subjectivity, which can lead to incorrect and inconsistent diagnoses and could result in an incorrect treatment and even loss of life of the patient. Hence, conventional microscopy diagnosis cannot be recommended as a safe testing strategy and recent studies have revealed that the concurrence rates among pathologists for the identification of this epidemic have alarmingly decreased.

Due to this drawback, the primary objective of this study is to develop a computerized malaria detection framework that replicates the conventional gold standard manual microscopy diagnosis of malaria to identify malaria parasites in blood smear images.

None of reported research works have been proposed based on computer vision and pattern recognition perceptive on automatic malaria parasite identification in peripheral blood smear images. But none of these studies could attain the desirable accuracy which can replace the human interference in the diagnostic procedure. Recent studies in the domain of deep learning indicate that there is a profound increase in the use of deep belief networks (DBNs) in medical diagnosis due to the advancements in the effective layer-by-layer learning method. Hence this work proposes an automated decision support system for malaria parasite detection in human peripheral blood smear images using deep belief networks. The fundamental goal of this work is to implement an accurate and robust statistical model using a Deep Belief Network (DBN) to detect the parasite infected blood cells in peripheral blood smear image, which is considered to be the most crucial step in the automated malaria diagnosis system.

In the proposed method, we developed a trained model using a DBN for malaria parasite detection in peripheral blood smear images. Deep belief networks (DBNs) are probabilistic generative models that consist of various layers of hidden variables, with associations among the layers but not among the units within each layer. A DBN is composed of stacks of trained restricted Boltzmann machines (RBMs), which are unsupervised networks where each sub-network's hidden layer serves as a visible layer for the next. In this method, we

[16] Dhanya Bibin, Madhu S. Nair and P. Punitha, *The above research work has been published as a research article in IEEE Access, Vol.5, No.1, pp.9099-9108, May 2017. (SCI Indexed, Impact Factor: 3.244)*

used image descriptors as input to the visible units of the DBN. To extract the image descriptors, we first segmented out the blood smear image to extract all the purple coloured objects (which are also called as stained objects) using level set method. Fig 1 illustrates the different steps of level set segmentation method. Since the retrieved stained objects include parasites and non-parasites, we extracted suitable image descriptors to distinguish between them. In this study, the DBN is trained by initializing the visible layer by the concatenated feature of color and texture. In our method, there are 4 hidden layers, and every hidden layer is independently trained as an RBM. To initialize the weights, the RBM uses contrastive divergence (CD) pre-training. The states of the hidden nodes derived from the trained RBM are used as inputs to the next layer of the RBM. A series of RBMs are trained in a similar way. Finally, a DBN is constructed by stacking the prepared RBMs. The newly formed DBN adds a final layer of variables that represent the desired output values and performs the discriminative tune up using backpropagation. The DBN architecture used in this study is shown in Fig. 2.

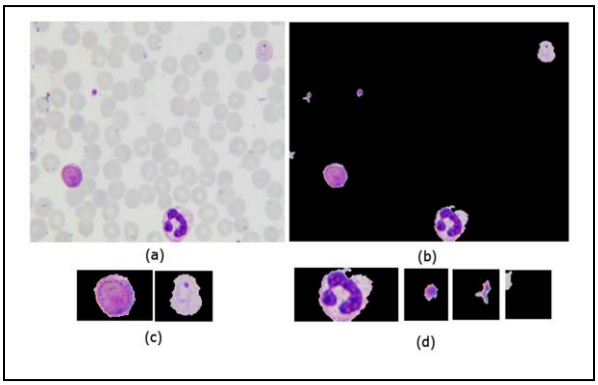


Fig 1: (a) Peripheral blood smear image (b) Segmented Image. (c) Parasite objects (d) Non-parasite objects

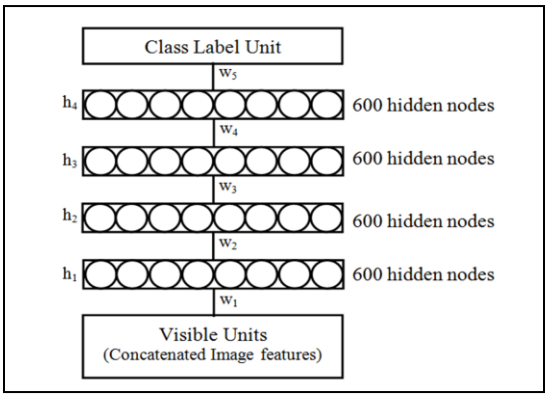


Fig 2: The DBN architecture of the proposed method.

The experiments used 650 RGB images of malaria infected peripheral blood slides consisting of non-overlapping fields of nine peripheral blood smear slides. All experiments were performed on the training data to obtain an optimized DBN architecture to differentiate the blood cells as parasites and non-parasites, and the best performing architecture was utilized to calculate the accuracy of the test data. The optimum size of the DBN architecture used in this work is 484-600-600-600-600-2, in which the visible layer has 484 nodes and the output layer has 2 nodes with 4 hidden layers containing 600 hidden nodes in every layer. The proposed method has performed significantly better than the other state-of-the-art methods in the area of automated malaria diagnosis with an F-score of 89.66%, a sensitivity of 97.60% and specificity of 95.92%. This study is the first application of a DBN for malaria parasite detection in human peripheral blood smear images. This can help to advance machine-supported pattern recognition of malaria parasites. This can also be applicable in tele-pathology to provide accurate and cost-effective prognosis of malaria in rural areas where experienced pathologists are not available. Since this study has used generic pattern recognition and deep learning architecture, it could easily be leveraged for the diagnosis of a variety of other haematology-related abnormalities.

16. "Junkomics": Making treasure out of Junk DNA[17]

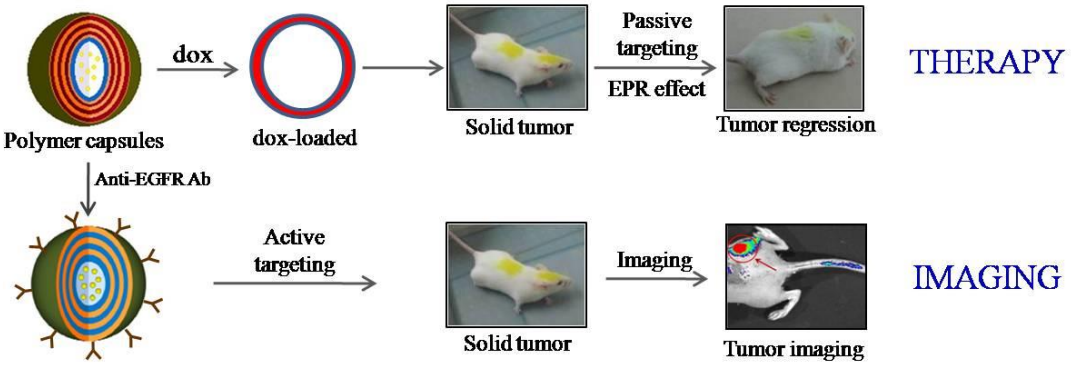
There are three major forms of DNA sequences: Protein coding DNA, RNA coding DNA and Not expressing DNA. Historically, RNA coding and Not expressing DNA is considered as 'Junk'. However, people have found RNA coding fraction has bulk of genomic activity. Still sizable fraction of genome in *Escherichia coli*, 10-15% code for either RNA or protein. The non-protein coding portion of the Genome is called 'Dark matter of the Genome'. We invented a new technique in 2009 for artificially making functional genes from the not coding region of E.coli K-12 strain. These artificial genes were named as EKA which in Sanskrit meaning first (Dhar et al., 2009). Based on this pioneering work, our lab currently focuses on studying the Dark matter genome of organisms such as *Escherichia coli*, *Saccharomyces cerevisiae* and *Drosophila melanogaster* to identify functional molecules toward useful applications. We named this novel area as '**Junkomics**' (Making proteins/peptides out of 'Junk' DNA). One of our studies shown that novel functional proteins can be made from Pseudogenes of *Saccharomyces cerevisiae* (Shidhi et al., 2015). Our studies revealed that proteins/peptides generated from the intergenic region were involved in various functions such as signal transduction, immunity, metabolism, DNA binding etc. Moreover many intergenic peptides with therapeutic application were also identified. Here, we used a peptidomimetic approach to predict the function of peptides. Five lead micropeptides with drug like properties were identified from *Escherichia coli* as best candidates for drug design against Alzheimer's disease(AD) and a total of 7 antigenic epitopes were identified that can be applied for epitope based vaccine design against AD (Navya et al., 2015). Peptides having anti-microbial and anti -cancer activity were identified from the intergenic region of *Escherichia coli, Saccharomyces cerevisiae* and *Drosophila melanogaster* (Deepthi et al., 2016: Vipin et al., 2015). The entire results of the study were deposited in EKA Knowledgebase, which is an in-house database to explore more on the functional aspects of noncoding DNA. Currently an extensive study is being carried out to uncover possible functional protein/peptides with potential therapeutic and industrial application from noncoding RNA, Introns etc. *In vitro* and *In vivo* studies have been initiated to prove the outcomes. Above studies demonstrates that non coding regions has untapped potential of making useful proteins and peptides which would have a wide range of applications including protein engineering and therapeutics. This work has received global attention with vide number of industrial application.

[17] Team of Researchers led by Dr. Pawan K. Dhar, Dept of Computational Biology & Bioinformatics

17. Terbium doped lanthanide polymer capsules for cancer cell imaging and drug delivery[18]

Cancer nanotechnology aims to develop safe and biocompatible systems that can achieve specific drug targeting and delivery to the tumor site, thereby diminishing the toxicity whilst maintaining therapeutic effectiveness of the drug. The EPR (enhanced permeability and retention) effect and poor lymphatic drainage of tumor vessels have opened way for passively targeting nanoparticles to the tumor site. Layer- by- layer (LbL) deposition technique can be utilized to synthesize multilayered nanoparticles that can act as novel systems for systemic drug delivery. PEGylated polymer-based drug delivery systems curb immunogenicity and improve the bioavailability of cancer therapeutic drugs at tumor site. Nanotechnology also offers new methods for development of harmless imaging agents that can find application in early diagnosis of cancer. Lanthanide doped nano probes that are characterized by up conversion or down conversion luminescence have surfaced as potent non invasive device for visualizing morphological features of cells and tissues.

We have developed non toxic, LbL assembled polymer capsules encapsulating Tb^{3+} doped $LaVO_4$ nanoparticles for delivery of cancer therapeutic drug doxorubicin that can be targeted to tumor site actively or passively. The polymer capsules could release the drug in a controlled manner in both *in vitro* and *in vivo* experimental models and were found to efficiently obliterate cancer cells without affecting normal cells. The Lanthanide doped nanoparticles present within the core contributed to the imaging capability of the polymer capsules. The polymer capsules thus provide a platform for the formulation of multifunctional systems for cancer cell imaging and drug delivery (Ref: CR Dhanya, J Jeyaraman, PA Janeesh, A Shukla, S Sivakumar **Annie Abraham** Bio-distribution and in vivo/in vitro toxicity profile of PEGylated polymer capsules encapsulating LaVO 4: Tb 3+ nanoparticles for bioimaging applications. ***RSC Advances.*** 6 (60), 55125-55134 (2) 2016 **(IF: 3.108)**

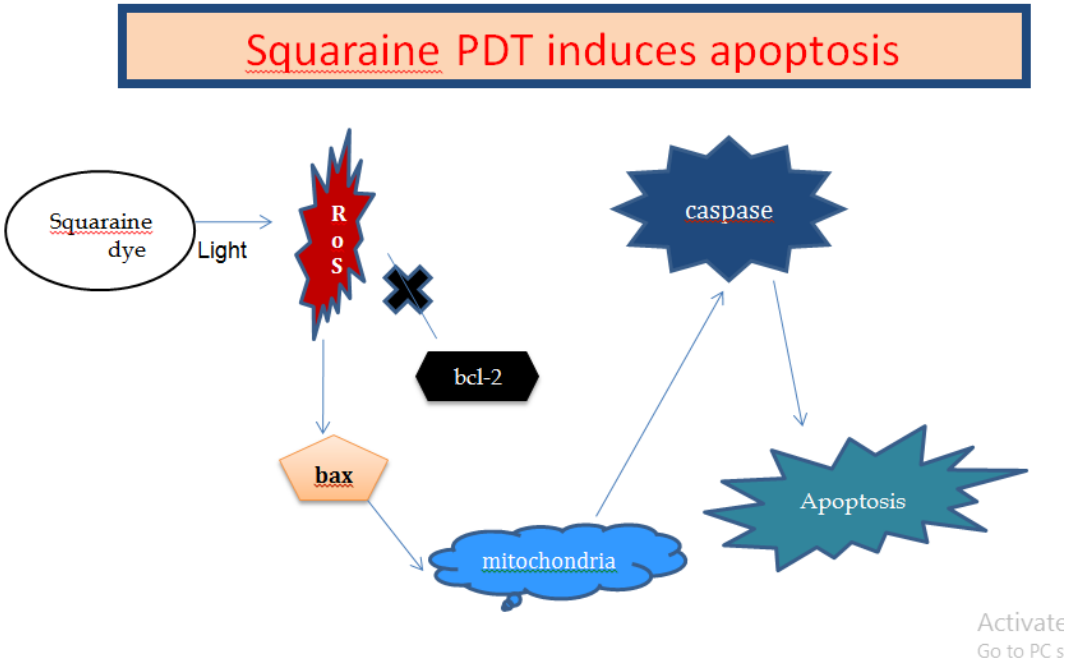


[18] Dr. Annie Abraham, Dept. of Biochemistry

18. Symmetrical diiodinated Squaraine dye as an ideal candidate for photodynamic therapeutic (PDT) applications in cancer treatment[19]

Cancer, known medically as malignant neoplasia, is a broad group of diseases involving unregulated cell growth. Photodynamic therapy (PDT) is a form of phototherapy using nontoxic light-sensitive compounds known as photosenstizers that are exposed selectively to light, whereupon they become toxic to targeted cancers, precancers or diseased cells. PDT is recognised as a treatment strategy which is both minimally invasive and minimally toxic.

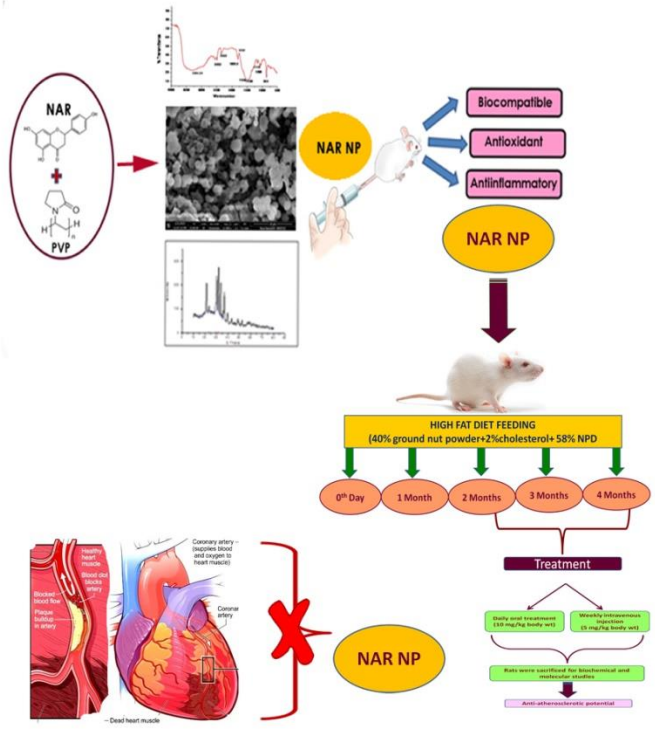
Symmetrical diiodinated squaraine is one of the newly developed photosensitizers. We focused on the therapeutic efficacy of the compound for PDT applications in *in vitro* and *in vivo* experimental cancer models. The preliminary studies on cancer cell lines showed that cytotoxicity is induced by the synergistic effect of light and dye. Neither the dye nor the light alone is toxic to cells. The dye is retained only in tumor cells and also non toxic to normal cells in the body. The dye is also effective in curing skin tumor as evident from the *in vivo* studies on skin tumor induced mice. Hence, the dye (Symmetrical diiodinated squaraine) is a promising agent that finds application in photodynamic therapy with high selectivity in killing cancer cells without any significant toxicity to the normal tissues. We have proposed the mechanism of tumor destruction mediated by squaraine PDT and it was found out that the tumor demolition is through apoptosis. The goal of any therapeutic strategy is to provide impact on the target tumor cells with limited detrimental effect to normal cell function. Our study with squaraine PDT is found to satisfy this criterion (Ref: Soumya M.S, Gayathri Devi D, Shafeekh K.M, Suresh Das and **Annie Abraham**. Photodynamic therapeutic efficacy of symmetrical diiodinated squaraine in in vivo skin cancer models. ***Photodiagnosis and Photodynamic Therapy***, 18 (2017) 302–309 **(IF: 2.219)**



[19] Dr. Annie Abraham, Dept. of Biochemistry

19. PVP coated Naringenin nanoparticle as a novel therapeutic agent for drug delivery applications in atherosclerosis[20]

Atherosclerosis is a disease with global distribution which afflicts man severely and causes great mortality and morbidity. Nanoparticles offer a great possibility for biomedical applications in atherosclerotic research. Nanonization is one of the drug delivery process which help to overcome a material's poor aqueous solubility, dissolution and bioavailability. Polymer–drug conjugates have drawn considerable interest from researchers working in medicine, pharmaceutics and chemistry. Naringenin (4′,5, 7-trihydroxyflavanone, NAR), a natural flavonoid aglycone of naringin, is widely distributed in citrus fruits , tomatoes , cherries , grapefruit and cocoa. Clinical relevance of NAR is limited by its low solubility and minimal bioavailability, we have proved that, polyvinyl pyrrolidone (PVP) coated NAR nanoparticle (NAR NP) will be an ideal drug delivery system in experimental atherosclerosis. The study suggests that the safe NAR NP can be used to reduce the dosage of naringenin, improve its bioavailability and can be effectively targeted for ameliorating the complications of atherogenic progression and this is one of the first approach in using nanomaterials for drug delivery applications in experimental atherosclerosis (Ref: Pradeep Kumar R., & **Annie Abraham**, (2017). Inhibition of LPS induced pro-inflammatory responses in RAW264. 7 macrophage cells by PVP coated naringenin nanoparticle via down regulation of NF-κB/P38MAPK mediated stress signaling. ***Pharmacological Reports***, 69,908–915 **(IF: 2.587).**



[20] Dr. Annie Abraham, Dept. of Biochemistry

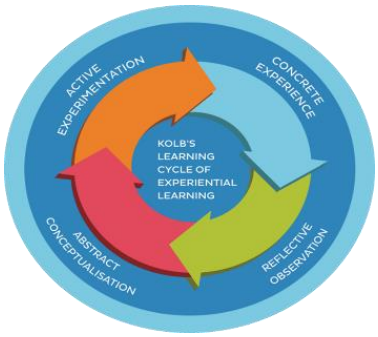
20. Amelioration of experimental cataract using indigenous medicinal plants[21]

Our laboratory has reported the potential of many medicinal plants in preventing the onset and maturation of cataract on *in vitro/in vivo* models. The model employed for the study is selenite cataract, a globally accepted model for studying oxidative stress induced cataract. *Cochlospermum religiosum, Dregea volubilis, Emilia sonchifolia, Brassica oleracea var. italic, Vitex negundo, Moringa oleifera, Vernonia cinerea*, *Cassia tora* etc. are some of the plants studied. The image below is a visible result of cataract prevention by one of the previous mentioned plant. First one isnormal, second one is cataract induced and third one is lens of animal pre-treated with the plant extract (Ref: Sreelakshmi V and **Annie Abraham**- Anthraquinones and flavanoids of *Cassia tora* leaves ameliorate sodium selenite induced cataractogenesis in neonatal rats. ***Food and Function***. 7 (2016) 1087-95**(IF: 3.247)**

[21] Dr. Annie Abraham, Department of Biochemistry

21. Crowdsourcing Mobile Applications as Tools for Research & Experiential Learning in Environmental Science[22]

Future workforce will be faced with complex problems that require interdisciplinary approaches. Environmental sciences is critical to STEM skill set of 21st-century workforce. The present research propose that new technologies (crowdsourcing apps) that are being used in research settings to solve interdisciplinary problems may also be used in STEM education for experiential learning of environmental science. Environmental science is especially suited to experiential learning models because of the strong links between environmental change and human activity. Technological advances makes it possible to implement hands-on approach for environmental science learning in K-12, using tools that were accessible only to laboratories and universities until the last few years. All important aspects identified by experiential learning theories can be effectively incorporated through the proposed hands-on approach to environmental science education.



The experiential theory proposed by Kolb takes a holistic approach that incorporates the influence of experiences, cognitions, environmental factors, and emotions on the learning process. Kolb (1984) asserts that for the learner to be effective in gaining knowledge or skill, he or she has to fully engage in four main stages. In the experiential model, Kolb described two different ways of grasping experience: Concrete Experience and Abstract Conceptualization. He also identified two ways of transforming experience: Reflective Observation and Active Experimentation. These four modes of learning are often portrayed as a cycle. According to Kolb, concrete experience provides the information that serves as a basis for reflection. From these reflections, we assimilate the information and form abstract concepts. We then use these concepts to develop new theories about the world, which we then actively test. Through the testing of our ideas, we once again gather information through experience, cycling back to the beginning of the process.

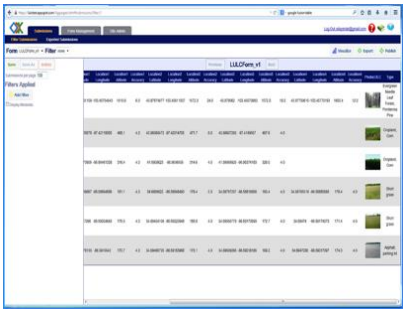
PEERA: The Public Environmental Education and Research App

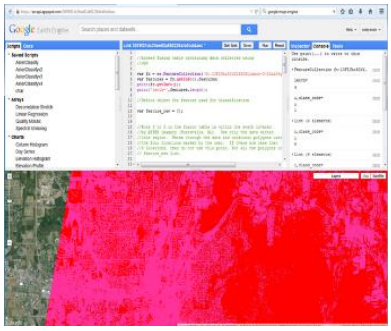
Changing of land cover and land use (deforestation, urbanization etc.) is one of the major influences that humans have on the environment. Understanding and predicting how human settlements change land cover is important and is often related to socioeconomics. Experiential learning model could be utilized to understand drivers of land cover change. The Public Environmental Education and Research App (PEERA), based on the Open Data Kit

[22] Dr. Divya C. Senan, Department of Education, *Acknowledgement: This work is supported by Raman Post-doctoral Fellowship grant by the University Grants Commission, India.*

(ODK), is developed for populating a GEE based LULC ground truth database which may act as an experiential learning tool for environmental education. The Open Data Kit (ODK) based application is intended for crowdsourcing of ground truth information regarding the nature of Land Use and Land Cover (LULC).

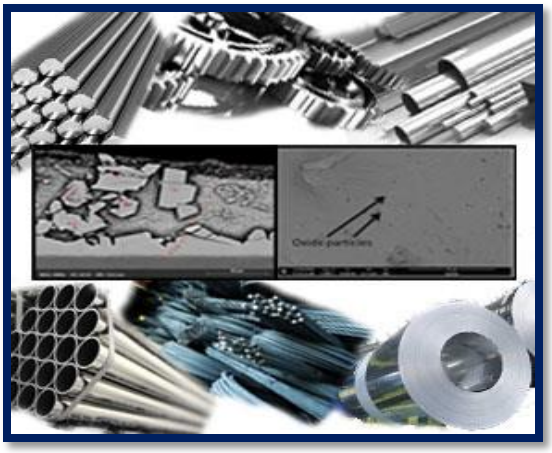
In the experiential learning cycle, during the concrete experience phase, Students use the Android mobile application to collect a sample of geo-locations f or different land cover types. While making reflective observations in the next stage, with the help of a Google fusion table, they use this data to classify satellite imagery and understand how their neighbourhoods have changed over the years. They can visually see how urban regions grow, crop lands shrink and forests disappear. They create abstract conceptualisations based on their experiences and reflective observations. Only when students both understand and experience the natural environment will they be able to adequately address environmental problems and find creative solutions for the future of humanity on the earth which finally lead them to active experimentations. Students generate new knowledge or theories to make decisions or to solve real life problems.





We propose that crowdsourcing applications and other associated technologies may be utilized to implement experiential learning in K-12 curriculum. The information generated by the students can also be utilized by the researchers. Thus students will be both recipient and generator of knowledge. We are developing a series of dual purpose crowdsourcing apps and associated curricular implementation for use in schools within US and India.

22. Development of Industrial Galvanized Iron/Steel[23]



Development in Surface Engineering and Surface Functionalization are very important in electrochemical and mechanical industries. Different types of functionalization including catalytic coatings find wide spread application in industrial electrochemical catalysis, processes, sensors and energy generation. Apart from the development of highly efficient catalytic coatings for hydrogen and energy generation, surface engineering of steel is an important research focus in our department.

Macro and micro structures of GI articles

Hot dip galvanized steel is used in different environment for various purposes because of its high tolerance to corrosion. Galvanized steel has a strong protective coating of zinc that is metallurgically bonded to it. The life and durability of steel can be improved when coated with zinc. Zinc offers a very good combination of galvanic and barrier protection. However galvanized coatings suffer a drawback due to formation of biofilm on the coating surface that increases the rate of corrosion. Therefore many research groups have been working to impart functional properties such as antifouling property to the existing galvanized coating. This property is required for some specific fields such as ship building industry, structural steel works on docks, water supply, poultry farms, food industry etc. Today, however there is no such commercial galvanized product available which offers antifouling property in addition to high corrosion resistance. The industrial research team sponsored by TATA Steel Industries Ltd. Has explored transition metal oxide based nanocomposites to impart antifouling property in hot dip galvanised coating. These composites imparted antifouling properties on the surface of galvanic coating. Wettability of the composite in the molten bath can result in enhanced interior incorporation and long lasting antifouling property of galvanic coating. Development of such coatings and technology for such processes are in progress as a joint research effort of University of Kerala and TATA Steel.

[23] Dr S.M.A. Shibli, Department of Chemistry

23.Njavara Rice (*Oryza sativa Linn*)[24]

Njavara is an indigenous medicinal rice variety traditionally used in Ayurvedic system of medicine practiced in Kerala, India. Previous scientific reports on agronomic aspects, genetic characteristics, proximate composition, starch characteristics, antioxidant activity, phytochemical investigations and bioactivity of the compounds reveals that Njavara is a cryptic variant within the traditional rice gene pool in Kerala distinct from that of syntopic traditional cultivars and confirms that it is a potential source of antioxidants, substantiating its use in indigenous medicine.

Phytoceutical prospecting has revealed significantly higher levels of nutrients, antioxidant, anti-inflammatory and chemical indices in "black glumed" Njavara, compared with staple, pigmented (Palakkadan Matta) and white (Sujatha) rice varieties. The phytochemical investigations and spectroscopic studies revealed the occurrence of a flavonoid, tricin at significantly higher levels in diethyl ether fraction of methanolic extract of Njavara Black (NB) rice bran compared to staple varieties. Methanol extracts of Njavara yellow rice (NYr) and bran (NYb) also has been shown to have significantly higher antioxidant activity than other varieties. NYb showed a higher anti-inflammatory effect and higher chemical indices (phenolic content; flavonoid content; proanthocyanidin content; and phytate content per gram of dry weight of bran) than NYr and staple varieties. The content of bioactive compounds, oryzanols (659 µg/mL) and tricin (24.58 mg/100 g bran), were higher in NYb than in other varieties.

Invivo and invitro studies in our laboratory have described the new aspects of inflammatory suppression by the Njavara rice by evaluating the role of active constituent, tricin in the regulation of production of various pro-inflammatory markers by human peripheral blood mononuclear cells and HUVECs stimulated with lipopolysaccharide. The effect of tricin in actively inhibiting endothelial activation has been studied. Following its medicinal values and findings of the predominant bioactive compounds and its impact in invitro studies, the Rice bran oil from Njavara was studied and examined for its anti-atherogenic effect owing to its use in traditional medicine and therapies for various inflammatory diseases. This showed that Njavra rice bran oil (NjRBO) possesses anti-atherogenic property by modulating lipid metabolism, upregulating genes of reverse cholesterol transport (RCT) and antioxidative defense mechanism through the induction of PON1 gene expression and activities of SOD and catalase. The progression study (90 days) and regression study (180 days) in hypercholesterolemic rabbits confirmed that the Njavara rice bran oil supplementation decreases the inflammatory milieu in the aortic endothelial cells, monocytes and macrophages, indicating that treatment with NjRBO reduce the inflammation caused within the plaque, enhance emigration of excess cholesterol out of the arterial wall & lead to remodelling of the damaged intimal layer, that are processes involved in plaque regression. These results demonstrate that treatment with NjRBO accelerates regression of atherosclerotic plaques. In conclusion, it is established that Njavara has significant anti-atherogenic, lipid lowering and anti-inflammatory effects. Hence dietary interventions with NjRBO can be considered as a valuable preventive and treatment strategy for atherosclerosis.

[24] Dr Helen Antony, Dept. of Biochemistry

Miscellaneous

Dr. S. Sankara Raman, Dept. of Optoelectronics: (i). Developing a method of improving agricultural yield using nanoparticles. **(ii).** Developing a method of using futile diesel soot to fruitful light emitting material for low cost, energy efficient light sources. **(iii).** Developing green synthesis for boron carbide for reactor and refractory applications.

Dr. Yamuna A., Dept. of Optoelectronics: Research and Development of bioinspired molecular electronic devices, quantum dot luminescent devices, integrated MEMS and advanced biomaterials for electronics and photonics applications.

Dr. A.P Pradeepkumar, Dept. of Geology: Disaster mitigation: Recently established an experimental Vetivar system (Chrysopogen zizanioides) along the banks of Meenachil river with a view to reduce pollution and enhance environment sustainability, and this was implemented through the National Rural Employment Generation Scheme (NREGS).

Dr. A Ganagaprasad, Dept. of Botany: (i). Biodiversity conservation and sustainable utilization through biotechnological interventions. **(ii).** Conservation of rare and endangeared medicinal and ornamental plants of Western Ghats and bioproduction of pharmaceutically and industrially important high value natural compounds from selected medicinal plants using cell culture technology.

Dr. Suhara Beevy, Dept. of Botany: Research work concentrated on the wild germ plasm of the cultivated plants like cucurbits, amorphophallus, sesamumand Passiflora: The study is mainly on germplasm characterization, screening of elite germplasm in terms of nutritional quality, resistance to drought and the chemical constituents in the wild varieties. The findings shall help the farmeres and breeders to incorporate the elite characters in the programmes for crop improvement.

Dr. Geetha Janet Vitus, Dept. of Education: A study of the Psycho- Social and Educational Problems of Marginalised adolescent Learners: Adolescent learners are found to be confused of their role. The marginalised selection appear to be most affected in them, psycho-social and educational adjustment. This study throws light in to the above said areas and the investigation can provide remedial measures to tackle the issues.

Dr. Kamarudeenkunju M., Dept. of Botany: Research concentrated on Ret medicinal plants, which are commonly used by the tribals for various ailments. The status of these plants is under threat, so we are focussing to restore such species in their original habitats.

Dr. K. Satheesh Kumar, Dept. of Future Studies: Researh work on developing predictive model of wind speed variataion is relevant to wind power industry: Wind speed forecasts are needed for active turbine control and mananging wind energy at electricity grids and energy management and trading, especially in liberalized electricity markets where users devise best bidding strategy based on expected power production. Long-term forecasts of up tp several days ahead are useful in managing the maintenace of wind farms and transmission lines.

Dr. Josukutty C.A., Dept. of Political Science: Regular opinion studies regarding polity and society of Kerala. Three studies conducted on status of women in Kerala, Performance of LDF government and demonetization have helped the society and policy makers to understand issues concerned in a better way.

Antony Palackal, Dept. of Sociology: (i) Gulf Migration and Transformation to Prosperity- An analysis of the Dynamics of the Process: It is a study in the dynamics of the processes of transormation of the poor gulf migrants and its effects on the making of Kerala society in terms of development and values. It seeks to capture transformative trajectory of the three generation of the Gulf migrant- parents, the migrant and his family-from a longitudinal frame. **(ii).** A comparative study on the Zika and Dengue epidemics: The study intends to understand the level of awareness, knowledge and the policy implications of these widespread epidemics in terms from the perspective of Medical Sociology.

Dr. Prasad A.K, Dept. of Economics: Research work on socio-economics issues of Scheduled Castes and Scheduled Tribes communities in Kerala: The output of the research will be highly useful to policy makers and planners for the socio- economics upliftment of these weaker sections.

Dr. Shaji Varkey, Dept. of Political Science: Spaces of Political Protests in India: Competition, Conflict and Co-operation between Party and Non-Party Organizations: This study expolres the competition, conflict and cooperation between party and non-party organization in the context of new social movement in kerala.

Dr. Sameer Babu.M, Dept. of Education: Women Efficiency Building Project in Mankada Grama Panchayat.

Dr. G. Raju, Dept. of Commerce: Study on the viability of PACS: The present issues faced by Primary Agricultural Credit Society in providing the needs of rural people, which help the governmnet in fine tuning the Credit societies for the disbursement of credit to the agriculture and other related sections of the economy.

Part B

Summary of Research Work from University Departments which were awarded PhD in 2016

Contents

Stream: Science *&* Technology

Title: **"Ecological Interactions and Defensive Strategies of Marine Organisms"**

Researcher: M. Srikumar | Guide: Dr. K. Padmakumar

Subject: Aquatic Biology and Fisheries

Marine organisms interact with each other for food, space, reproduction, defending predators, pathogens and are ultimately evolved with various effective strategies for survival. Such strategies of many marine organisms are through chemical molecules. The understanding of chemically mediated interaction would reveal the underlying molecular mechanisms and such strategies may be harnessed for deriving biologically active molecules of economic importance. In this context, 104 species of marine organisms were evaluated for antifouling property using four fouling marine bacteria as well as juvenile mussel *Perna indica*. In this study, extracts of 12 macroalgal species (35.29%) and eleven sponge species (28.94%) showed inhibitory activity against the fouling bacteria. Similarly, 38% sponges, 57.1% algae, 55% cnidarians showed excellent antisettlement activity against juvenile mussels. N-Acyl Homoserine lactone (AHL) has also been studied using the bacteria isolated from the biofilm communities. It showed that three biofilm bacterial phenotypes had the production potential of AHL molecule and four bacterial phenotypes displayed maximum AHL inhibition potential. The influence of AHL molecule on growth of endosymbionts (bacteria) isolated from the sponge showed that *Paracoccus marcusii* has responded well in terms of growth as well as DNA synthesis when the medium was supplemented with crude AHL extracted from the culture supernatant of biofilm bacteria. Microbial associations of sponge *Mycale mytilorum* was analysed and nine microbial strains viz., *Aspergillus niger*, *Aspergillus flavus*, *Penicillium* sp., *Mucor* sp., *Trichoderma* sp., Actinomycetes, *Paracoccus marcusii*, *Vibrio gazogenes* and *Vibrio nigripulchritudo* were isolated from the sponge. Growth, siderophore production and influence of exogenous siderophore on growth of *Paracoccus marcusii* were studied and the result indicated that *Paracoccus marcusii* positively responded in terms of growth and it suggest that siderophore supplementation in growth medium could be used for high throughput cultivation for the isolation of uncultivable bacteria from the marine environment. It is observed that such a natural quorum sensing strategies, siderophore production and antifouling property of marine organisms could be pursued into the direction of understanding the molecular signalling among marine organisms and also pursued towards the development of ecofriendly bioactive molecules for human welfare.

Keywords: antifouling, siderophore, sponges, macroalgae, AHL

Major publications appeared in: 1. Proceedings of National Seminar on Bioactive Compounds from Marine Organisms, 2008, Cochin.; 2. Proceedings of National Conference on Explorations of the Natural Bioactive Compounds from the Marine Resources-BIOACTIVA-11, Trichy.

Total number of pages in the thesis : 147

Total number of references cited in the thesis : 313

E.mail of Researcher : srikumar.biotech@gmail.com

Title: **"Cell Matrix Interactions In Liver"**	
Researcher: Shiju Jacob.	Guide: Dr. P.R.Sudhakaran
Subject: Biochemistry	
Drug induced injury accounts for a sizable number of acute liver injury and hepatic failure cases. A common feature in acute liver injury, apart from hepatocyte death, is hepatic repair and regeneration. Proper coordination and integration of cell cycle regulation, cell adhesion and migration, gene expression and metabolic regulation, inflammation and angiogenesis are required to ensure repair and regeneration. As ECM and ECM degrading enzymes, particularly, MMPs can impact many of these processes, understanding the molecular mechanism in the regulation of the MMPs in acute liver injury is particularly important. Mammalian liver consists different cell types mainly parenchymal cells or hepatocytes and non parenchymal cells (NPC) that include hepatic stellate cells (HSC), sinusoidal endothelial cells (SEC), Kupffer cells (KUP) or liver macrophages.The hepatocytes perform the essential functions of the liver but the proportion of the ECM and the connective tissue in relation to them is very small in liver. The liver ECM has a unique architecture not only of collagenous matrix components but having a non uniform distribution in the tissue. During hepatic regeneration, changes in the composition and organization of ECM as well as changes in cell surface molecules occur that can affect cell matrix interactions and changes in cellular architecture. Changes in the ECM degrading mechanisms can also alter ECM composition. Apart from this alteration in cell surface molecules that can modulate cell matrix interactions. A few set of molecules that can influence the degradation of ECM as well as cell surface molecules are neutral proteases particularly MMPs that are regulated by the binding with their endogenous tissue inhibitors (TIMPs). Experimental animals in which acute hepatic injury is induced using chemical compounds such as CCl_4 is a useful model system to study mechanisms of changes in cell-matrix interactions in drug induced acute hepatic injury using biochemical and cell biology methods such as zymography, ELISA, western blot etc. Studies in injured rats indicate that upregulation of MMP production occurs during regeneration and it is regulated by TIMPs. The up regulation of integrin sub units after injury indicated that cell surface integrin receptors can alter cell matrix interactions during hepatic regeneration.Studies on the cellular sources of the MMPs showed that NPC particularly HSC and SEC respond to factors produced by injured hepatocytes in a paracrine manner involving IL 6 and NFκB activation throughPI3K/Akt, JAK/STAT and/ PKC pathway. Studies with NPC indicated that HSC and KUP are the major source of ADAMTS 4 in injured liver. Upregulation of VEGF indicate that neovascularisation occurs during hepatic regeneration by the paracrine influence of injured hepatocytes via IL 6 signalling pathway. Apart from the action of parenchymal derived factors, the role of miRNAs in regulating the expression of MMPs, ADAMTS 4 and VEGF was also examined using bioinformatics tools. We validated the predicted role of these micro RNAs in the upregulation of MMP 2, MMP 9, VEGF and ADAMTS 4 in activated HSC during hepatic regeneration and predicted the link between IL 6 effect and miRNA in hepatic regeneration	
Major publications appeared in: J. Biochem. &Biophys Total no. of pages in the thesis: 210 Total no. of references cited in the thesis: 669 Email of Researcher :shjacob24@gmail.com	

Title: **"Molecular Mechanisms Underlying the Beneficial Effects of Vernoniacinerea in Cataractous Models"**	
Researcher: Asha R.	Guide: Dr.Annie Abraham
Subject: Biochemistry	

Cataract refers to the disease that involves opacification of the eye lens. At present, the most effective treatment of cataract is surgical extirpation of opaque lens, but it is expensive and not free from risk factors. Pharmacological intervention that prevents or slows the progression of cataractogenesis has a significant health impact. Several studies reported that natural antioxidants and herbal drugs have potential anticataract activity. Selenite induced cataract have been widely used to study mechanisms of cataract formation and to screen potential anticataract agents. Vernoniacinerea has great medicinal value in traditional usage in Ayurveda. Oxidative stress plays a crucial role in the pathogenesis of cataract and the study was to determine the efficacy of Vernoniacinerea (whole plant) and its active component, lupeol in preventing selenite induced cataractogenesis- both in vitro and in vivo. Lupeol, a triterpenoid isolated from methanolic extract of V.cinerea follows standard chromatographic techniques. Our study reveals that lupeol is nontoxic and does not cause any systemic toxicity in animals by assessing toxicity markers-Glutatamate Oxaloacetate Transaminase (GOT) and Glutamate Pyruvate Transaminase (GPT) in liver, kidney and serum. We further extended our study to compare whether lupeol and salicylidenecurcumin-CD1 (a curcumin43mbricate43) prevent selenite inducedcataractogenesis both in vitro and in vivo. Lenses were analyzed for enzymatic activities of superoxide dismutase (SOD), catalase (CAT), glutathioneperoxidase (GPx), glutathione reductase (GR), Ca2+ATPase and glutathione S-transferase (GST), levels of reduced glutathione (GSH), malondialdehyde (MDA), total calcium content, inducible nitric oxide synthase (iNOS) activity, by Western blotting and PCR. Lupeol and salicyledenecurcumin appeared to prevent cataractogenesis in selenite exposed lens by reducing the intensity of lipid peroxidation, enhancing the antioxidant enzyme activities, and also by inhibiting free radical generation. Our results implicate a major role for lupeol and salicyledenecurcumin in preventing cataractogenesis in selenite exposed lenses and lupeol was found to be more potent

Major publications appeared in:Chemico-Biological Interactions, Chemical Biology and Drug Design
Total no. of pages in the thesis: 147
Total no. of references cited in the thesis: 258
Email of Researcher :asharajan.86@gmail.com

Title: **"Studies on cell-cell interactions in angiogenesis"**	
Researcher: Athira A. P.	Guide: Dr. P. R. Sudhakaran
Subject: Biochemistry	

Angiogenesis, the process of formation of new capillaries from existing blood vessels, is a complex process that requires the tight control and coordination of endothelial cell 44mbricat. It involves extensive cell-cell and cell- matrix interactions and is regulated by various molecules. Pericellular proteolysis, favoured by matrix metalloproteinase (MMPs) and cell-cell contact formation favoured by VE-cadherin are two important process regulating angiogenesis, which must be suitably coordinated and regulated.So, the broad objective of our study was to examine whether cell-cell contact dependent mechanism including VE-cadherin and cadherin dependent signaling involving β-catenin is regulating endothelial cell function relevant to angiogenesis and whether these mechanisms are involved in the modulation of MMPs. Using different *invitro* model systems and techniques we showed that cell-cell contact dependent signaling involving VE-cadherin/β-catenin may modulate the expression of MMPs. It was further observed that a change in the expression of VE-cadherin/β-catenin signaling occurred via GSK-3β,a key enzyme involved in regulating the activity of catenin. Studies using chebulagic acid, a naturally occurring compound showed that it exerts an anti angiogenic effect in serum stimulated conditions by specifically inhibiting both GSK3β dependent catenin phosphorylation and activation ofVEGFR2, an important receptor involved in mediating the effect of VEGF, suggesting that CA acts on dual targets. Apart from natural compounds, angiogenesis can be regulated at genetic level by micro RNAs. A reciprocal relation between the expression of micro RNAs and their targets involved in wnt signaling in response to angiogenic stimuli in HUVECs have been observed. These observations suggest that cell-cell contact dependent signaling involving VE-cadherin/β-catenin is critical in regulating angiogenesis and this can be targeted either by using natural compounds that directly influences signaling pathways or by targeting micro RNAs which regulates the expression of specific genes that can modulate angiogenic phenotype.

Keywords: Angiogenesis, VE-Cadherin/β-catenin signaling, Chebulagic acid, Micro RNAs

Major publications appeared in: Biochemistry and Cell Biology, International Journal of Vascular Medicine.
Total no. of pages in the thesis: 214
Total no. of references cited in the thesis: 332
Email of Researcher :athiraprabha@gmail.com

Title: **"A probe into the cardioprotective effect of *Ocimum sanctum* Linn."**	
Researcher: Kavitha S.	Guide: Dr. M. Indira
Subject: Biochemistry	

Ocimum sanctum (OS) Linn. Commonly known as 'Tulsi' is a plant which is used in several traditional systems to cure various diseases. The pharmacological properties attributed to this plant have been used to cure wide range of pathological conditions including cardiovascular diseases, which are the major cause of mortality and morbidity globally. We evaluated the mechanism of cardioprotective effect of methanolic extract of OS leaves on isoproterenol (ISP) induced cardiac toxicity in rats. The studies on oxidative stress revealed the antioxidant capacity of MOS by enhancing the non-enzymatic and enzymatic antioxidant status in the myocardium. MOS also caused a significant reduction in the serum and tissue lipid profiles. MOS pre-treatment could also effectively decrease the markers of myocardial infarction and infarct size in the myocardium of ISP treated rats. The amelioration of inflammation by MOS in the ISP treated myocardium was mediated by downregulating nuclear factor kappa-B, inflammatory cytokines and arachidonic acid pathway. MOS administration also effectively alleviated the endothelial dysfunction induced by ISP. Increased generation of ROS and development of oxidative stress caused dysfunction and damage to the mitochondria of ISP induced rats, which was reversed on administration of MOS. MOS pre-treatment potentially down regulated mitochondrial damage induced apoptosis by reducing cytochrome c levels, activity and expression of caspases, and proapoptotic factors, and by upregulatingantiapoptotic factor Bcl2 in the myocardium. The studies on cardiac hypertrophy showed that MOS pretreatment significantly reduced the mRNA expression of the markers of hypertrophy. The enhancement of PI3K-Akt-Nrf2 pathway and prevention of collagen deposition in the myocardium by MOS may be the underlying reasons for the anti-hypertrophic effect of MOS. With an aim to identify the active components of OS leaves, the dried powdered OS leaves were fractionated with various solvents. The methanolic fraction, which showed potent in vitro antioxidant activity, was subjected to silica column chromatography. GC-MS analysis of the most potent fraction (ethyl acetate: methanol-30:70) showed the presence of various components mainly terpenes and hydrocarbons. One of the terpenes, named borneol present in the active fraction have been reported for its, cardioprotective, antioxidant and antithrombotic antihypertensive effects, and protection against endothelial dysfunction. In short, methanolic extract of the leaves of O*cimum sanctum* possesses potent cardioprotective effect which due to the concerted or synergistic action of various biomolecules in the extract.

Key Words: Ocimum sanctum; isoproterenol; myocardium; Oxidative stress

Major publications appeared in:Toxicological and Environmental Chemistry, Indi
Journal of Experimental Biology, Journal of Chemical and Pharmaceutical Research
Total no. of pages in the thesis: 224
Total no. of references cited in the thesis: 519
Email of Researcher :kavithasankaran87@gmail.com

Title: **"Combined effects of Atorvastatin and nicotine on Brain and Testicular functions of rats"**

Researcher: Syamdas S.	Guide: Dr. M. Indira

Subject: Biochemistry

Nicotine is a parasympathomimetic alkaloid present in tobacco which can induce hyperlipidemia and has a direct effect on neural functions. Statins, competitive inhibitors of 3-hydroxymethyl-3-glutatyl-coenzyme-A reductase, are cholesterol lowering drugs. It has some neuroprotective effects and both of these drugs haveindirect effects on reproductive function. Hence we analyzed the combined effect of nicotine and statin on the learning behavior of male albino rats as well as their effects in testosterone biosynthesis in rats. We employed Y-Maze conditional discrimination task to analyze neural function. Rats were divided into 4 groups with six rats in each group. (1) Control, (2) Atorvastatin (10 mg/kg b.wt), (3) Nicotine (0.6 mg/kg b.wt) and (4) Atorvastatin (10 mg/kg b.wt) + Nicotine (0.6 mg/kg b.wt). After 30days of treatment rats from each group were selected for behavioural study and they were observed for 30days.At the end of the experimental period rats were sacrificed; and tissues (brain, liver, testes) were dissected out and blood was collected for further biochemical analysis. Nicotine treated group showed least performance in learning in comparison with control, atorvastatin and atorvastatin + nicotine treated groups. Reactive oxygen species level was significantly increased in nicotine group compared to control. The level of neurotransmitter serotonin which has a significant role in learning was found to be decreased in nicotine treated group compared to the control group. Activities of $Na^{(+)}$ $K^{(+)}$ ATPase, $Ca^{(2+)}$ ATPase and glutathione content was significantly reduced in nicotine treated group compared to control. The activity of acetylcholine esterase was significantly increased in the nicotine treated group. Expression studies showed significant decrease in N-methyl D-aspartate receptors and increase in mono amine oxidase-A and mono amine oxidase-B in nicotine treated group and was reversed in atorvastatin + nicotine treated group.In the testes nicotine administration resulted in hypercholesterolemia, decreased expression of steroidogenic enzymes and testosterone levels, activated extrinsic pathway of apoptosis and down regulated SLCOB1-which transports atorvastatin. Administration of atorvastatin reduced cholesterol levels decreased the expression and activity of steroidogenicenzymes,suppress apoptotic pathway and down regulate SLC22A1-transporter of nicotine.Co-administration of atorvastatin with nicotine enhanced the testosterone levels and down regulated expressions of apoptotic genes. The interactions of atorvastatin and nicotine reduced the influx of both atorvastatin and nicotine and enhanced the efflux of these drugs thereby altering the microenvironment of testis and improving testicular function. In short, both nicotine and atorvastatin independently caused testicular toxicity. But their co- administration reduced the testicular toxicity induced by nicotine.Co-administration of nicotine with statin also ameliorated the neural functional alterations caused by nicotine to a significant level.

Key words: Nicotine; Atorvastatin; Testis; Y maze; Neurotransmitters

Major publications appeared in:Pharmacology Biochemistry and Behavior
Total no. of pages in the thesis: 128
Total no. of references cited in the thesis: 232
Email of Researcher :sm06.1985@gmail.com

Title: **"Characterization and Species Relationships in the Genus *Sesamum* L. (Pedaliaceae) From Kerala"**

Researcher: Akhila.	Guide: Dr. Suhara Beevy

Subject: Botany

*Sesamum*L. of the family Pedaliaceae is distributed in the tropical and subtropical regions of Asia and Africa. The species of *Sesamum*have much significance owing to their industrial, neutraceutical and pharmaceutical applications. *Sesamum*exhibits wide variations both in the wild and cultivated species. *S.indicum*(gingelly),the widely cultivated species is commonly known as the 'Queen of oil seeds'

The present study focussed on the morphological, cytological, anatomical, palynological, biochemical and molecular characterizations of the cultivated and wild species of *Sesamum*from Kerala, India. The data collected were used to find out the inter and intra specific relationships, to resolve the taxonomic discrepancy of the species, *S. malabaricum* and to find out the elite germplasm.

Thirty seven accessions belonging to six species of *Sesamum* collected from different districts of Kerala were analysed for the study. The germplasm included 4 accessions (landraces) of *S.indicum*, 17 accessions of *S.radiatum*, 12 accessions of *S.malabaricum*, 2 accessions of *S.laciniatum* and 1 accession each of *S.prostratum* and *S.alatum*.

The major findings of the study are:

1. The occurrence of the wild species of *Sesamum,S.alatum,* is reported for the first time from the state of Kerala, India.
2. The morphological characterizations of the wild and cultivated species of *Sesamum* screened out the accessions viz.,SI 1, SR3, SR6, SR12, SR14, SR15, SR16, SM2, SM4, SM5, SM10, SM11, SL1, SL2 as elite germplasm based on the yield contributing characteristics like plant height, number of primary branches, number of flowers per axis, number of capsules/plant, seed colour, seed thickness, number of seeds/ capsule and weight of 1000 seeds.
3. The taxonomic keys based on morphology and palynologyproposed for the delimitation of the species of *Sesamum*.
4. The morphological, palynological and cytological data revealed the evolutionary advancement of the cultivated species, *S. indicum*.
5. The study identified the wild accessions with high protein content.
6. The superiority of the wild species over the cultivated in terms of seed oil percentage, antioxidant activityand sesamin concentration in oil is identified and reported.
7. The present investigation suggests the use of molecular makers, RAPD and ISSR, for the analysis of genetic diversity. The high polymorphism observed in biochemical and molecular characterization indicates the genetic diversity of the accessions.
8. The study noticed the interrelationships within and between the species of *Sesamum*.
9. The study suggests the treatment of the taxa, *S. malabaricum* as a separate species rather than as a variety/subspecies of the cultivated species, *S. indicum*.

The study emphasizes the significance of the wild germplasm of *S. radiatum* and *S. malabaricum* for future breeding programme, as well as for the pharmaceutical purposes.

Major publications appeared in:
Total no. of pages in the thesis:
Total no. of references cited in the thesis:
Email of Researcher :

Title: "Evaluation of bioactive compounds and pharmacological activity of selected mushrooms of Kerala"

Researcher: G. Shirmila Jose	Guide: Dr. Suhara Beevy

Subject: Botany

Major contributions of the present study are;

- Identify *O. nidiformis* mushroom form Kerala was a first identification, The new host tree (Coconut tree) was also identified during collection .
- The HPLC and GC-Ms analysis revealed the phenolic acids and volatile compounds of the mushroom of *O. nidiformis , M. mastoidea* and *T. mummiformis* .
- The bioautography guided identification by HPLC of antioxidant, antibacterial and antifungal compound of crude methanolic extract of mushrooms fruiting body were identified as tannic acid and p-coumaric acid .which make the mushrooms a candidate for bio-prospecting for future drugs.
- This study is the first in-depth phytochemical study to be conducted on *O. nidiformis, M. mastoidea and T. mummiformis*mushrooms. The isolated compounds 1,2,3,4,6-penta-O-galloyl-β-D-glucose (PGG) ,β-sitosterol, hydroxycinnamic acid derivative (p- coumaric acid related compound), syringic acid, fatty acid amide and (1→3)-β-D- glucanare reported in these species for the first time.
- Bioactivity assays result highlighted the hydroxycinnamic acid derivative (p- coumaric acid related compound), syringic acid and (1→3)-β-D- glucan pharmacological roles.
- Synthetic antioxidants, such as butylatedhydroxyanisole (BHA) and butylatedhydroxytoluene (BHT), exhibit potent free radical scavenging effects, they have been demonstrated to exert toxicological effects as compared with natural antioxidants . However the results of antioxidant activity of the pure compound syringic acid, 1,2,3,4,6-penta-O-galloyl-β-D-glucose (PGG) followed by the compounds p- coumaric acid related compound Hydroxycinnamic acid derivative (p- coumaric acid related compound) and(1→3)-β-D- glucan prove that they are an alternative and safe antioxidants from natural sources.
- The results obtained for antimicrobial activity of the compounds1,2,3,4,6-penta-O-galloyl-β-D-glucose (PGG) , β-sitosterol, hydroxycinnamic acid derivative (p- coumaric acid related compound), syringic acid, fatty acid amide and (1→3)-β-D- glucan against the human pathogen were understand that compounds could be used as antimicrobial agents, namely against some micro-organisms resistant to commercial antibiotics.
- The results obtained for antimicrobial activity of the compounds1,2,3,4,6-penta-O-galloyl-β-D-glucose (PGG) , β-sitosterol, hydroxycinnamic acid derivative (p- coumaric acid related compound), syringic acid, fatty acid amide and (1→3)-β-D- glucan against the pytopathogen were understand that, likealectin named AAL from *Agrocybeaegerita*(Brigantini) and PSK, a poly-saccharide from *T. versicolor*. Our compound also formulate and commercialize in future.
- The cytotoxic activity of the compounds1,2,3,4,6-penta-O-galloyl-β-D-glucose (PGG) , β-sitosterol, hydroxycinnamic acid derivative (p- coumaric acid related compound), syringic acid from *O. nidiformis and M. mastoidea* and polysaccharide compound (1→3)-β-D- glucan from *T. mummiformis* give new cytotoxic mushroom source.
- The new hydroxycinnamic acid derivative (p- coumaric acid related compound), acid from edible mushroom *macrolepiotamastoidea*(fr.) to be submitted for patenting.

Major publications appeared in:
Total no. of pages in the thesis:
Total no. of references cited in the thesis:
Email of Researcher :

Title: "Physico-Chemical and Biological Studies on Metal Complexes of Heterocyclic Ligand Systems"	
Researcher: Niecy Elsa Mathews	Guide: Dr. K. Mohanan Emeritus Professor, Dept. of Chemistry, UoK
Subject: Chemistry	
The thesis is concerned with synthetic aspects, structure, stability, reactivity, thermal studies, fluorescence spectra, molecular modeling, antimicrobial properties, DNA cleavage, superoxide dismutase mimetic and α-amylase inhibitory activity studies of certain interesting ranges of transition metal complexes, with a host of heterocyclic ligand systems derived mainly from 2-amino-3-carboxyethyl-4,5,6,7-tetrahydrobenzo[*b*]thiophene. The heterocyclic ligands consist of two azomethine derivatives, an azo derivative and a hydrazone. Elemental analysis, molar conductance, magnetic moment measurements and various spectroscopic techniques such as IR, UV-Vis, ^{1}H NMR, ^{13}C NMR, ESR and mass spectral data were used to characterise the ligands and their metal complexes. On the basis of these studies, suitable structures have been proposed for the ligands and their metal complexes. The thermal decomposition studies of cobalt(II) complexes help to evaluate the kinetic parameters using Coats-Redfern equation. Apart from the kinetic parameters and thermal stability, suitable mechanisms have been proposed for their thermal decomposition. Since these ligands are heterocyclic derivatives containing N, S and O donors, they and their metal complexes have considerable biological activities. The synthesized ligands and their metal complexes were screened for their antimicrobial activities against various bacteria and fungi and observed that the antimicrobial activities of the ligands are enhanced on coordination with the metal ions. The DNA cleavage study reveals that almost all the metal(II) complexes are having efficient DNA cleavage activity when compared to the free ligands. The Superoxide dismutase mimetic activities of the synthesized ligands and their metal complexes has been tested using alkaline DMSO as a source of superoxide radical ($O_2^{\bullet -}$) and nitrobluetetrazolium (NBT) as $O_2^{\bullet -}$ scavenger. From the results, it is observed that the ligand itself show no activity, while the copper(II) complexes show good SOD mimetic activity. The inhibition of α-amylase by the ligands and their metal complexes were tested using α-amylase inhibition assay and observed that the metal complexes found to inhibit α-amylase more effectively than the ligand. Metal complexes of polydentate ligands derived from 2-amino-3-carboxyethyl-4,5,6,7-tetrahydrobenzothiophene hold exciting possibilities for the future, particularly in formulating new synthetic routes and in developing novel biological agents.	
Major publication appeared in: Medicinal Chemistry Research; Spectrochimica Acta A; Journal of Rare earths & Journal Indian Chemical Society. Total No of pages in the thesis: 278 Total No of reference cited in thesis: 437 Email of Researcher: nicyelsa@yahoo.co.in	

Title: "**Synthesis And Characterisation Of Bi-functional Composite Nanostructures For Customised Applications"**	
Researcher: Praveen G.L	Guide : Dr. Sony George
Subject: Chemistry	
Here, we have synthesized and characterised certain transition-inner transition metal-oxide nanoparticles and gold in nanoparticle, rod and cluster types to have both the lumino-magnetic and plasmonic entities. To employ the synthesized nanoparticles for the customized applications as cancer theranostics and high energy molecules detection, we combined these particles into mesoporous composite and hybrid nanostructers. The mesoporous composite nanostructures were utilized for the *in vitro* fluorescence imaging of A549 lung cancer cellines with the pH triggered targeted chemotherapeutic drug delivery. The hybrid nanostructures formed as a result of the rational assembly of nanophosphors with different types of gold particles were employed for the *turn on* fluorescent detection of an explosive namely TNT. Magneto-Luminescent mesoporous silica nanocomposites for the *in vitro* pH triggered drug delivery and imaging includes three different types of combinations such as Fe_3O_4 @ ZnO:Dy; Fe_3O_4 @ ZnS:Mn and Gd_2O_3:Eu mesoporous silica nanocomposites. Here we make use of the surface functionalisation and fluorescence of the corresponding nanodomains for the *in vitro* active drug delivery and imaging. The bio-compatibility of the nanocomposite with and without anticancer drug was investigated *in vitro* through MTT assay on A549 Lung cancer cells. The system showed a good bio-compatibility without the anticancer drug and showed good anticancer activity for the 5 FU drug loaded system with an IC_{50} value of 25 μg/mL. The red luminescence obtained for the same concentration of nanoparticles loaded A549 lung cancer cells through Confocal Laser Scanning Microscopic (CLSM) study makes our nanosystem a suitable candidate in cancer cell imaging and drug delivery. The nanoassembly was formed by the electrostatic interactions of the magneto-luminescent domains with the spherical (AuNP) and rod shaped (AuNR) gold nanostructures. The ZnO:Dy@AuNP; Gd_2O_3: Eu@AuNR and AuNC@AuNR nanoassemblies were employed for the trace amount *turn-on* fluorescence detection of nitro aromatic compounds from the aqueous solution. Through systematic evaluations it was found that the as developed three nanoassemblies can detect TNT in nanomolar and sub nanomolar concentrations when present in real time speciments.	
Major publication appeared in :Journal of nanoparticle research, Journal of Luminescece Total number of pages in the thesis: 211 Total number of reference cited in the thesis: 334 Email of the researcher:emailtopgl@gmail.com	

Title: "**Synthesis And Characterisation of Magnetic Luminescent Hybrid Nanoparticles for Bioimaging Applications "**	
Researcher: Lekha.G.M	Guide : Dr. Sony George
Subject: Chemistry	
Hybrid nanoparticle is defined as a well-organized nanomaterial consisting of two or more types of individual nan ocomponents. Combining two different types of nanoparticles can produce a synergistic effect leading to a combination or improvement of the existing properties of the two nano material. The incorporation of magnetic and fluorescent nanoparticles in the same entity can provide a unique hybrid structure which may find wide applications in the bio-medical field such as bio-imaging, drug delivery carriers, magnetic resonance imaging, bio-separation and immunoassays. In this perspective the scope of the present investigation relies on developing a hybrid nanosystem that endows both magnetic and luminescent entity adaptable for bioimaging applications. The hybrid nanostructure was synthesized using transition metal ions (Cu^{2+}, Mn^{2+}, Fe^{2+}, Co^{2+}) co doped lanthanide oxide (Gadolinium/Dysprosium) via a microwave assisted solvothermal method. The room temperature magnetization (Ms) of the as-prepared nanoparticles is studied and found that they exhibit paramagnetic behavior at room temperature. Moreover, codoping with transition metal ion induce an increase in Ms value for gadolinium oxide and a decrease in Ms for dysprosium oxide. Another type of lumino magnetic nano entity was synthesized from magnetic lanthanide oxide (gadolinium oxide) and luminescent lanthanide ions (Tb^{3+}/Eu^{3+}). The nanoparticles were synthesized from microwave as well as the polyol methods and the resultant system. To explore further application in cancer cell imaging, we incorporated of folic acid moiety on the surface of the as-prepared probe. Inorder to check its cytotoxicity as well as its adaptability for bioimaging an MTT assay was carried out on A549 Lung cancer cells. The red luminescence obtained from confocal laser scanning microscopy (CLSM) for the fabricated nano entity clearly confirms that the system is a suitable moiety for cancer cell imaging. PEI capped luminescent ZnO nanoparticle was used to develop next type of lumino magnetic system. Gd^{3+} doped with ZnO shows an increase in luminescence when compared with other ions of interest. The presence of amine group at the surface of ZnO enables attachment of folic acid by EDC/NHS coupling which can adhere to folate receptors so as to facilitate the system for biotargeting. The cytotoxicity of ZnO:Gd^{3+} nanosystem was carried out with A549 Lung cancer cells utilizing the Live Dead cell assay. With an intension for exploiting the fluorescent nature of gold quantum clusters in lumino magnetic composites, we developed magnetic lanthanide oxide (gadolinium and dysprosium) incorporated BSA-AuNC system. The cytotoxicity of the nanosystem was carried out with A549 Lung cancer cells utilizing the Live Dead cell and obtained promising result.	
Major publication appeared in : Journal of Luinescence, International nanoletters, Total number of pages in the thesis: 256 Total number of reference cited in the thesis: 420 Email of the researcher:lekhagm@gmail.com	

Title: "Preparation and Characterization of Fe-Doped Titania Based Photocatalysts for the Efficient Degradation of Organic Pollutants and Clay/Chitosan/B-Cyclodextrin Hydrogels for the Controlled Delivery Of Drugs"

Researcher: Divya P. L. | Guide: Dr. T. S. Anirudhan

Subject: Chemistry

The term 'photocatalysis' originated from two Greek words 'Phos' and 'katalysis' refers to the process in which light is used to activate the photocatalyst, which modifies the rate of a chemical reaction without being involved itself in the chemical transformation. Various semiconductors are used as photocatalysts among which titania still remains the most promising photocatalyst. But the widespread use of bare titania is limited due to the wide band gap of the semiconductor which requires UV radiation for exhibiting photocatalysis. Various approaches have been adopted for increasing its photocatalytic activity. In the present work, importance was given for doping with Fe^{3}+ ions and coating with conducting polymer, polypyrrole. To increase the catalytic activity of the material, monomers like itaconic acid and 2-acrylamido-2-methyl propane-1-sulphonic acid in the presence of initiator and cross-linker were polymerized. The newly prepared materials were tested using different organic compounds like Victoria blue dye and tetracycline hydrochloride commonly present in aquatic stream as a result of increased usage.

The emergence of controlled drug delivery system (CDDS) occurred after several technical advancements in this field since it can control the rate of drug delivery and it can target the drug to a particular site. Various natural biodegradable polymers so far used include starch, dextran, chitosan (CS), alginate, hyaluronic acid, cyclodextrin (CD), cellulose derivatives and natural clay like montmorillonite (MMT), due to their excellent biocompatibility. In the present work MMT, CS and CD based CDDS were used. Various modifications like coating with silane, polymerization with hydrophilic monomers and grafting with other monomeric units capable of exhibiting host-guest interactions were also performed to improve the biocompatibility of bare materials. Molecular imprinting technology was also employed for increasing the specific encapsulation of drug into the polymer with sustained release. The performance of various DDS prepared was tested using three different drugs like thiamine hydrochloride (THC), curcumin and 5-flurouracil.

Key words: Drug delivery, photocatalyst degradation, molecular imprinting, titania.

Major publications appeared in: *RSC Advances, Applied Surface Science, Reactive and Functional Polymers, Journal of Colloid and Interface Science, Materials Science and Engineering C, Chemical Engineering Journal, Environmental Nanotechnology Monitoring and Management*

Total no. of pages in the thesis: 223

Total no. of reference cited: 320

Email of researcher: divyasg5301@gmail.com

Title: Explorartion of Titanium Group Metals based Composite for Mechanical and Metallurgical Improvement of Electroless Ni- P Coatings	
Researcher: Chinchu. K. S	Guide: Dr. S. M. A. Shibli
Subject: Chemistry	
Electroless nickel coatings find wide applications in various fields of surface engineering due to its excellent properties such as corrosion resistance and wear resistance. High solderability, low porosity, thickness uniformity and ability to coat on non metals make it significant in day to day life application. The present work focuses on developing electroless Ni-P composite coatings by improving their physicochemical and electrochemical characteristics for their application in various fields of industry, where mechanical aggressiveness and electrochemical corrosion are the focus points. The main objective of the present work is to explore nano zirconia based electroless composite coatings with a view to improve its inherent physicochemical and electrochemical characteristics. The next phase aims to improve the characteristics of Ni-P nano ZrO_2 coating systems by incorporating suitable stabilizing oxides. Phase transformation of zirconia can be controlled by addition of CeO_2. In addition to this, the material characteristics of electroless Ni-P coatings can be significantly improved by the incorporation of nano Ceria. Hence the present study beneficially explores ZrO_2-CeO_2 incorporated electroless composite coatings and to study the effect of incorporation of ZrO_2- CeO_2 composite on the physicochemical, morphological and electrochemical characteristics of electroless Ni-P coatings.	
Major publications appeared in: Surface & Coatings Technology, Material Research Innovations Total no. of pages in thesis: 250 Total no. of reference cited in the thesis: 269 Email of researcher: skchinchu@gmail.com	

Title: "Studies Of Metal Complexes Of Some Azo And Azomethine Derivatives"

Researcher : Aswathy. R | Guide : Dr. K. Mohanan

Subject: Chemistry

The main objective of the work is concerned with synthesis, spectral characterization, fluorescence spectra, thermal decomposition kinetics, antimicrobial, DNA cleavage, superoxide dismutase mimetic and α-amylase inhibitory activities of metal chelates of ligands containing functionality such as azomethine/azo/azo-azomethine etc. In this investigation, the heterocyclic ligand systems are derived from 2-aminopyrimidine, 2-aminophthalhydrazide and antipyrine-4-carboxaldehyde moieties and they are

a) 2-{N-[1-(2'-hydroxyphenyl)-1-methylmethylene]} aminopyrimidine (HAAP).
b) 2-Hydroxyacetophenone-[(N'-(2,3-dimethyl-1-phenylpyrazol-5-on-4-yl)methylene] hydrazone(HDAP)
c) 1-(Phthalichydrazid-3-yl)azonaphth-2-ol (H_2PAN)
d) 1-[(2-aminopyrimidinyl)methylene]-3-[(phthalichydrazid-3-yl)azo]naphtha-2-ol(H_2PAP)

These ligands served effectively as monobasic tridentate, neutral tridentate and dibasic tridentate according to the experimental conditions. In the present investigation main attention was bestowed on 3d metal ions. However, a few lanthanide(III) ions have been also used here. Complexation of lanthanide ions is an altogether different phenomenon from complexation by the 3d metal ions. These ligands and their metal complexes have been characterized on the basis of various physico-chemical and spectral studies such as IR, UV-Vis, NMR and ESR, wherever possible and applicable. On the basis of these studies, suitable structures have been proposed for the ligands and their metal complexes.

Apart from the structural diversity and biological activities of the parent compounds, it was hoped that these azo and azomethine derivatives and their metal complexes could have pronounced biological activities. To find out some potential application of these novel ligands and their metal complexes different type of biological studies were also envisaged. The ligands and their metal complexes were screened for their antibacterial and antifungal activities by disc diffusion method. The interaction between DNA and metal complexes is an important fundamental aspect in life sciences. Considering this, DNA cleavage activities of the ligands and their metal complexes has been examined. In the present study, a modest attempt has also been made to examine the Superoxide dismutase mimetic and α–amylase inhibitory activities. Major biological interest in these ligands and their metal complexes stems from their suitability in designing metal containing model systems, which mimics biologically active systems.

Major publication appeared in : J. Fluorescence, J. Rare Earths, Medicinal Chemistry Research, Spectrochimica Acta Part A, J. Indian Chemical Society.
Total No of pages in the thesis 341
Total No of reference cited in thesis620
Email of Researcher : aswathysr86@gmail.com

Title: Development of metal wetted metal oxide composite incorporated hot dip zinc coatings.	
Researcher: Meena B. Nair	Guide: Dr. S. M. A. Shibli
Subject: Chemistry	
Hot dip galvanizing technique is a cost effective anti-corrosion process that has many advantages over other coating processes in terms of mode of application and extended protection from corrosion. The incorporation of metal oxides in molten zinc bath has got advantages in enhancing the hardness adhesion and other mechanical properties of hot dip zinc coatings. Many new transition metal oxides have been investigated to improve the efficiency of the hot dip galvanized coatings for various applications. The present work focuses on developing hot dip galvanized coatings by tuning their features for their efficient application in industrial and marine fields where chemical and mechanical aggressiveness are the focus point. The main objective of the present work is to study the effect of nano TiO_2 and nano W-TiO_2 composites as an additive in molten zinc bath in order to improve the galvanic and corrosion resistant properties of conventional hot dip zinc coatings. The present study beneficially explores nano TiO_2 incorporated hot dip zinc coatings and to study the effect of nano sized composite on the physicochemical, morphological and electrochemical characteristics of hot dip zinc coatings. The TiO_2 surface was modified using tungsten to improve metallurgical and galvanic characteristics of hot dip zinc coatings by enhancing wettability. The enhancement of biological corrosion resistance of nano TiO_2 and nano W- TiO_2 composite incorporated hot dip zinc coatings for its efficient coating marine fields were also analysed.	
Major publications appeared in: Applied Microbiology and Biotechnology, Surface and Coating Technology Total no. of pages in thesis: 212 Total no. of reference cited in the thesis: 259 Email of researcher: meenabnair1986@gmail.com	

Title : A Computational Synthetic Biology Study of the Non-coding Genome of Saccharomyces cerevisiae

Researcher: Shidhi P. R.	Guide: Dr. Pawan K. Dhar

Subject: Computational Biology and Bioinformatics

The major part of genome in most organisms doesn't encode proteins. Recent studies have demonstrated that many non-coding regions once considered as junk are in fact being transcribed to functional molecules involved in various biological processes such as differentiation, embryogenesis, cell signaling and regulation of innate immunity. The present study focuses on identifying novel functional elements from the non-coding regions of Saccharomyces cerevisiae using computational approaches. The study aimed at identifying novel proteins and peptides from the intergenic regions and pseudogenes that are not naturally transcribed. Structure and putative functions for intergenic regions were predicted. Intergenic regions and pseudogenes were tagged with sequence features like profiles, patterns, signatures, functional category, gene ontology category, enzyme classifications, subcellular localization and other physiochemical properties. Predicted functions of pseudogenes were compared with the biological roles of their relatives to strengthen the reliability of the predictions. Pathway analysis revealed that these putative proteins are involved in pathways specific to cell cycle, glucose metabolism, biosynthesis of amino acid and citrate cycle pathway. Proteins were also tagged with structural features such as structural similarity, gene ontology, ligand binding sites, structural folds, enzyme homologs, enzyme commission number etc. Multi-parametric study, based on sequence and structural evidences identified functional features in intergenic regions and pseudogenes. Stability parameters like stabilization centers, total energy, cation – π interactions, cation – π interaction energies, non-covalent, non-canonical interaction and instability index showed encouraging evidences of protein structure stability. Graphical analysis revealed symmetric trends across all stability parameters proving authenticity of results. Promising candidates for artificial protein synthesis from intergenic regions and pseudogenes were identified. Sequence and structural based studies was performed with non-coding peptides to check similarity with known therapeutic peptides that are used for the treatment of diseases such as cancer, diabetics and osteoporosis. Peptide derived from the intergenic regions was found to have sequence and structural similarity with the therapeutic peptide Angiotensin (1-7). Protein interaction analysis reveals that non coding peptide has comparable binding mode and affinity as that of Ang (1-7) towards its drug target MAS receptor and may act as an Ang (1-7) analog. It was encouraging to infer that non coding peptide could be used as a potent therapeutic agent. The present work demonstrated that non coding regions has untapped potential of making useful proteins and peptides which would have a wide range of applications including protein engineering and therapeutics.

Major Publication appeared in: (1) Bioinformatics (Oxford University Press) (2) Systems and Synthetic Biology (Springer)
Total number of pages in the thesis: 162
Total number of references cited: 334
Email of Researcher: shidhibio@gmail.com

Title : In silico analysis of Chikungunya viral genome	
Researcher: Vidya R. V.	Guide: Pawan K Dhar
Subject: Computational Biology and Bioinformatics	
Infectious diseases are the main threat to humanity ever since the origin of the race. This is caused by microbial pathogens like virus, bacteria, fungi, protozoa and algae. The thesis attempts to provide an in silico analysis of Chikungunya virus that causes Chikungunya infection. CHIKV vaccine development attempts are in its preliminary stages and an effective vaccine for this disease still remains as a major challenge. This work entails and discusses many obscure facts about the pathogen CHIKV, which could possibly reveal the enigma associated with Chikungunya infections. The study include a genome wide comparative analysis of CHIKV viral strains of all the genotypes to understand evolving the nature, mutation trend and degree of conservation among CHIKV viral strains. The objective include preliminary analysis and grouping of CHIKV strains, recombination analysis of CHIKV, characterization of antigenic epitopes in CHIKV, in silico characterization of novel Chikungunya non- structured protein 2 target peptides, genotyping of CHIKV strains using soft-computing approach based on multi characteristic feature vector. The effective epitopes among the predicted epitopes in CHIKV protein, which plays a major role in host viral interaction, was identified using various tools. CHIKV phylogenetic tree double confirms the CHIKV grouping. Pair wise distance analysis shows that CHIKV Group III has reached its steady state and Group II can be said as an evolving group and conservation variation analysis and evolutionary divergence calculations support this observations. The calculated Tajima's D values indicate population size expansion in CHIKV genotypes and it was found that the excess of genetic variations are in CHIKV Group II. The study identified mutational hot spot regions and analysed the mutation trends in CHIKV structural and non structural poly protein regions. The probable recombination events and recombination hotspots along CHIKV genotypes were identified. Six druggable target peptides in CHIKV nsp2 protein that can be considered for vaccine development were identified from conserved region of protein. CHIKV genotyping prediction system with 90% accuracy was developed based on soft computing approach using multi-characteristic feature vector.	
Major Publication appeared in: Proceedings of National Academy of Sciences Total number of pages in the thesis: 179 Total number of references cited: 119 Email of Researcher: amanparakkat@gmail.com	

Title : In silico approach to elucidate the bioactivity of formicidae venom

Researcher: Priya Das | Guide: Dr. Pawan K Dhar

Subject: Computational Biology and Bioinformatics

Terrestrial dominance of the ant species (family: *Formicidae*) can be attributed, at least partially to the extraordinary diversity of chemical defense mechanisms, which has evolved lucratively across ages since cretacean period. Venom of *Formicidae* plays a major role in communication among colony mates, defense against microbes and predators and for catching prey. The constituents of ant venom range from low molecular weight hydrocarbons and its derivatives to alkaloids and also peptides ranging from molecular mass 4 to 100 KDa. Solenopsin is the alkaloidal component of the Fire ant (subfamily: *Myrmicinae*), one of the venomous ant species. Solenopsin has been demonstrated as a potential anti- angiogenic agent inhibiting the PI3K signaling pathway and as potent inhibitor of nitric oxide synthases (NOS). cDNA microarray analysis of GEO data was done to infer the gene expression modulations in Human U937 cell lines induced by solenopsin B. Functional annotation of the differentially expressed genes followed by pathway enrichment has been done using computational methods. A reductionist approach has been used to define possible cellular targets of solenopsin B which leads to these variations in gene expression levels. Molecular docking studies were followed using modules of Autodock 4.0 to elucidate the action of solenopsin B. Venom analysis of an Asian ant species: *Oecophylla smaragdina* (subfamily: *Formicinae*), an arboreal insect that has been known for centuries as a potential biopest control agent was done. Preliminary analysis along with GC-MS analysis infers the presence of an alkaloid [2, 5 dipropyl decahydroquinoline] in the venom of *O. smaragdina*. Decahydroquinolines which are non-competitive inhibitors of nicotinic acetylcholine receptors (nAChRs) as deduced to be present in *Oecophylla* venom; we hypothesized that it poses paralyzing like effects on their prey. Molecular docking and molecular dynamics studies (using GROMACS 5.0), were followed to unravel the mechanism of inhibition of nAChRs by decahydroquinolines. Potent antimicrobial, mild antioxidant and anti-inflammatory activity of *Oecophylla* venom was noted from in vitro assays. A library of analogues of ponericin, AMP from ant venom was created. Computational methods are used to screen peptides, probably with better antimicrobial potential from the proposed library of ponericin analogues.

Major Publication appeared in: (1) Toxicon (2) International Journal of Bioinformatics Research and Applications
Total number of pages in the thesis: 166
Total number of references cited: 183
Email of Researcher: priyadas001@gmail.com

Title: Methodologies for the Development of an Intelligent Botnet Detection System	
Researcher : Soniya B	Guide: Dr. Wilscy. M
Subject: Computer Science and Engineering	

In the highly networked world in which we live, computers and the Internet are ubiquitous and most business activities take place over this networked infrastructure. It is observed that criminals are also proliferating in this networked environment and create malicious programs or *malware* that exploit the vulnerabilities existing in the system as well as the naiveté of users to rob the users of money and valuable data that can be monetized by them. Among these malicious programs, botnets have emerged as a serious threat since they silently infect machines, are difficult to detect and can be remotely controlled by criminals (called botmasters) for purposes varying from data theft, DoS attacks, generating spam mails, click fraud attack or any other malicious attack that the botmaster considers suitable for his purpose. Hence detection of botnets is of critical importance for all users of networked infrastructure.

Research in botnet detection mainly falls under the broad category of anomaly based intrusion detection systems which can be further classified into host-based and network-based approaches. Network-based botnet detection systems are located at the network edge and mostly look for similar or correlated communication patterns among a group of hosts to detect the presence of a botnet. This approach can detect botnets only if multiple hosts in the same network are infected by the same bot. Host-based bot detection systems are located on the host itself and inspect evidence collected from that host such as bot binary signatures, system calls executed, files and registry entries modified, etc. to decide whether the machine is bot infected or not. But bots employ several evasive techniques including use of packers, polymorphism and other code obfuscation methods, rootkit techniques, randomization of communication etc to avoid detection.

In this thesis, we propose an alternate bot detection approach, different from host-based and network-based approaches mentioned earlier, that aims to detect the presence of bots on a single endpoint host by examining the traffic generated by the host. Four bot detection methods are proposed adhering to this aim. The first method, Traffic Signature-based bot detection system (TS Detector), uses three traffic signatures to identify bot infection of a host. The traffic signatures are derived (i) through a study of bot traffic behaviour available in literature and (ii) by observing bot traffic in an experimental botnet set up on DETER Testbed. The second method proposed, called Entropy-based Bot Detection System or EB Detector relies on the regularity of bot command and control (C&C) traffic compared to burstiness of user-generated normal HTTP traffic to identify bot presence on the host and uses entropy of traffic features to differentiate between benign and malicious traffic. The third method, Improved Traffic Modeling and Detection of HTTP based bot C&C (ITM Detector) expands on EB Detector to model the regularity of HTTP-based bot C&C and burstiness of normal HTTP

traffic within a user session using more traffic features and a Multi-Layer Perceptron Classifier is trained on the model and later used to detect bot presence within a user session. Meanwhile, it was observed that a few bot families randomized the command and control communication used by them in order to evade detection and the last work proposed in the thesis, Randomized Command and Control Detector (RCC Detector), aims to detect such randomized C&C traffic. RCC Detector examines traffic generated by a host and uses the repeated nature of bot C&C traffic to detect bot infection on the host.

Cross-validation testing and novelty detection of the proposed bot detection methods on different datasets yield good detection rates and low false positive rates. Two botnet datasets – (i) A publically available botnet dataset, CTU-13 and (ii) a botnet traffic dataset compiled by us from 8 bot families- are used in testing the bot detection methods. Benign traffic data used in testing is a subset of DARPA and LBNL datasets. An attribute relevance analysis of features used in ITM Detector is done and the effect of various evasive techniques on Detection Rate of ITM Detector is also evaluated. A comparison among the proposed methods is also done and the results presented.

Major Publication appeared in :*Alexandria Engineering Journal, Elsevier, 2016*
Total No: of Pages in Thesis: 106
No: of references sited in the thesis: 114
Email of researcher: soniya@sctce.ac.in

Title: "Health Status of Female Fisher Folk in Kerala"	
Researcher: Rafeeka Beevi. M	Guide : Dr. S. Sulaja
Subject : Demography	
The main objective of the present study is to project the health status of the fisher folk women in Kerala. Required information was collected from fisher folk women of age above 18 years through structured schedule. For the data collections, the selected districts were Thiruvananthapuram from south, Ernakulum from central and Kozhikode from north. A total of 1050 women were interviewed for the study and among these 970 who provides all the required information were considered for the analysis. Univariate, bivariate and multivariate tools are used for the analysis. Four different types of indices were constructed to categorize the whole respondents into three status groups. The four indices constructed were Health Index, Reproductive Health Index, Standard of living Index and Women Empowerment Index. Standard of living is an important variable to determine the reproductive health status. For both low and medium standard of living women have significantly lesser likelihood to have better health status. Those who have no communicable diseases the chances of having better reproductive health status are significantly high. It is seen from the study that both communicable and non-communicable diseases increases with ages and the health status and the diseases are inversely related. The study showed that there exists domestic violence among fisher folk women in Kerala. The study clearly depicts the true picture of the sample fisher folk women. They lead a miserable life. Their level of education, standard of living, level of empowerment and health status are very low. Among the three districts studied, the conditions of the capital city are worse than the other two districts, Kozhikode and Ernakulum. So efforts should be taken by the authorities to improve the socio- economic and health status of fisher folk women in Kerala. There are some health factors, such as high level of smoking, alcohol consumption and other drug usages have been identified among the fisher folk in Kerala. Information, counselling and education programmes should be essential to improve the awareness of fisher folk women.	
Total Number of Pages in the thesis : 112 Total Number of references cited in the thesis : 54 E mail of Researcher :rafeekab@gmail.com	

Title: Evaluation of Groundwater Quality & Health Status of Residents in the Surroundings of Valiathura Sewage Farm in Thiruvananthapuram, Kerala

Researcher: **Jainy Varghese** | Guide: **Dr. Jaya D.S**

Subject: **Environmental Sciences**

The monitoring and evaluation of groundwater quality is very important for sustainable management and protection of groundwater sources. The present study was carried out in groundwater sources in the surroundings of 'Valiathura Sewage Farm' situated in the coastal stretch of Thiruvananthapuram District in Kerala state, South India. The major objectives of the study was to find out the seasonal and spatial variation of physico-chemical and bacteriological attributes of groundwater sources, and to assess the potability and irrigational suitability of groundwater using various indices like Water Quality Index (WQI), Heavy metal Pollution Index (HPI) and by multivariate statistical technique. The study also aims to delineate the groundwater pollution zones using Geographic Information System (GIS), and to determine the health status of residents in the nearby households, to assess water related health problems prevailing in the surroundings of sewage farm, and to evaluate the major environmental factors and its influence on the groundwater quality of the study area. After a preliminary field survey, the sampling stations were fixed at an interval of 500 m, and up to 2 km radius in the northern, southern, eastern direction and western directions of the sewage farm. The water samples from groundwater sources (dug wells & tube wells) in the study area were collected bimonthly during the pre-monsoon, monsoon and post-monsoon seasons, from January 2010 to December 2010. In order to determine the contamination status of other factors affecting the quality of groundwater in the study area, water samples from two surface water sources (sea water and Parvathy Puthanar canal), sewage effluent from the sewage farm and soil samples in the study area were also collected, and the physico-chemical characteristics of all samples were analyzed. The results of WQI, HPI and GIS study showed that the quality of groundwater in the surroundings of sewage farm is degraded and the water in majority of the wells are not suitable for drinking purpose/ non-potable according to the drinking water quality standards (BIS, 1991 and WHO, 1984). Among the groundwater sources studied, dug wells are more contaminated than the tube wells with respect to the physical, chemical and bacteriological parameters analyzed. The health survey conducted among the residents in the study area showed that communicable diseases are more prevalent than non-communicable diseases. The study reveals that sewage irrigation for grass cultivation in the sewage farm is one of the governing factors that led to the deterioration of groundwater quality and associated health problems in the study area. The wastewater leakage from soak pit/septic tank system, seepage of polluted water from Parvathy Puthanar canal, improper disposal of solid and liquid wastes from households, shallow dug wells, saline water intrusion, sandy texture of soil in the study area are the other factors that aggravate the deterioration of groundwater quality in Valiathura area of Thiruvananthapuram district.

Keywords: Groundwater, Sewage Farm, Valiathura, Water Quality Index, Heavy Metal Pollution Index, Health survey, Communicable diseases, Waterborne pathogens

Major Publications appeared in: (1)*Bulletin of Environmental Contamination and Toxicology*, *(2)Environment Conservation Journal*

Total number of pages in the Thesis: 401

Total number of references cited in the thesis:509

Email of Researcher: jainy.env@gmail.com

Title: Studies on Groundwater Characteristics of Chennam-Pallipuram & Thykkattussery Panchayat, Alappuzha, Kerala

Researcher: Manjusree, T. M | Guide: Dr. Sabu Joseph

Subject: Environmental Sciences

Groundwater, one of the important resources of water supply, support vast human population throughout the world and is facing several challenges due to various natural factors as well as anthropogenic interventions. In Kerala, the groundwater has been the mainstay for meeting the domestic needs of more than 80% of rural and 50% of urban population. However, reports on the deterioration of groundwater quality from various parts of the State especially from the coastal belts (e.g., Alappuzha district) is a matter of deep concern for scientists, planners and administrators. Further, management of groundwater in such areas requires a precise understanding of sources, processes and complex mechanisms controlling groundwater quality. In addition, well-documented and systematic spatio-temporal studies on the groundwater chemistry of the coastal zone of Alappuzha district are sidelined. Hence, this monograph, accounting for the salient aspects of groundwater characteristics of two coastal panchayats of Alappuzha district, viz., Chennam-Pallipuram (Area = 25.30 km^2) and Thykkattussery (Area = 13.80 km^2) has been undertaken. The study area is surrounded by the Vembanadu lake except the northern border. Major objectives of the investigation are to evaluate the spatio-temporal variations of groundwater quality and thereby assess the suitability for various purposes, to determine the aquifer parameters and yield characteristics, to evaluate association between the soil characteristics and groundwater chemistry and to propose innovative recommendations for sustainable groundwater management. Based on this study, it has been found that spatio-temporal variation of water quality parameters exist in the study area for both dug wells and tube wells. Most of the groundwater samples are acidic in nature, some of the water quality parameters exceed the permissible limits, leading to the formation of 'hot spots' in the northern part of the study area in the case of dug wells and towards southern part of the area in the case of tube wells. Most of the wells are affected by microbial contamination and the ground water chemistry is influenced by a combination of several factors, viz., salinization of aquifer from the lake, dissolution of salt and lime shell from the aquifer, sediment-water interaction, agricultural return flow vis-à-vis anthropogenic activities (sewage disposal, coir retting, sand mining aggravate etc.). Based on the aquifer characteristics study, it is suggested that overall groundwater potential of the aquifer is moderate to good with maximum developmental potential towards the central part of the area. Best management practices are needed to conserve these groundwater resources for sustainable use.

Key words: Groundwater quality, multivariate, stable isotopic techniques, Alappuzha, India.

Major publications appeared in 1) Journal of the Geological Society of India
Total no. of pages in the thesis: 209
Total no. of references cited in the thesis: 339
Email of Researcher: tmmanjuens@gmail.com

Title: "Studies on Pollution Status, Fish Diversity & Conservation of Threatened Fishes in Vattakkayal, A Part of Ashtamudi Lake, South India"

Researcher: Seethal Lal. S. | Guide: Dr. Jaya D.S; Co-guide: Dr. Sherly Williams E

Subject : Environmental Sciences

The study was undertaken during the period 2012 to 2015 in Vattakkayal, a part of Ashtamudi lake, Kerala, South India to evaluate fish diversity, pollution load, conservation of threatened fishes as well as to put forward suggestions to protect the water body. Vattakkayal is located at 8°55'3" North latitude and 76°32'57" East longitude. The results of physico-chemical and heavy metal analyses of water and sediment samples collected from Vattakkayal showed that the lake is heavily polluted. The findings of fish diversity investigation revealed the presence of occurrence of 22 fish species belonging to 10 orders and 17 families. To confirm the impact of pollution on fishes, out of 22 fish species, *Mystus gulio* was selected, and a thorough study on its morphometry, feeding biology and reproductive biology were undertaken. In the present investigation, morphometric characters were undertaken for the growth in relation to the total length as well as standard length of the fish which indicated a linear relationship. Reproductive studies of *M. gulio* revealed that the period of spawning started in the month of June, with a peak spawning in the month of July. It was also showed that general sex ratio was 1: 0.15. From the study it was noted that the size at first sexual maturity of male and female of *M. gulio* was found to be above 8.3 and 8.5 cm respectively. Fecundity of *M. gulio* ranged from 5,950 to 1, 41,210. The maximum and minimum values of Gonado Somatic Index (GSI) were noticed in the month of July and November. General diet composition of *M. gulio* showed that the fish feed on a variety of food items. Crustaceans (36%) were the most predominant dietary item recorded from the stomach of the fish throughout the year, followed by insects (16.60 %), detritus (11.14%), oligochaetes (10.36%), eggs (10.11%), protozoans (5.46%), diatoms (5.06 %) fishes (4.65%) and algae (4.25 %). Analysis of heavy metals like copper, cadmium, lead, iron and chromium accumulation in fish tissues namely muscle, liver, fin, intestine, gill and ovary showed that the values of these metals were found to be low as compared to the maximum acceptable limits in the muscle of *Mystus gulio.* The present study concluded that Vattakkayal, a part of Ashtamudi lake hosts a number of fish species, and due to different anthropogenic activities, the fish diversity of this water body is in declining mode. The results of the present study on the quality of water and various aspects of *Mystus gulio* proved the grave situation of the lake. Morphology and reproductive organs of the fishes are greatly affected due to the pollutants. The depletion and declining trend of fish population will adversely affect the fishery economy as it has commercial value and in turn will affect the local fisher man community being their major livelihood.

Keywords : Heavy metals, Morphometry, *Mystus gulio*, Vattakkayal

Major Publication appeared in: 1) *International Journal of Scientific and Engineering Research*. 4(12), (2013), ISSN 2229-5518. 2) *International Journal of Scientific and Research publication*. 3(12), (2013), ISSN 2250-3153. 3) Journal *of Basic And Applied Biology*. 7(3), (2013), 36-38.

Total no: of pages in the Thesis : 380

Email of the Researcher: 456seethal@gmail.com

Title: "River Environment, Biogeochemistry & Anthropogenism - A Case Study of Vamanapuram River Basin, Kerala, India"

Researcher: Vinod Gopal. V | Guide: Dr. Sabu Joseph

Subject: Environmental Sciences

The Vamanapuram river basin (VRB) is sandwiched between the Karamana River Basin (south) and Ithikkara, Kallada and Ayiroor River Basins (north). It occupies 1.78% of the total area of Kerala. Geologically, major part (67%) of the study area is made up of Archean crystalline rocks- all highland panchayats are under this category; estuarine areas in the coast are composed of Cenozoic sediments of tertiary and quaternary age. Study area, geomorphologically having seven major units, experiences a humid tropical climate with an average annual rainfall is 2113 mm. The work was scheduled to delineate the present scenario of the VRB and to plot the thematic maps of midland – lowland areas so as to explore the severity of anthropogenism. The health appraisal of the river bank was carried out by performing various physico-chemical analyses. Study results showed explicit that the VRB is degraded physically and biologically, the active mining of the substratum of biological life has challenged the survival of the ecosystem. Mismanagement of the bio-shield and promotion of artificial side walls have affected the sediment discharge and increased the siltation. Bed lowering has affected the Chirayinkeezhu, Kizhuvilam, Vakkom and Attingal Municipality by saline ingression. Domination of trees and the absence of deep rooted shrubs and grasses in riparian buffer show Riparian illness. **Water quality and geochemistry** suggest that water is good for usage and the major problem identified is saline water ingression and its related issues in the lower reaches. Textural analysis revealed that enrichment of gravel during MON indicates good sediment transport. Human interference for sand mining had caused irregularities in textural distribution of river sediment in between MON and POM. Statistically nutrients have a moderate correlation with mud fraction. **Morphometry** and **plankton study** show that structural and climatic coordinators have played a major role in reshaping the basin. Stream order relegation from seven to six is the after effect of upland collapse, an indirect root cause of anthropogenism. Random distribution of bio-indicators (phytoplankton) summarize that the water is moderately polluted with Palmer pollution index (PPI) value 18. River flow velocity is the major factor controlling the population density in VRB. Unfortunately, the role of humans is unaffordable and detrimental as is clear from **environmental appraisal of banks and land-use / land cover analysis**. Traditional paddy areas are either practicing clay mining activities or are diverted for tree crops and settlement purposes. Geographical modifications of wetlands (paddy lands), floodplain degradation in lowland reaches and channelization will advance the flood in Attingal Municipality and Vembayam panchayat during heavy rains. So here in this study the impact of anthropogenism on the biological environment of VRB has been evaluated and thereby the rate of degradation was assessed and the areas demanding management options were delineated.

Key words: *VRB, appraisal, thematic map, anthropogenism, textural analysis, bio-shield, riparian, stream order, PPI*

Major publication appeared in: *International Journal of Scientific & Engineering Research*
Total no. of pages in the thesis: 237
Total no. of references cited in the thesis: 786
Email of Researcher: gopalvinod85@gmail.com

Title: "Dimensions of Time"	
Researcher: Prathibha S Nair	Guide: Dr V Nandamohan
Subject : Futures Studies	
In the study the different Dimensions of Time like succession, change, before-after temporal relation, linear or cyclical time, etc. are considered and studied and all are brought under one unifying dimension of time as 'Duration.' - a duration that could be eternal but also felt as piecemeal, static, a playground for all motion in space, as motion is characteristic of space not time. Time cannot be completely described by one discipline; neither psychology nor cosmology necessitating an integrated interdisciplinary/transdisciplinary study. The following hypotheses are discussed and supported in this study i) Time is basically a phenomenon of duration. ii) Psychological experience of time is a problem of vagueness. Key words: Time, Duration , Interdisciplinary analysis	
Major publication appeared in the following journals Only Conference Abstracts Total no. of pages in the thesis: 286 Total no. of reference cited in the thesis: 230 Email of Researcher: Prathibhasundaresan@gmail.com	

Title : "**Hydrogeochemistry and Fine Sediment Geochemistry of Neyyar River Basin, Southern Kerala**"

Researcher : Princy R. M. | Dr. S. Anirudhan and Dr. K. P. Thrivikramji

Subject : Geology

Results of research deal with hydro-geochemistry of groundwater (GW) and surface water (SW), sediment and soil geochemistry in the Neyyar River basin (order = 6; area= 484 km^2; length =56 km), Trivandrum Dist., south India. Vast areas of the basin have undergone extensive landuse changes, intense stream channel modifications. An extra visible intervention is the construction of a straight gravity masonry dam at Kallikad (circa 1957). The physiographic divisions of Kerala are robustly noticed in the basin. The basement, set in the southern Khondalite terrain, is dominated by khondalites, followed by rocks of Charnockite series and intrusive pegmatites. The midland is covered by thicker laterite and alluvium filled valleys. The coastal land is characterized by the modern coastal alluvium, which overlies patches of coastal Tertiary Warkalli series. This study addresses the spatio-temporal variations of hydrogeochemistry of groundwater (n=67) and surface water (n=48), texture and chemistry of sediments (n=33) and soils (n=40). The geodatabase of the chemical attributes of GW, SW, sediment and soil is created to enable analysis and thematic mapping of results in a GIS platform to better understand the spatial variations and to enlighten on the sources, controls, trends and variations. The analysis of suitability of GW and SW for domestic and irrigation uses shows quality deterioration towards downstream segment of the basin due to cumulative effect of anthropogenic activities, saline water intrusion due to proximity to sea and tidal influx in to the river channel. The study shows that precipitation induced chemical weathering along with dissolution of the rock forming minerals chiefly control the GW and SW chemistry. The higher concentration of Na^+ is a concern while considering the irrigational suitability. The Water Quality Index shows that the GWs are good to excellent with exception of very few locations near downstream. Textural and chemical analysis of sediments were carried out to decipher the sediment characteristics and to picture the geochemical profile. The sediments are coarse grained, moderately well sorted, positively skewed and platykurtic in nature. Geochemically, they are derived from Fe- Ti aluminosilicates. Strong positive correlations among the heavy metal concentrations suggest their abundances are caused by a common mechanism. The soils are mainly sandy-clay-loam type and acidic in nature and are deficient in SiO_2, CaO and MgO, but enriched in Fe_2O_3 and Al_2O_3 with good amount of TiO_2. In soils and sediments, heavy metals viz., Cd, Pb, Cr, Ni, Cu and Pb are present in excess of desirable limits, caused by geogenic and anthropogenic contributions. The study also suggests intense chemical weathering in the terrain of tropical monsoon climate. As the Neyyar River Basin does not have any major industry, presence of any chemical element in more than acceptable levels in water/sediment/soil could be attributed to natural and/or anthropogenic processes.

Keywords : Neyyar River Basin, GIS, Water Quality Index, Hydro-geochemistry, Heavy metal contamination, Anthropogenic sources

Major Publication appeared in : Journal of Applied Geochemistry
Total No. of Pages in the thesis : 278
Total No. of References cited in the thesis : 296
Email of the researcher: frincyrm@gmail.com

Title : "**Tectono-Metamorphic Evolution of the Moyar Shear Zone, South India"**	
Researcher : Praveen K. R.	Guide : Dr. V. Prasannakumar
Subject : Geology	

The South Indian Precambrian shield constitutes multiply-deformed and metamorphosed rocks with complex lithological, structural and metamorphic relationships transacted by crustal-scale shear zones. The Palghat Cauvery Shear System (PCSS), separating the Archaean Dharwar craton in the north and the Late Archaean to Early Proterozoic Nilgiri granulites in the south, is one of the major transcrustal shear zones in South India. The PCSS, comprising the Moyar, Bhavani, Palghat, Cauvery and Attur shear zones, plays a key role in the crustal evolution of South India. The WNW-ESE-trending, 10km-wide Moyar Shear Zone is the focus of the present study. The selected portion of the Moyar Shear Zone (MSZ) and adjoining areas consist of an assemblage of metamorphic rocks and acid to basic intrusives. Systematic analysis of structural elements and metamorphic signatures were carried out on mesoscopic and microscopic scales to arrive at the tectono-metamorphic evolution of the shear zone and associated rocks. These analyses were augmented with the results obtained from microstructural, geochemical, EPMA and AMS investigations. Structural mapping, field relations as well as petrographic and geometric analyses indicate poly-phase deformation and multiple events of metamorphism. The planar and linear structures, including the shear indicators and shear-sense indicators, both on the mesoscopic and microscopic scales, reveal that the MSZ underwent intense progressive ductile deformation with a predominant dextral sense of shear. The shear zone was reactivated in Pan-African times (ca. 0.55 Ga) resulting in retrogression leading to the formation of the low-grade rocks. The Peralimala syenite pluton, considered as post-tectonic, in the absence of mesoscopic or microscopic indicators of deformation, shows influence of strain during the development of magnetic fabrics, suggesting its syn-kinematic formation. In contrast, the magnetic fabrics of mafic intrusives are post-tectonic. The characteristic signatures of various deformation episodes and the corresponding P-T-t path are discussed and the results of the present study can be effectively utilised while modeling the crustal evolution of South India.

Keywords : Moyar Shear Zone, Peralimala Syenite, Shear Indicators, Shear-Sense Indicators, Magnetic Fabrics, Crustal Evolution

Major Publication appeared in : Journal of Geological Society of India, Geoscience Frontiers, Arabian Journal of Geosciences, Iranian Journal of Earth Sciences

Total No. of Pages in the thesis : 262

Total No. of References cited in the thesis : 443

Email of the researcher: geopraveen@gmail.com

Title : A**ugmentation of Groundwater resources of the Critical blocks of Kerala : A Remote sensing and GIS based study for the Parassala block**	
Researcher : Rakhi Gopal. R	Guide : Dr. Rajesh Reghunath
Subject : Geology	

The integration of remote sensing and GIS techniques has proved to be useful for the management of groundwater resources. An attempt has been made in the present study to apply the GIS and remote sensing technology to demarcate groundwater potential zones and to delineate suitable sites for artificial recharge. Parassala Block, the present study area is recognized as a problematic block in terms of the groundwater utilization. It covers an area of 101.98 Km^2. The main objectives of the study include (i) to generate a GIS based data bases about the groundwater environment of the area (ii) to understand the spatial and temporal patterns of groundwater quality (iii) to quantify the dynamic groundwater recharge (iv) to identify groundwater potential zones and various groundwater quality zones and (v) to find out suitable sites and appropriate methods for the augmentation of groundwater in the block. Groundwater level data was collected five times from 70 observation wells in an year. Pumping test was carried out at 24 locations to determine the aquifer characteristics such as Transmissivity, Storativity, Specific capacity and Time for full recovery. Soil thickness and soil textural analysis were carried out for 70 locations in the study area. Soil infiltration tests were carried out at 24 locations by using classic double ring method. Water samples were collected from 70 open wells, 2 bore wells, 12 ponds and 11 locations in the river channels during the pre-monsoon and post monsoon periods to understand the quality of the surface and subsurface water. Numerical weighted parameter rating approach and weighted index overlay method was used to delineate various groundwater quality zones for pre monsoon and post monsoon seasons. The Q- mode and R- mode factor analysis of groundwater chemical data revealed the lithological control on groundwater quality. The groundwater balance approach revealed that the study area faces a shortage of 2.563 Mm^3 of groundwater per year and the stage of development of the entire study area is 132%. Groundwater potential zones were delineated by integrating thematic layers of geology, geomorphology, drainage density, landuse, lineament density, relative relief, transmissivity, storativity, slope, water level fluctuation and time for full recuperation of wells. Slope stability analysis of the study area was also attempted to find out the stability of terrains before attempting the artificial groundwater recharging. The factors which affect the infiltration of water into the subsurface formations and the aquifer parameters which control the accumulation and movement of groundwater in aquifers were integrated in GIS platform to find out suitable sites for artificial recharging of groundwater. The suitable sites for artificial recharging of groundwater were again analysed in detail to find out the specific sites for various groundwater recharging techniques such as infiltration pits, check dams, percolation pond, injection wells and pond-cum-injection wells.

Total No. of Pages in the thesis : 144
Total No. of References cited in the thesis : 228
Email of the researcher: rakhi_gopal@rediffmail.com

Title: Groundwater Augmentation and Management in Vettikavalablock, South Kerala, India using Geospatial Technology	
Researcher: Vidhya. G. S	Guide: Dr. R.B. Binoj Kumar
Subject: Geology	
Water is nowadays a scarce and precious resource. However Kerala has not adequately responded with appropriate water retention techniques and approaches to meet the challenge of the high rate of surface runoff: hence there is heavy pressure on the groundwater resources. The present study was to evaluate the status of groundwater development and find out suitable sites and appropriate methods for augmentation of groundwater in the Vettikavala block of Kollam district. Scientific and systematic approach to augmentation and management of groundwater resources was done with collecting various kinds of primary and secondary data which throws lights on hydrogeology and hydro-geochemistry of the study area and processing and interpretation of these data to formulate some meaningful and useful recommendations. The study depicts the land slide susceptible areas and critical slope, where recharge structures should be avoided, thereby addressing the environment problems. The groundwater quality analyses were carried out in detailed and information on its spatial pattern was brought into consideration. The quality of groundwater for drinking, domestic and agricultural purposes were also studied and classified. The presence of anomalous pH in ground water was detected and addressed. Statistical tool was used to classify the water types in conjunction with various water quality plots. Thematic maps were prepared for various parameters also supported the water resource management in the study area. Various geologic and geo-morphological aspects were integrated to recommend suitable sites and most appropriate site specific water harvesting structures for improving water environment in the region. Hence, the research finding will be useful for future developmental activities of the study area and beneficial for sustainable water management planning.	
Major Publications appeared in: Nature Environment and Pollution Technology Journal Total Number of Pages in the Thesis: 254 Total Number of references cited in the Thesis: 163 Email id of the Researcher: vidhyashivadam@gmail.com	

Title: "Studies on Some Graph Families & Posets Related to Cover-Incomparability Graphs"	
Researcher: Dr. Baiju S.	Guide: Dr. Manoj Changat
Subject : Mathematics	
The Cover-Incomparability graphs is a recently introduced class of graphs arising from Posets. I have introduced the concept of 2-colored and 3-clored diagrams for Posets. I have attempted the problem of characterizing posets whose C-I graphs belong to the family of Chordal graphs, Distance Hereditary graphs and Line graphs using 2-colored and 3-colored diagrams on posets. Also Characterized the family of C-I graphs among Cographs, Ptolemaic graphs and subclass of Ptolemaic graphs such as Block Duplicate graphs, Acyclic Clique intersection graphs (AC graphs). Key words: Ptolemaic graphs, Block Duplicate graphs, Acyclic Clique intersection graphs, 2-colored diagrams and 3-colored diagrams on posets.	
Major publication appeared in the following journals :Taiwanese Journal of Mathematics, Order Total no. of pages in the thesis: 95 Total no. of reference cited in the thesis: 44 Email of Researcher: baiju.sahyadri@gmail.com	

Title: "Cross-connections of some classes of regular semigroups"	
Researcher: Azeef Muhammed P. A.	Guide: A. R. Rajan
Subject: Mathematics	
Nambooripad described the ideal structure of regular semigroups using categories. For this, he propounded the theory of cross-connections. In this thesis, we study the structure of various classes of regular semigroups using the theory of cross-connections. We study the normal categories and characterise the cross-connections arising from the singular transformation semigroup, singular linear transformation semigroup and completely simple semigroup. We also discuss the cross-connection structures of rectangular bands of groups, rectangular bands, groups etc which arise as natural special cases of the classes studied. Keywords: Regular semigroups, cross-connections, normal category, transformation semigroup.	
Major publication appeared in: Journal of Algebra and its Applications, World Scientific. Total no. of pages in the thesis: 132 Total no. of references cited in the thesis: 20 E-mail of researcher: azeefp@gmail.com	

Title : "Studies on Synthesis & Characterization of $Gd_2o_3:Eu^{3+}$ Based Nanophosphors"	
Researcher : Abhilash Kumar R G	Guide : Dr. K. G. Gopchandran
Subject : Optoelectronics	

Inorganic nanophosphors is one of the most promising materials for lighting, displays, defence security inks, sensing, solid state lasers, solar energy converters and bio-labels. Increasing demand in these potential fields has created a thrust among researchers to develop high quality phosphors. Current focus in this area is to make use of the luminescence features of rare earth based phosphor materials in the nanoscale. Long lifetime and sharp emission lines exhibited by trivalent rare earth ions make them attractive for photonic applications. Cubic bixbyite structured gadolinium oxide (Gd_2O_3) is a promising host material for down and upconversion emissions due to its high density, good chemical durability, better thermal stability, high photochemical stability and low phonon energy. In the present work, investigations were carried out on $Gd_2O_3:Eu^{3+}$ based red emitting nanophosphors prepared by a modified organic mediated solution combustion technique. Present synthesis technique adopted in the work used diethylene glycol as the solvent and citric acid as the chelating agent. It is found that the structure, morphology and luminescent properties of the synthesized $Gd_2O_3:Eu^{3+}$ nanophosphors were highly sensitive to the sintering temperature, molar concentration of chelating agent and Eu^{3+} concentration. The structural symmetry around Eu^{3+} ions in the phosphor matrix and radiative parameters of the phosphors were elucidated by Judd-Ofelt theory. The shift of the charge transfer excitation band due to europium compensation is analysed using Jorgenson's method. It is found that excess Eu^{3+} in the Gd_2O_3 host leads to luminescence quenching. The observed luminescence quenching beyond a Eu^{3+} content of 0.1 in $Gd_{2-x}Eu_xO_3$ is analysed using Dexter's theory of quenching and the reason for quenching is verified to be electric dipole-dipole interaction among the Eu^{3+} activators. The influence of sintering temperature, chelating agent and Eu^{3+} activator concentration on the luminescence properties is also studied by evaluating the colour analysis. The $Gd_{1.9}Eu_{0.1}O_3$ nanophosphor obtained under optimum preparation conditions showed a quantum efficiency of 78.63 % and a lifetime of 1.217 ms. In order to improve the luminescence properties, monovalent lithium (Li^+) is compensated in $Gd_2O_3:Eu^{3+}$ nanophosphor. Li^+ enhances the luminescence intensity by a factor of 1.83, modifying the crystallinity, morphology and symmetry around the Eu^{3+} activators. The Li^+ compensated nanophosphor, $Gd_{1.75}Eu_{0.1}Li_{0.15}O_3$ obtained under optimum synthesis conditions showed a quantum efficiency of 83.93 % with a lifetime of 1.36 ms. In order to improve the luminescent properties further, Zn^{2+} was also added in addition to lithium ions in $Gd_2O_3:Eu^{3+}$ nanophosphor and their combined effect on the luminescent properties is evaluated. The $Gd_{1.71}Eu_{0.1}Li_{0.15}Zn_{0.04}O_3$ phosphor exhibited high emission intensity with a quantum yield of 86.89 % and a lifetime of 1.47 ms. It found that cooperative effect of Zn^{2+} and Li^+ enhances the emission intensity by a factor of 3.33 times compared to that of $Gd_{1.9}Eu_{0.1}O_3$ phosphor. It is found that the luminescence decay profiles of the $^5D_0$ level of Eu^{3+} ions follow single exponential behaviour in all the $Gd_2O_3:Eu^{3+}$ based nanophosphors. The observed trend in the Judd-Ofelt parameters has been correlated with the characteristics asymmetric chemical environments around the Eu^{3+} ions of the different phosphors. The present thesis reports a systematic investigation for developing efficient and stable red emitting phosphors for photonic applications.

Major Publications appeared in: RSC Advances; Ceramics International.
Total number of pages in the thesis: 218, Total number of reference cited in the thesis: 245
Email of Researcher: abhivenkulam@gmail.com

Title: "Effect of Noble Metal Incorporation on the Structural, Morphological & Optical Properties of Nanostructured Tungsten Oxide Films And The Development Of Platinum Added Wo_3 Gas Sensors"

Researcher : Jolly Bose R | Guide : Dr. V. P. Mahadevan Pillai

Subject : Optoelectronics

Tungsten oxide is a transition metal oxide exhibiting a rich collection of interesting and intriguing properties which can be tailored to suit wide variety of technological applications. The incorporation of noble metals can produce changes in the structural, morphological and optical properties of tungsten oxide. During this thesis work, we have prepared pure and noble metal (Ag, Au and Pt) incorporated tungsten oxide thin films by RF magnetron sputtering technique and gas sensors are developed using Pt loaded WO_3 films. Thin films of tungsten oxide with different weight percentage of silver are prepared by RF magnetron sputtering technique and the as-deposited films are characterized. It is found that silver can act as a catalyst for the formation of monoclinic $W_{18}O_{49}$ phase. Silver incorporation on tungsten oxide matrix enhances crystallinity of the films, improves the thickness of the films and grain size and decreases the transmittance and band gap of the films. Surface plasmon resonance peak of silver nanoparticles in tungsten oxide matrix is obtained around 437 nm. The phase evolution of silver tungstate with temperature on the multilayer films of Ag and WO_3 is also studied. In the case of gold incorporated tungsten oxide thin films, gold act as seed and nucleation centres for the formation of oxygen deficient tungsten oxide phase and also modifies the phase from WO_3 to $W_{18}O_{49}$. The surface plasmon resonance of gold nanoparticles in tungsten oxide matrix is studied and a localized surface plasmon resonance (LSPR) band is observed around 604 nm. The integrated areas of selective Raman band (~925 cm^{-1}) and LSPR band (~604 nm) increase almost linearly with increase in concentration of gold incorporation, which can be taken as a measure of gold concentration in the tungsten oxide matrix. The platinum incorporation deteriorates the crystallinity of tungsten oxide films and the particle size decreases with increase in Pt loading concentration. The 5 wt% platinum loaded tungsten oxide thin film is obtained with reduced particle size and nanoporous nature which is crucial for gas sensing applications. Hydrogen and carbon monoxide sensors are fabricated with pure and 5 wt% platinum loaded tungsten oxide sensing layers for sensing H_2 and CO gases at concentrations 250 and 500 ppm and the sensitivity is tested at operating temperatures 200, 300 and 400 °C in humid and non-humid atmospheres. The gas sensing measurements towards hydrogen gas show that the 5wt% Pt added WO_3 sensor is having sensitivity 2.5 times higher than pure WO_3 sensor (P1) for 250 ppm of hydrogen gas at 200 ^oC. The gas sensing measurements of sensors P1 and P5 towards CO gas reveals that the sensitivity of sensor P5 at 250 ppm of CO gas for operating temperature 200 °C in non-humid atmosphere is nearly 15 times greater than that of sensor P1, while it becomes 64 times in humid atmosphere. The Pt loaded WO_3 sensor is having good sensitivity towards both H_2 and CO gases at lower operating temperature of 200 °C. It also has a stable response in both humid and non-humid ambience and hence it can be preferred over pure WO_3 sensor in real life sensing measurements. The hydrogen sensing mechanism is investigated using micro-Raman spectroscopy.

Major Publications appeared in : Journal of Applied Physics, Applied Surface Science, Euro Physics Letters and Spectrochimica Acta.
Total number of pages in the thesis : 215
Total number of reference cited in the thesis : 347
Email of Researcher : jollyboser@gmail.com

Title: "Laser Assisted Synthesis of Gold & Silver Based Colloidal Nanostructures & Their Characterization"

Researcher : Vinod M.	Guide : Dr. K.G. Gopchandran

Subject : Optoelectronics

Plasmon characteristics of gold and silver nanoparticles have been used in a wide range of applications ranging from sensing and imaging to biomedicine and communication. Plasmons arise from the collective oscillations of conduction band electrons in these nanoparticles while interacting with an external electromagnetic radiation. Characteristics of plasmons in the nanoparticles strongly depend on the size, shape, dielectric environment, composition and interparticle distance. Laser assisted preparation of colloidal nanoparticles is emerging as an alternative physical method for the synthesis of ligand free colloidal gold and silver nanoparticles, as it does not necessarily use any chemical reagents or produce any toxic wastes during the synthesis process. The work reported in this thesis deals with the synthesis of colloidal Au, Ag, Ag@Au core-shell and Au-Ag bimetallic chain nanostructures by laser ablation in water. Initially, studies on the synthesis and characterization of Au, Ag and mechanically mixed Au:Ag colloidal nanoparticles were performed. The plasmon band of Au and Ag nanoparticles are found to depend on the laser fluence used and the duration of the ablation process. The position of the plasmon band of Au:Ag colloidal mixtures is found to be highly sensitive to Au:Ag concentration ratio. Later, Ag@Au core-shell nanoparticles were prepared by ablating the gold target in silver colloidal suspension and then Au-Ag bimetallic chains were prepared by ablating the silver target in gold colloidal suspension, by changing the laser parameters. The plasmon characteristics of the core-shell nanoparticles are found to be highly sensitive to the thickness of Au coating. An attempt was also made to understand the plasmon coupling and hybridization process between the nanoparticles in the colloidal suspensions. The inherent toxicity of gold nanoparticles was assessed using MTT (3-(4, 5-Dimethylthiazol-2-yl) -2,-Diphenyltetrazolium Bromide) assay and these particles showed no inherent toxicity. The photothermal efficiency of these gold nanoparticles was also found to be promising. The conductive properties and the local density of states on the surfaces of Au, Ag and bimetallic Au-Ag nanoparticles were also investigated and reported. The SERS activity of the Au, Ag and its bimetallic nanostructures was tested using crystal violet as probe molecules and found that these nanostructures can be used as efficient SERS substrates. The influence of plasmon coupling on the enhancement of Raman bands in these SERS spectra is found to be different for different bands.

Keywords: Gold, Silver, Plasmon, Laser ablation, Biocompatibility, Conductive properties

Major Publications appeared in : Progress in Natural Science: Materials International ; Current Applied Physics; Spectrochimica Acta Part A: Molecular biology and spectroscopy; Super lattices and Microstructures.

Total number of pages in the thesis : 172

Total number of reference cited in the thesis : 322

Email of Researcher : vinodmohan3@gmail.com

Title: "Study of wind fluctuations in the troposphere"	
Researcher. Ms. V. K. Mini	Guide: Prof. S. R. Prabhakaran Nair
Subject: Physics	
In the present study we explored the inner annual and intra seasonal variability of six important atmospheric parameters *Zonal wind, meridional wind, vertical wind and radio refractive index of the troposphere and lower stratosphere and tropopause height and temperature* over Indian summer monsoon region. It is found that variability of all these parameters in the troposphere contribute significance to monsoon variability. It is also observed that there exists a link between the tropospheric and lower stratospheric wind anomaly and Indian summer monsoon. From the result obtained from the present study, a suitable atmospheric model can be developed for study of the monsoon variability, long range forecasting and also to device a real time diagnostic tool for ISM. So more research work on these aspects will be needed for a better understanding of the physical mechanism responsible for monsoon variability and global climate change. The monsoon variability is a prime concern for a country like India, which depends on agriculture for its national income and agriculture is turn is mainly depended on monsoon rains. If we understand more about monsoon variability over Indian region, it will help us to issue the more accurate prediction of monsoon and to have a safer way of doing agriculture and there by proper planning in the agriculture sector of the country to minimize the loss due to the monsoon rainfall variability. Key Words: Vertical wind, refractive index, monsoon rainfall, Zonal wind	
Major Publication Appeared in: Total number of pages in the thesis: 208 Total number of reference cited in the thesis: 112 E-mail of researcher: minijayalal@yahoo.co.in	

Title:	
Researcher. Madhu.G	Guide: Dr. V.Biju
Subject: Physics	
This work deals with the synthesis of nanostructured nickel oxide (NiO) through a novel chemical method and detailed study of structure-property correlations in samples with different average crystallite sizes. One major outcome of the study is a novel chemical method for the synthesis of nanostructured NiO with different average crystallite sizes. Further the study explored in detail the role of point defects, viz., Ni^{2+} and O^{2-} vacancies in determining the electrical, optical and magnetic properties of nanostructured NiO. A systematic study of the defect structure was done by combing the results of different characterization tools such as X-ray diffraction analysis (XRD), UV-visible absorption spectroscopy, X-ray photoelectron spectroscopy (XPS), etc. It was shown that the antioxidatnt activity exhibited by NiO nanostructured could also reveal information regarding the defect structure. It was established that O^{2-} vacancies play a crucial role in determining the physical and chemical properties of nanostructured NiO. Previous studies had concentrated only on the role of Ni^{2+} vacancies as an important structural parameter and the significance of O2- vacancies in structure-property correlation is a major contribution of this work. The highlight of the thesis is the thorough investigation of the magnetic properties of the samples and the proposal of a plausible model for the observed weak ferromagnetism citing the distinct roles played by Ni^{2+} and O^{2-} vacancies. Key Words: Nanostructured materials, nickel oxide, chemical synthesis, structure-property correlation	
Major Publication Appeared in: Physical Chemistry Chemical Physics; Colloids and Surfaces A; Physica B; Physica E; Journal of Alloys and Compounds. Total number of pages in the thesis: 195 Total number of reference cited in the thesis: 175 E-mail of researcher: madhugnta@gmail.com	

Title: "Studies on synthesis and characterization of nanostructured Mn_3O_4"	
Researcher. Vipin. C. Bose	Guide: Dr. V. Biju
Subject: Physics	
The research work contained in the thesis includes the detailed investigation of the synthesis of phase pure nanostructured Mn_3O_4 through facile chemical methods, investigation of the physical properties and fabrication of electrochemical super capacitors with these samples as active materials. As manganese (Mn) can exist in different valence states, viz., +2, +3, +4, +5, +7, etc., it can form a host of stoichiometric and nonstoichiometric oxides which make the low temperature chemical synthesis of any one oxide a challenging task. As part of this Ph.D program we had developed and systematized three facile techniques for the synthesis of phase pure nanostructure Mn_3O_4. Further the details of many more routes that result in multiphase oxides of Mn are also included in the thesis. A thorough investigation of the structure and physical properties (optical, electrical and magnetic) of the samples is also done. The study establishes the fact the microstructure play a crucial role in determining the physical properties and hence samples with more or less similar crystallite sizes synthesized through different routes could show different electrical and magnetic properties. The performance of the nanostructured Mn3O4 samples as active materials in electrochemical super capacitors is also included which show promising results. Key Words: Nanostructured materials, Mn_3O_4, chemical synthesis, structure-property correlation	
Major Publication Appeared in: Physica E; Materials Science in Semiconductor Processing; Superlattices and Micostructures; Total number of pages in the thesis: 191 Total number of reference cited in the thesis: 144 E-mail of researcher: vipincbose@yahoo.co.in	

Title**: "On Skew Normal Distribution"**	
Researcher: Anusree, M.R.	Guide: Dr. C. Satheesh Kumar
Subject: Statistics	

During last three decades, there is a growing interest in the construction of flexible parametric classes of skew normal distributions and the motivation is mainly from certain real life data sets which do not follow the normal law. As a consequence, there has been renewed interest in the construction of parametric classes of non-normal distributions that can account for skewness. But, there are certain practical situations where the skew normal distribution is also not appropriate due to the presence of plurimodality. In order to overcome this drawback of the skew normal distribution, through this research work we propose thirteen classes of asymmetric normal distributions, which are more flexible enough to support both unimodal and/ or plurimodal shapes. First, we construct "the modified skew normal distribution (MSND)" as a generalized mixture of standard normal and skew normal distributions, and define "modified skew generalized normal distribution" as a generalized mixture of the standard normal and the skew generalized normal distribution. A more general class of asymmetric normal distribution is defined through the name "the modified skew normal distribution of order n". Also, we consider certain classes of asymmetric normal distributions namely the asymmetric mixture normal distribution (AMND)", the asymmetric mixture generalized normal distribution" and the asymmetric mixture normal distribution of order n". Further, we propose three new classes of two-piece skew normal distributions namely the modified two-piece skew normal distribution", the modified two piece skew normal distribution of order n" and the generalized two-piece skew normal distribution of order n". Through the present work, we also consider a two-piece version of the MSND and propose a further generalization to it. Thereafter, we define the two-piece modified skew normal distribution (TMSND)" and we develop a generalization to the TMSND which we termed as "the generalized two-piece modified skew normal distribution" and derive several important properties of it. The present thesis also contains a two-piece version of the AMND and its generalization. Several distributional as well as reliability aspects of all these classes of distributions are derived in respective cases. In addition, we consider the location-scale extension of these classes of distributions, investigate their properties and discuss the estimation of their parameters. Real life data sets are considered for illustrating the estimation procedures in case of each of these new classes of distributions.

Key words: Model selection, Plurimodality, Simulation, Skewness.

Major publications appeared in: *Statistics and Probability Letters, Statistics,* Journal of Statistical Theory and Practice, *Communications in Statistics-Theory and Methods, South African Statistical Journal,* Journal of the Japan Statistical Society, *Journal of Statistical Theory and Application*s, *The Aligarh Journal of Statistics, Journal of Statistics and Mathematical Engineering*

Total no. of pages in the thesis: 191

Total no. of reference cited: 73

Email of researcher: anun74@gmail.com

Title: **"A Study on Logarithmic Series Distributions"**	
Researcher: A. Riyaz	Guide: Dr. C. Satheesh Kumar
Subject: Statistics	

The logarithmic series distribution (LSD) is a limiting case of the zero-truncated negative binomial distribution and it has been useful for modeling species abundance data with exceptionally long tails. An important drawback of the LSD in certain practical situations is that it excludes zero observations from its support. To mitigate this difficulty, through this research work we introduce and study certain classes of zero-inflated logarithmic series distributions, and illustrate their usefulness with the help of certain real life data sets. First we proposed a modified version of the LSD, which we named as "the generalized logarithmic series distribution". We propose an alternative form of the well-known logarithmic-with-zeros distribution and named it as "the alpha-logarithmic series distribution (ALSD)". We investigate several properties of the ALSD and developed its bivariate version. The thesis contains some generalized versions of the ALSD namely "the extended alpha logarithmic series distribution", "the generalized alpha-logarithmic series distribution" and "the alpha-logarithmic series distribution of order k". We studied another zero-inflated model namely "the zero-inflated logarithmic series distribution (ZILSD)" and elaborated its bivariate version. Through the present work, we also introduced certain generalizations of the ZILSD such as "the extended zero-inflated logarithmic series distribution", "the generalized zero-inflated logarithmic series distribution" and "the zero-inflated logarithmic series distribution of order k". An alternative version of the ZILSD is introduced through the work, namely "the alternate zero-inflated logarithmic series distribution (AZILSD)" and suggested a bivariate version of it. We proposed certain generalizations of the AZILSD through the names "the extended alternative zero-inflated logarithmic series distribution", "the generalized alternative zero-inflated logarithmic series distribution" and "the alternative zero-inflated logarithmic series distribution of order k". In case of each of these new families of distributions, we derived recurrence relations for its probabilities, raw moments and factorial moments, and discussed the estimation of their parameters by the method of maximum likelihood. We have fitted these models to certain real life data sets for emphasizing their usefulness and suggested certain test procedures such as generalized likelihood ratio tests and Rao's efficient score tests for testing the significance of the additional parameters of the distributions. In addition, simulation studies are conducted for examinining the performance of the maximum likelihood estimators of the parameters of these distributions.

Key words: Count data models, Distributions of order k, Model selection, Simulation, Zero-inflated distributions.

Major publications appeared in: *AStA Advances in Statistical Analysis, Journal of Statistical Computation and Simulation, Journal of Applied Statistics, Communications in Statistics-Theory and Methods, Communications in Statistics-Simulation Computation simulation, South African Statistical Journal, Statistica, Communications for Statistical Applications and Methods, Journal of Applied Statistical Science, Journal of the Iranian Statistical Society, Journal of Statistical Theory and Applications*, *The Aligarh Journal of Statistics, Journal of Statistics and Mathematical Engineering, Journal of Combinatorics, Information & System Sciences.*

Total no. of pages in the thesis: 249

Total no. of reference cited: 85

Email of researcher: riyazstatoyour@gmail.com

Title: **"Some Contributions to the Study of Hyper-Poisson Distributions"**	
Researcher: Unnikrishnan Nair. B.	Guide: Dr. C. Satheesh Kumar
Subject: Statistics	

The Poisson distribution has been used for modelling number of rare events that occur in time, area, region, volume or space, and thereby it has found useful applications in various fields of research particularly in actuarial studies, agriculture, biosciences, commerce, demography, ecology, education, engineering, genetics, marketing, medicine, operation research, risk theory, social sciences etc. The Poisson probability model is based on the assumption that events occur under the principle of complete randomness. But in numerous practical situations, this principle does not hold. The equality of mean and variance characterize the Poisson model among all other discrete probability models. This property of "equi-disperson" of the Poisson probability model is found to be inappropriate in several practical situations. To model rare events in such situations, a well known discrete distribution namely "the hyper-Poisson distribution (HPD)" is studied in the literature since 1964. But in several practical situations, the hyper-Poisson model also fails to give good fit, but a model near to the hyper-Poisson will be more suitable. So, through this thesis we generalize and /or modify the HPD in various directions, study their important properties and illustrate their usefulness by utilizing certain real life data sets. First we develop a bivariate version of the HPD and thereby introduce certain modified versions of the HPD such as "the modified hyper-Poisson distribution (MHPD)", "the extended hyper-Poisson distribution (EHPD)"and "the stuttering hyper-Poisson distribution (SHPD)". Next we propose an alternative form of the HPD, which we call "the alternative hyper-Poisson distribution (AHPD)" and have developed its bivariate version. The thesis also contain certain modified versions of the AHPD such as "the modified alternative hyper-Poisson distribution (MAHPD)", "the extended alternative hyper-Poisson distribution (EAHPD)", and "the alternative hyper-Poisson distribution of order k [AHPD (k)]". Further, we defined a more wide class of distribution as a generalization of both the HPD and the AHPD through its p.m.f. We name this class of distribution as "the alpha generalized hyper-Poisson distribution (AGHPD)"and a bivariate version of the AGHPD is also introduced here. Certain modified versions of the AGHPD are suggested, including an order k version of the AGHPD. We obtain several important aspects of each of these classes of distributions and discuss the estimation of the parameters of them by various methods of estimation. Testing procedures are considered for highlighting the relevance of these new models. All these distributions are fitted to real life data sets for illustrating the application of these classes of distributions. We have also carried out simulation studies in each case for examining the performance of the estimators of the parameters of the distributions, obtained through various methods of estimation.

Key words: Count data models, Distributions of order k, Model selection, Over-dispersion, Simulation.

Major publications appeared in: *Communications in Statistics-Theory and Methods*, *Opsearch*, *Statistica*, *Journal of Applied Statistical Sciences*, *Journal of Statistical Research*, *Economic Quality Control*, *Journal of Statistics and Applications*, *Sri Lankan Journal of Applied Statistics*, *The Aligarh Journal of Statistics* and *Journal of the Indian Society of Agricultural Statistics.*

Total no. of pages in the thesis: 200

Total no. of reference cited: 61

Email of researcher: ukswathy@gmail.com

Title: "Taxonomy and Diversity of Echinoderms in Kerala Coast with Special Emphasis on Sea Cucumbers"

Researcher: Deepa R. Pillai | Guide: Dr. A. Bijukumar

Subject: Zoology

The phylum Echinodermata includes a diverse group of typically slow-moving and non-aggressive animals occupying a variety of habitats in marine ecosystem. Echinoderms are an important component of deep-sea benthic communities and highly sensitive organisms and are used as indicators of pollution. This phylum fall into five well-defined clades: Crinoidea (sea lilies and feather stars), Asteroidea (sea stars), Ophiuroidea (basket stars and brittle stars), Echinoidea (sea urchins, sand dollars, and sea biscuits), and Holothuroidea (sea cucumbers).The identification of echinoderms was done by following the 'Monograph of shallow water Indo-Pacific Echinoderms' by Clark and Rowe (1971). In addition, the publications of James (1967, 1969, 1971, 1973, 1978, 1983, 1982, 1989, 1994, 1996, 1999, 2004, 2007, 2008) and other taxonomic keys relevant to each family were also consulted for identification.The taxonomic survey of echinoderms conducted along Kerala coast during August 2007 to July 2014 recorded the presence of 62 species classified under 5 classes, 13 orders, 30 families and 43 genera. Under the class Crinoidea 3 species categorized under 1 order, 3 families and 3 genera were recorded, while class Asteroidea was represented by 13 species 82mbricate8282 under 2 orders, 5 families and 9 genera. Class Ophiuroidea consisted of 10 species belonging to a single order and 5 families, representing 7 genera. Class Echinoidea included 15 species coming under 6 orders, 12 families and 14 genera, while class Holothuroidea was represented by 21species 82mbricate8282 under 3 orders, 5 families and 10 genera. The results of the study showed that Holothuroidea is the most species rich class of echinoderm fauna along Kerala coast and is represented by 21 species. Out of the 62 species collected, seven species of echinoderms were reported for the first time from India. The first records of sea star species from India include *Astropectenfasciatus*Doderlein, 1926, *Astropecten82mbricate82*Muller&Troschel, 1842 and the genus *Mediaster*. The echinoid *Schizasterlacunosus*(Linnaeus, 1758) and the holothuroids, *Holothuriaimitans* Ludwig 1875, *Trachassinacrucifera* (Semper, 1869) and the genus *Thyonina*were new reports from India. Among ophiuroids *Ophiocoma82mbrica* Muller &Troschel, 1842,*Ophiocomaerinaceus* Muller &Troschel, 1842, *Ophiocoma pica* Muller &Troschel, 1842, *Ophionereisdubia* (Müller & Troschel, 1842), *Ophiarach-nellainfernalis* (Muller and Troschel, 1842), *Macrophiothrixnereidina* (Lamarck, 1816) and *Ophiothrix82mbricate* Duncan, 1887 were new reports from southwest coast of India. The echinoid *Maretiaplanulata* (Lamarck, 1816) and the genus *Metalia* are new reports from southwest coast of India. *Protankyrasimilis* (Semper, 1867), *Holothuriahilla* Lesson, 1830, *Holothuriaerinaceus*Semper, 1868, *Holothuriafuscocinerea*Jager, 1833, *Holothuriaarenicola*Semper 1868, *Stichopusherrmanni* (Semper, 1868), *Stichopushorrens*Selenka, 1867 and *Phyllophoruscebuensis* (Semper, 1867) formed new reports of holothurians from southwest coast of India.

Despite the ecological and commercial importance of echinoderms, their diversity and ecology remain poorly understood along the southwest coast of India. Shannon

diversity index, Simpson diversity index, Margalef index, Fisher alpha diversity was found to be maximum for Vizhinjam. The results of the study indicated higher species diversity of echinoderms in Vizhinjam coast. Diversity of echinoderms of Vizhinjam coast was significantly different from all other localities along Kerala coast, indicating the uniqueness of Vizhinjam Bay as a habitat of echinoderms. Comparison of species abundance of five classes of echinoderms indicated that Class Holothuroidea is the species rich taxon and was abundant in Vizhinjam coast with 17 species. For crinoids and ophiuroids also, species abundance and individual abundance was maximum in Vizhinjam coast.

Due to the absence of characteristic morphological features and the ossicles of the body wall are highly variable there existed difficulty with the taxonomy of many species of sea cucumbers. As schedule 1 species and as species of great ecological, biomedical and industrial importance (used for beche-de-mer production) accurate species level identification of sea cucumbers is inevitable. DNA barcoding is very significant for the identification of all echinoderms especially holothurians which need effective conservation. Barcoding analysis of 17 species of class Holothuroidea was done in order to clarify its systematic and taxonomy along Kerala coast by analyzing mitochondrial gene cytochrome oxidase 1. The result of molecular phylogeny supported the existing taxonomical identification based on the structure of calcareous spicules isolated from various parts of the sea cucumber. The present study confirms that all the species of sea cucumbers collected are separate species and none are geographic variants of a single species. All the species analysed form distinct monophyletic clades in accordance with the taxonomic identification done. Most sequences generated for the species were well clustered with the sequences of the corresponding species of the respective nominal taxon from GenBank with high boot strap values. The nucleotide sequence data of 17 species of sea cucumbers generated in the present study was deposited to the GenBank and accession numbers are obtained which aid further reference and research. Sequence data of 7 species of sea cucumbers were new submission to the GenBank which include Aspidochirotidan species such as *Holothuriapardalis, H. difficilis* and Derndrochirotidan species such as *Asliaforbesi, Leptopentacta83mbricate, Trachasinacrucifera, Phyllophoruscebuensis* and *Thyonina*sp.

Keywords: Phylum Echinodermata, Taxonomy, Asteriods, Crinoids, Ophiuroids, Echinoids, Holothuroids, Bar coding of sea cucumbers

Major Publication appeared in: Journal of threatened taxa
Total no. of pages in the thesis: 286
Total no. of reference cited in the thesis: 632
Email of Researcher:deepakudassanad@gmail.com

Title: "Ecology and Plankton Diversity of Wetlands: A Case Study from Wetlands adjacent to the Sea Food Processing Facilities in Cherthala-Aroor-Edakochi Coastal Belt of Kerala"

Researcher: Vidya V.	Guide: Dr. Gopal Prasad

Subject: Zoology

Kerala is one of the most important maritime states in the country contributing significantly to the Indian sea food Industry. There are about 287 sea food exporters in Kerala with 124 processing plants and 169 cold storages. A distinct feature of the processing sector in Kerala is its dependence on the pre-processing sector which is popularly known as "peeling sheds". The sea food industries in Kerala are particularly limited to the narrow coastline of the Vembanad Lake mainly due to the ease of transport. The fishing industry comprises fish catching, processing and marketing. Processing of seafood produces a large bulk of by-products and wastes. The direct discharge of waste from the seafood processing industries into the adjacent wetlands affects the aquatic life and thus may affect the whole food chain. The present study has been formulated to understand the influence of seafood processing waste on the physico-chemical properties, plankton diversity, distribution and abundance of water receiving the effluent discharge and their inter relationship among each other and to create thematic maps to understand the stress zones in and around the collection sites of this wetland so that appropriate measures could be taken to protect them. The study was conducted in Cherthala - Aroor - Edakochi coastal belt, where large numbers of seafood processing plants are situated. The water samples for the present study were collected from ten different stations for a period of two years on a monthly basis. The stations, S1-S9 were closely associated with the seafood processing discharge outlets and the site S10, was kept as a reference site, which is free from the seafood processing discharge. The mean and standard error of mean (SEM) values were calculated for all parameters in each station and season and Pearson correlation between the abiotic factors and the dominant classes of phytoplankton and zooplankton were analysed. Multivariate statistical analysis using PCA and cluster analysis were carried out to establish the principal components causing the total variance and cluster them according to their features. Biodiversity indices were done to understand the diversity of phytoplankton and zooplankton. Carlson trophic state index was used to categorise the stations into eutrophic and hypereutrophic state. Palmer's algal pollution index was done to rate the collection sites in terms of pollution.

The analysis of the water quality parameters showed marked variation among stations. The mean values of alkalinity, hardness, BOD, COD and the nutrients like nitrate, phosphate, ammonia and silicate were low in the reference station when compared to the other nine (S1-S9) stations. The high values of BOD in nine stations (S1-S9) would be due to the presence of high biological waste in the water. The mean value of DO obtained was high in the reference site when compared to the nine stations. The stations were categorised into eutrophic or hypereutrophic based on Carlson trophic state index. According to this index stations particularly S3, S5 and S9 were in hyper eutrophic state when compared to the reference station. A strong positive correlation among TDS, EC,

salinity and hardness was the most remarkable finding. The nutrient enrichment associated with the waste discharge from the nearby sea food industry significantly altered the parameters like BOD, alkalinity, hardness, DO and electrical conductivity The physico-chemical parameters loaded on the first factor in PCA showed the organic pollution indicators which contributed significantly to the total variation in water quality. The cluster analysis grouped all 10 sampling sites into three statistically significant clusters. The presence of main organic pollution indicators such as Nitzschia sp Navicula sp Ceratium sp, Ankistrodesmus sp, Scenedesmus sp, Oscillatoria sp and Phormidium sp indicated the pollutants of biological origin. In the case of zooplankton the pollution tolerant groups like Rotifera, Cladocera and Copepoda were high in the S1-S9 when compared to the reference station. The pollution-tolerant algal communities can be used as bioindicators of organic pollution.The factors responsible for eutrophication were identified for the different stretch of lake system. The study revealed that hyper eutrophication existed near the effluent discharge point is as a result of the indiscriminate fish/shrimp processing waste dumping. The waste discharge from the sea food processing industry is major factor contributing to the alarming rate of organic pollution and subsequent eutrophication. The study concluded that the discharge of sea food effluents into the nearby wetlands is deteriorating the water quality and hampering the aquatic life other than the pollution tolerant plankton. So the legal provisions should be strengthened to control the pollution at the source itself and make sure that the industries own modern eco- technologies for the primary and secondary treatment of waste water before being dumped into the water bodies

Major publications appeared in: Nature, Environment and Pollution Technology, Journal of Aquatic Biology & Fisheries
Total no. of pages in the thesis: 370
Total no. of references cited in the thesis: 723
Email of Researcher :vidyaveee@gmail.com

Title: "impacts of wetland depletion on the ecology and faunal diversity of veli lake"	
Researcher: Fouzia J.	Guide: Dr. Gopal Prasad
Subject: Zoology	

Wetland is a general term applied to the land areas that are seasonally or permanently water logged including lakes, rivers, estuaries and fresh water marshes. Nowadays wetlands all over the world face severe ecological crisis mainly due to the climatic and anthropogenic interferences. The present study is an attempt to understand the impact of wetland quality depletion on the hydro ecology and faunal diversity status of Lake Veli, the smallest estuarine wetland in the southwest coast of Kerala situated in Thiruvananthapuram district. In comparison with other backwater systems of Kerala, the Lake Veli is shallow and very limited in extent and received very little attention. The study highlights the precise assessment of the extent of degradation caused to the lake.

The thesis is divided into five chapters. Chapter 1 deals with the general introduction about the wetland ecology and its significance. Chapter 2 deals with the present hydro ecological status of Lake Veli. A correct perspective on the status of hydrological system is possible by the documentation of physico chemical parameters in an environmental scenario. Ecological parameters of the lake were carried out for a period of two years (from June 2009 to May 2011). Water and sediment samples were taken from four stations and the selected parameters were tested for each month during the study period. The parameters were analyzed using standard techniques.

General physicochemical parameters such as atmospheric water and sediment temperatures, total dissolved solids, pH, electrical conductivity, salinity, dissolved oxygen, biological oxygen demand, alkalinity, chemical oxygen demand, hardness, organic matter and nutrients such as nitrite, nitrate, phosphate, ammonia, silica and copper were analyzed. Rainfall data was obtained from Indian meteorological department Thiruvananthapuram. The data was prepared and processed using statistical tools.

The mean value obtained for nitrite, ammonia and organic matter was 1.12±0.09 mg/l, 4.37 ±0.34mg/l and 5.46± 0.13 mg/l respectively. Principal component analysis and cluster analysis reduced the set of 21 hydro ecological parameters into 5 reliable groups and PCA explaining 66.88% of the total variability. The statistically dominant first principal component mainly characterized by the positive loading of ammonia, nitrite, temperature, and organic matter explains 25.10% of variance; which reveals the eutrophication pattern of the Lake in relation with temperature. The second principal component indicates industrial pollution, third component governed by the inter dependence of electrical conductivity and rain, fourth component indicates organic pollution and oxygen debt and fifth component indicates the alkaline nature of the lake. Hierarchical cluster analysis in the form of dendrogram also grouped the data into five structured and stable clusters over a wide range of similarities.

The Chapter 3 describes the fish diversity status and its interrelationship with the hydro ecological parameters. Fish diversity was assessed by the monthly sampling and identified by using standard keys and the family wise percentage, relative abundance

and rank for each species were also calculated and rank-abundance curves were plotted. The Shannon-Wiener index (H'), Simpson index (D), Margalef index, Dominance index and Evenness index were used to quantify species diversity. Pearson correlation analysis was applied to evaluate the relationship between hydro ecological parameters and fishery diversity. Total 30 species of fishes belonging to 19 families were identified during the present study. Both Cyprinidae and Mugilidae were the dominant families with four species each, which together constitute the higher percentage of the total fish population. The Oreochromis mossambicus and Clarias gariepinus were the two exotic species collected during the study; while O. mossambicus dominated over the indigenous fauna of the lake. Maximum species richness of fishes was observed on monsoon (June). The over exploitation of economically profitable fishes, pollution, eutrophication, habitat loss, depletion of mangrove vegetation and the exotic species invasion may lead to the indigenous fishery fauna reduction and their extinction in the near future.

Chapter 4 describes the benthic shell fish diversity status and its interrelationship with the hydro ecological parameters. Total of 17 species of shell fishes such as molluscs, prawns and crabs were identified during the present study. Phylum Mollusca contributes 8 species to the total shell fishery and V. cyprinoides under the family corbiculidae was the most abundant shell fish species. Most of the physico-chemical parameters showed significant negative correlation with species richness, Shannon index and Margalef index of shell fishes, while evenness, dominance and Simpson index showed significant positive correlation with shell fish distribution. Chapter 5 deals with the summary and conclusion.

Major publications appeared in: Journal of Aquatic Biology & Fisheries
Total no. of pages in the thesis: 304
Total no. of references cited in the thesis: 540
Email of Researcher : fouzjia@gmail.com

Title: **"Aquatic Insect Diversity and Biomonitoring of Kallar Stream and its Tributaries, Western Ghats"**

Researcher: Priyanka G. L.	Guide: Dr. Gopal Prasad

Subject: Zoology

Aquatic insects spend at least a part of their lives in aquatic environments and they occur in all freshwater environments and a few in marine environments. They can exhibit a great breadth of genetic diversity and species richness, maintenance of which is essential for the functioning of stream ecosystems. Ephemeroptera, Plecoptera and Trichoptera larvae have important role in running water ecosystems, especially in non-polluted lotic systems, where they are dominant taxa and used to assess the organic pollution load in these systems.

The present study has been formulated to understand the physico-chemical properties and the diversity and abundance of aquatic insects in the Kallar stream and its tributaries situated in the southern part of Western Ghats. For the study, five collection sites were selected in which four are tributaries of Kallar stream and one is the main Kallar. The selected sites are Darpha-Kalungu (S1), Pottanchira (S2), Kaliyikkal (S3), Meenmutti (S4) and main Kallar (S5). The water and aquatic insects were collected for a period of two years on a monthly basis (January 2012-December 2013).

The thesis is divided into five chapters. Chapter 1 deals with the general introduction about the stream ecology, aquatic insects and the importance of biomonitoring using aquatic insects. Chapter 2 discuses the ecology of Kallar stream and its tributaries. The site characteristics and the methodology adopted for studying the physico-chemical parameters were given in this chapter. The general physico-chemical parameters like atmospheric and water temperature, velocity, TDS, pH, EC, width, depth, DO, BOD, alkalinity, hardness and nutrients such as nitrate, phosphate, ammonia, silicate and total chlorine were analyzed with standard methods. Sediment organic matter, sediment pH and sediment conductivity were also measured. PCA extracted eight components that are responsible for majority of the variance observed. The cluster analysis showed two statistically significant clusters.

Chapter 3 deals with the taxonomy and diversity of aquatic insects in the selected sites. Aquatic insects were collected by using kick net (1m² area, mesh size 200 mm) and D-frame net (mesh size 50 mm). The samples were preserved in 70 % alcohol and were identified up to the genus level with the help of keys. The habit and functional feeding categories were also assessed. The biodiversity indices like Margalef's richness index, Shannon-Weiner diversity index and Simpson dominance index were calculated. In the present study a total of 29372 aquatic insects belong to 9 orders, 61 families and 125 genera were obtained. The maximum number of aquatic insect was recorded from site 5, followed by site 4, site 2, site 1 and site 3 respectively. Ephemeroptera was the most dominant order with the highest number of individuals (24.89%) and was followed by Trichoptera (24.19%), Odonata (21.35), Hemiptera (11.34), Plecoptera (7.84%), Coleoptera (6.66), Diptera (2.88), Megaloptera (0.70) and Lepidoptera (0.15) respectively. The highest number of aquatic insect was recorded during post monsoon season and in site 5. The high abundance during post monsoon season may be due to the relatively

moderate velocity of water, low water volume, high DO and maximum accumulation of leaf detritus. Collectors were the most dominant feeding group which was followed by scrapers, predators and shredders.

The chapter 4 discusses the biomonitoring of the selected sites. Here different biological indices such as Hilsenhoff's Family Biotic Index (FBI), Biological monitoring working party score (BMWP), Average score per taxon (ASPT), Richness measures, Composition measures, Feeding measures and Habit measures etc. were used for the analysis of water quality. The results revealed that water quality of sit 5 is free from organic pollution compared to the other sites.

Chapter 5 deals with the summary and conclusion. The most pollution sensitive aquatic insects are high in the main Kallar stream (S5) compared to the tributaries. In the tributaries many anthropogenic activities (deforestation, intensification of agriculture, intensive human settlement, soil erosion, and extraction of sand, pebbles and stones) are present and these factors have direct and indirect impact on the diversity of aquatic insects and which could be the reason for the low abundance of the pollution sensitive taxa in the tributaries compared to the main Kallar stream. The conservation and management of the streams in Western Ghats is important for proper functioning of the ecosystem and maintenance of the biodiversity. The present data can be considered as a benchmark and routine monitoring and investigation are required to find out the changes occurring in the stream and the related fauna.

Major publications appeared in: Entomon, Journal of Aquatic Biology & Fisheries
Total no. of pages in the thesis: 318
Total no. of references cited in the thesis: 355
Email of Researcher: priyankagl09@gmail.com

Stream: Social Science

Title: "A Study of Temple Murals in Kerala''	
Researcher: Sheena V.R.	Guide: Dr. Ajit Kumar
Subject: Archaeology	
Mural paintings are one of the most precious visual art forms depicted with splendid beauty. They are endowed with traditional and cultural heritage of the province. Kerala has a unique and rich mural art tradition. The painting tradition in Kerala can be traced back from rock-cut temples and consequently spread to structural temples, palaces and churches. The earliest evidences of mural paintings in Kerala date to 8th century CE and is reported from Thirunandikkara rock-cut Temple, which was a part of ancient Travancore and now in Kanyakumari district. There is a paucity of temple murals posterior to 8th century CE essentially because they were painted on the exterior surfaces and subjected to verities of nature and eroded away. This Kerala mural tradition revives such a tradition around 15th century CE onwards. Most of the surviving temple murals in Kerala date between 16th and 19th century CE. In order to understand the mural traditions of Kerala, a broad perspective of few temples from north Kerala, central Kerala and south Kerala were selected. A list of 37 temples were prepared and each of these temples were visited and photo-documented. The documented paintings were then studied to understand their style, iconography and social dimensions. From stylistic analysis Kerala Mural Tradition has been divided in to three periods. The period I shows influences of contemporary classical Schools under the Pallavas, Pāndyas and Chōlas. However, towards end of the period III representations from epics like *Rāmayaṇa* and *Mahābhārata* come to be incorporated in a large way. During this period, there is a movement towards creating an indigenous style in the paintings which can be called as the Kerala mural school. The deities are shown with different colours based on its character described in the literature. The location of the deities in the temple walls appear to be based on certain iconographic and *vāstu* parameters. The depictions of social life are generally found in association with the Śāstha-hunt and Gaṇapatī panels. In Śāstha panels the depicted themes are generally the hunting practices. Around the Gaṇapati panel reflected religious, social and academic pursuit. These socio-cultural themes represent social hierarchy, costumes, ornaments, food habit, musical instruments, etc. of the contemporary period. Keywords: mural painting, mural tradition, Kerala murals, mural school, Kerala temples, socio-cultural studies, iconography, painting techniques, costumes, ornaments, social hierarchy, heritage.	
Total Number of pages in the thesis: 474 Total number of references cited: 172 Email of Researcher: vr.sheena@gmail.com	

Title: "Women Entrepreneurship in the Globalised Economy- A Study of Kerala State"

Researcher: Ruby. S | Guide: Dr. Resia Beegam. S

Subject: Commerce

Women's entrepreneurship has gained momentum in the last three decades with an increase in the number of enterprises run by women and a consequent increase in women's contribution to economic growth. Industrial development, economic policies, technological innovations and export potential have helped bring a wide range of socio-economic opportunities to women entrepreneurs. Realising the increasingly leading role the women entrepreneurs have to play in the development of the economy, government strove to form an environment conducive to entrepreneurial activities. As a result of numerous efforts to promote women entrepreneurs, there was a phenomenal growth in the number of women entrepreneurs in India as well as Kerala. Globalisation and liberalisation of markets encouraged women to come forward to become entrepreneurs and start new enterprises. But the irony of the situation is that a good number of women entrepreneurs who have started their enterprises with great optimism, are not able to achieve their aspirations. Even though there are a lot of programs meant to help women entrepreneurs, they can succeed only if their specific problems be solved, managerial capabilities be improved and appropriate skills development training still remains the key for successful development of entrepreneurship among women. The objectives were to to understand the present scenario and growth of women entrepreneurship in the globalised economy,to identify and analyse the managerial capabilities, training needs and problems of women entrepreneurs in Kerala, to find out the efficacy of supporting institutions for the promotion of women entrepreneurs in Kerala to identify the strengths, weaknesses, opportunities and threats of women entrepreneurs in the globalised economy of Kerala and to assess the views of various institutional heads, officials and consumers towards women entrepreneurship in Kerala. Secondary data were collected from the websites, books, journals, news papers, published and unpublished research papers. The primary data were collected by administering - A structured interview schedule among women entrepreneurs and -Separate Questionnaires designed for officials of supporting institutions and consumers. Multi Stage Stratified Proportionate Sampling method was used for collection of data from women entrepreneurs. Kerala is divided into 3 zones i.e. south, central and north –From the 3 zones, 3 districts (Thiruvananthapuram, Thrissur and Kannur) with highest number of registered women entrepreneurs has been selected. A total of 420 women entrepreneurial units was selected. Random sampling method was used to select sufficient number of officials from entrepreneurial supporting institutions of Kerala identified from the Entrepreneurship Support Guide of Kerala. A total of 95 officials comprising 44 top level officials and 51 middle level officials have been selected as the sample. Judgement Sampling was used for selecting consumers of women entrepreneurs' products or services, based on the regularity of visit in women entrepreneurial units. A total of 330 individual consumers of selected women entrepreneurs in three districts of Kerala (Thiruvananthapuram, Thrissur and Kannur) were also selected for the study.

Outcome of Research: The study has significantly contributed to fill the existing the research gap by a three dimensional approach (entrepreneurs', Officials' and Consumers' views) about the women entrepreneurship in Kerala in the context of competition under globalisation and liberalisation.

Major Publication appeared in: Southern Economist
Total No. of pages in the thesis: 402
Total No. of references cited in the thesis: 217
E-mail of Researcher: rubysivanandini@yahoo.com

Title: "**Implications of International Financial Reporting Standards in the Indian Corporate Sector**"

Researcher: Madhu Lal. M	Guide: Dr. G. Raju

Subject: Commerce

The reporting practice based on the Indian Accounting Standards (IAS) which is followed by Indian corporate has been going to converge with global level standards, i.e., International Financial Reporting Standards (IFRS). In this situation the researcher tries to understand the implications and the necessity of implementation of IFRS in India, and an effort is also made to understand the status of implementation of IFRS in other countries of the world. While adopting the convergence program each country may face some obstacles and difficulties. The researcher in this study makes an attempt to perceive these issues that may happen in India after the adoption of IFRS. As the Indian companies are following IAS, there are certain disparities between the Indian standards and IFRS. In the light of the IFRS implementation, the researcher purports to study the difference and disparities of the existing reporting system with global standard. The study is basically confined to the listed companies in India. To strengthen the findings of the study, the case of countries in the world has also been added. The study doesn't cover any particular standards but it focuses on the perspectives of the parties involved in it. This study discloses that the majority of the countries worldwide intend to completely implement IFRS in their jurisdiction. While comparing the financial ratios derived from the financial reports of such companies as per IFRS and IAS, every financial ratios show variations either negative or positive. But no variations show any significant differences. By considering these facts, it can be inferred that IFRS implementations in India will not cause any conceptual financial reporting problems. In addition to comparing the financial ratios, the perspectives of company CFOs, Auditors and Academicians are being studied. The study reveals that the financial report as per IFRS is more effective for India than the IAS. Even though company CFOs have a similar opinion, they do not disagree that the financial disclosure practices as per existing reporting standards are effective and suitable to the Indian financial environment. The Auditors and Academicians however, strongly argue that the preparation and publication of financial report as per IFRS is most suitable to India.

Research outcome: The present study is an aid to the companies in the succeeding phase of the road map of convergence and the study result will cater the needs of academicians who are curiously waiting to search what is happening in the context of the convergence of accounting standards.

Key Words: IFRS, In AS, Financial Reporting, Corporate Sector, Accounting Standards.

Major Publication appeared in: Commerce and Business Researcher, Management Researcher, Lambert Academic Publishing (International)

Total No. of pages in the thesis: 226

Total No. of references cited in the thesis: 141

e-mail of Researcher: madhulaldoc@gmail.com

Title: **A Study of Accounting Information System (AIS) in Public and Private Sector Telecommunication Industry in India**

Researcher: Hojjatallah Salari | **Guide**: Dr. G.Raju

Subject: commerce

An industrialized world has moved dramatically towards an information society based on IT (Information Technology) that is saving capital as well as labor by its applications. The Accounting Information System is a powerful tool for getting progress, efficiency and effectiveness and helps the reporting process more easily. All the activities of the organizations are linked together by an Accounting Information System. It is very important that our management tools and organizational objectives are considered together. Evaluating the impact of Accounting Information System on performance of telecommunication industry is an indispensable part of this study. Therefore a study is necessary to identify the various factors influencing performance of telecommunication industry such as, information quality, management function, efficiency of decision making and the level of data mining within the Accounting Information System. The public and private sector telecommunication industry is considered as an important means of the public and private sector development. The result from this research are likely to help managers and accountants of telecommunication industry to obtain a better understanding of Accounting Information System and adequacy of information quality, role of Accounting Information System in discharging the management functions, the relationship between the use of Accounting Information System and efficiency of decision making, understanding the level of data mining within the Accounting Information System. The multi stage sampling method was used for identifying the sample respondents. According to the reports provided by (TRAI) eleven private sector telecommunication companies provide the services across India like Bharti, Vodafone, Idea, Reliance, Aircel, Tata, Telewings, Sistema, Quadrant, Loop Mobile and Videocon. Where the BSNL and MTNL are public sector telecommunication companies offering the services.Well-structured questionnaires were used for collecting the primary data.

Outcome of Research: The findings of the research give a macro and micro level knowledge about the adequacy of information quality in the AIS maintained by the public and private sector telecommunication industry in India. It also helps to identify generalization of role of AIS in discharging the management function of these companies and exposed the intrinsic relationship between the use of AIS and efficiency of decision making. It also provides detailed information about the dynamics of the perception of managers related to the level of data mining within AIS. The results give some vital information for the development of telecommunication industry in India by implementing Accounting Information System. Finally, It is well concluded that the AIS provided for the policy makers an in-depth information about the causes and consequence implementation of Accounting Information System in a management function, decision making and the level of data mining.

Key words: Accounting information system, information technology.

Major Publication appeared in: The Journal of Strategic Information Systems, and International journal of Accounting and Information Management.

Total No. of pages in the thesis: 280

Total No. of references cited in the thesis: 224

E-mail of Researcher: hojjatslr@gmail.com

Title: "Integrated Services through E-Banking- An Analytical Study on the Indian Banking Sector".

Research Scholar: Sridevi. K	Supervisor: Prof. Gabriel Simon Thattil

Technological innovation witnessed by the corporate sector during the nineties had changed the way business needs to be conducted. Information technology introduced new business paradigm and is increasingly playing a significant role in improving host of e-services in the banking industry. The delivery of banks' service to a customer at his office or home by using technology can be termed as E-banking. Continuous increase in the use of electronic technology to meet the ever increasing competition in banking resulted in transformation of "Brick and Mortar banking (banking at fixed branch premises) to E-banking".

Objectives of the Study: (i) To compare the factors motivating the customers to avail E-Banking services provided by Public Sector Banks and Private Sector Banks in the Kerala and Tamil Nadu. (ii) To assess the perception of customers about E-Banking services in banking sector. (iii) To examine the awareness level of customers of E-Banking products. (iv)To compare the usage of E-Banking services in rural and urban areas. (v) To evaluate the views and opinions of bank's personal on E-Banking on both the Public Sector Banks and Private Sector Banks. (vi) To assess the factors influencing promotion of E-Banking service provided by Public Sector Banks and Private Sector Banks. (vii) To ascertain the problems faced by customers while availing Integrated Services through E-Banking by Public Sector Banks and Private Sector Banks.

Motivating factors which promote customers to select a bank were identified

Awareness level of customers on E-banking products was examined and ways to promote awareness suggested

Customer education and counselling on E-services, Promotional activities of E-Channels and Mechanization & Automation were found to be different in public and private sector banks.

Publications :

1. 'Mobile Payments – A prospective Payment System'. Commerce and Business Researcher, Volume I Issue No.112 July-December

2. "Integrated Services Through E-Banking: An Analytical Study on the Indian Banking Sector". Southern Economist, , Volume No.54 No.7 dated August 01, 2015

3. 'Financial Sector Reforms and E-Banking' Financial Sector Reforms and the Banking Industry in India: Opportunities and Challenges published by Department of Commerce, University of Kerala .

Title: "**Factors Influencing Consumer Behaviour: Study on FMCG Market in South India"**

Research Scholar: Rema Devi V. N	**Supervisor: Prof. Gabriel Simon Thattil**

The importance of consumer research has incurred tremendously over the years in FMCG sector over the year with increasing competition from domestic as well as international marketers and rising consumer awareness with subject to the choices available as well as consumer rights. Consumers' expectations with respect to customer service and quality of the product have increased phenomenally, and so to survive in the market place of today consumer research serves as an extremely important tool to understand consumer behaviour. In the customer perspective, they are also having problems while they are making purchase decision with regard to FMCG goods. Therefore, it is identified that there is a need for research work in the field of consumer behaviour of FMCG in South India comprising the states of Kerala and Tamil Nadu. The present study will focus on identifying the major factors which influence the consumer behaviour of fast moving consumer goods in south India

Objectives

To ascertain the extent of influence of the factors in relation to consumer behaviour for identified consumer goods in Kerala and Tamil nadu. The factors identified for the study are buying motives, consumer awareness, consumer decision making process, brand loyalty, consumer preferences, and decision making styles and shopping behaviour

To examine whether there is a significant difference between the consumer behavioural pattern of respondents in urban and rural area in each state in South India.

To develop a Consumer Behaviour Decision Making Model (CBDMM) based on the factors identified for the study for the identified consumer goods in South India.

To make suggestions and recommendations of the study

Rational motives behind purchases and factors influencing purchase decision were studied in terms of Urban rural differences and through a comparison between Kerala and Tamil Nadu

Total Pages 317 Ref cited 151

Publications

1 Rural Marketing through Rural Empowerment: The Kerala Model, Commerce and Business Researcher, Vol.5, July-December2012

2 Buying Perception of Fast Moving Consumer Goods in Kerala, Review of Social Sciences, Vol.XV, No:2, July-December 2014

3 Subprime lending and global recession: Issues of Concern, Finance and Banking- An Anthology of contemporary research, 2008, Editors- P.S James & Roji George

4 Corporate Governance and Financial credibility, Finance and banking- A Collection of Contemporary Research, 2009, Editors- P.S James & Roji George

5 Self Help Groups: A Tool for Women Empowerment, Micro Credit and Rural Empowerment, Editor- Arunachalam

Title: "A Study on Depository System in India"	
Researcher: **Regina Sibi Cleetus**	Guide: **Dr. K. Sasikumar**
Subject: Commerce	

In the securities market for decades the best-in-class trading systems were coupled with poor settlement systems because trading called for just exchange of information while settlement required a physical exchange. This hindrance was overcome by securities markets throughout the world through Central Securities Depositories (CSDs) which holds securities in electronic form by opting for either immobilization or dematerialization. In fact operational efficiency of securities markets across the world is to a great extent the result of CSD. India adopted the multiple depository system together with dematerialization way back in 1996. Since then the Indian securities market has seen drastic changes and now it is ranked in the world's 10 best securities market. It was infact the silent revolution brought in by dematerialization and electronic holding of securities in CSD which ushered changes like rolling settlement, transition from a weekly account period settlement to a T+2 settlement etc. But still there are very few studies related to depositories. It was in this backdrop that the study was undertaken to understand the context in which the depository was introduced and the progress thereafter with special reference to financial depth, financial access, financial efficiency and financial stability of securities market in the dematerialised era. An attempt was also made to bring out the strengths, weaknesses, opportunities and threats of the system by studying the impact of dematerialisation on operational efficiency of the market from the Depository Participants (DPs) point of view and the perception of individual investors towards the depository system.

State of art technology and liaison with other CSDs and CSD associations were found to be the strength of the Indian depository system. The weaknesses were pointed out as distorted issuer-investor relationship and poor awareness level among investors. Growing activity in securities market, positive attitude of people towards holding personal documents in e-wallets and likely change in government policy towards dematerialisation of paper certificates issued by the government were found to be the opportunities of the system. The threats identified were legislation to reinstate distorted issuer-investor relationship, technological problems and possibility of a new depository. A systems model in which the depository would be confined to the role of service provider and investors would enjoy the status of a registered owner rather than being a beneficial owner was put forward to overcome the problem of distorted issuer investor relationship. In order to address the issue of low awareness level of investors with respect to depository system it was proposed that the awareness campaigns of Securities and Exchange Board of India (SEBI) has to include details related to depository system. Further DPs should also partner in the efforts of SEBI and the government in its awareness campaigns. To overcome technological issues it was suggested that SEBI should ensure the safety and security of transactions in the technological environment through legislation and inspection of the technological aspects on which the entire system is based. The study concludes with the statement that whether the depository system is acknowledged or not the future will be in the hands of the depository as wealth and every form of document will be in the form of magnetic dots in its computer.

Keywords: Central Securities Depository, Depository System, Depository Participant, Securities market, Investor

Major publication appeared in: Management Researcher, KICMA Reach
Total no. of pages in the thesis: 296
Total no of references cited in the thesis:161
Email of researcher: reginacleetus@yahoo.co.in

Title: **"Catastrophic Health Care Expenditure and its Impact on Living Standards: A Micro Panel Study"**

Researcher: Manjusha. P.	Guide: Dr. Manju S. Nair

Subject: Economics

Catastrophic Health Care Expenditure (CHCE) has been documented as the major cause of impoverishment for people suffering health shocks. The chronic nature of Non Communicable Diseases (NCDs) implies protracted treatment and significant treatment costs and definitely health expenditure turns catastrophic. The present research work examines the incidence, intensity and impact of CHCE emerging out of two NCDs, cardiovascular diseases and accidents/injuries. Panel data is collected from sixty inpatients from Medical College, Trivandrum for the same purpose. (Pre pay period, Health Shock Period, Post pay I and Post pay II period). The changes in head count ratio based on different catastrophic threshold levels for the pre pay, post pay I and post pay II period shows that in the pre pay period the head count ratio at 50 percent catastrophic level was zero for all categories. In the post pay I period the head count ratio was 100 percent for all the background characteristics at 90 percent catastrophic threshold and in the post pay II period the head count ratio was 100 percent when catastrophic threshold was 50 percent. The catastrophic overshoot is positive even at an extreme high threshold after their subsistence consumption is spent for meeting health expenditure. This definitely shows the intensity of catastrophic health expenditure. The relation between catastrophic health expenditure and impoverishment is very severe. It is striking to note that the majority of the APL category, medium and high income category has fallen into poverty because of health expenditure. An important message is that households with higher out of pocket shares of non subsistence spending reduce expenditure on goods that are arguably essential to development and poverty alleviation (education, clothing, other expenses etc). At higher catastrophic levels, households demonstrate strong signs of consumption modification. The estimate for the coefficients in the Engel curve and catastrophic share equation analysis and the coefficients of the catastrophic dummy suggest that food shares increase while shares for education and housing decrease. Thus households protect food when out of pocket comprises high shares of non-subsistence spending by allowing larger proportions of their budget. Analysis relating to six broad domains of Quality of Life including physical, psychological, level of independence, social, environmental and entertainment shows that there has been continuous deterioration in the quality of life of the sample population. Thus the impact of CHCE has been very deleterious on the family and they have been pushed into poverty over the time span of treatment.

Key words - Non Communicable Diseases, Catastrophic Health Care Expenditure, Households, Impoverishment, Poverty.

Publication Appeared in – ISDA Journal
Total number of pages in the thesis: 247
Number of references cited in the thesis: 187
Email of the researcher: manjushap08@yahoo.com

Title: **"Governance and Economic Growth : An Analysis Based on MENA Countries"**	
Researcher: Zahra Akbarian Mehr	Guide: Dr. Manju S. Nair
Subject: Economics	

The role of institutions in facilitating and augmenting economic growth has been documented by recent literature on issues of economic growth and development. Institutional economics focuses on the importance of good governance for the smooth conduct of economic activity. Good governance implies a lot of conditionalities including accountability, efficiency, effectiveness, equity and inclusiveness, responsiveness, transparency, etc. of the governance institutions in a country. It results in increase of freedom of the people, thereby contributing to the enrichment of capabilities and achievements of the society as a whole. The economic growth in Middle East and North African region needs to be understood in this background. MENA region stands aloof from the rest of the world in terms of its abundance of natural resources, particularly oil. The labour population of the region is also huge. But in spite of the abundance of the traditional factors of production, many of the countries in the region witness slow performance in terms of economic growth. As a possible reason for this, governance in the region is examined. The six indicators developed by World Bank namely, Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption are used to measure the governance of the region, and an attempt has been made to relate these indicators with economic growth. All these very poor in the region, and from the study it is clear that poor governance is the major reason for slower performance in economic growth. In those countries where there exists good governance, economic growth has been increasing as in the case of Qatar, Bahrain, UAE and Jordan. Regression analysis establishes a positive relation between governance indicators and economic growth in MENA countries. To conclude, the majority of the MENA countries could not fare well in economic growth because of poor governance in terms of the rule of law, corruption, effectiveness of government and political instability.

Key words – Governance, MENA Countries, Regulatory Quality, Rule of Law

Publication Appeared in – ISDA Journal, Total number of pages in the thesis: 206
Number of references cited in the thesis: 131

Email of the researcher : akbarianmehr@gmail.com

Title:"Thrikkodithanam Mahavishnu Temple, Changanassery: A Historical Study"

Researcher: Anila. K	Guide:

Temples have a unique place in the history of Kerala. They have exercised a profound influence on the religious, social, economic, political and cultural life of the country. They are not merely places of worship but centres of education and asylums of refuge. They remained as the makers and breakers of rules and regulations. Temples constitute an important part in the cultural history of Kerala. This study focuses not only on the historical and architectural features of Thrikkodithanam Mahavishnu temple but also the socio-economic significance of the temple.

The Thesis is divided into four chapters besides introduction and conclusion. The introductory chapter provides the scope and importance of the study. The first chapter deals with the historical background of the temple. Vaishnavites have 108 grand temples in India and the oldest among them is the Vaishnava temple at Thrikkodithanam. It is situated in the Changanassery taluk of Kottayam District, seven kilometers north of Thiruvalla.

The second chapter contains the socio-economic significance of the temple. It also deals with the role played by the temples in the integration of society. This chapter also discusses about the various communities associated with the temple.

The third chapter deals with the architectural features of the temple. The iconographic representations of deities in this temple are described in this chapter. This chapter also furnishes the details of murals in this temple. Murals in this temple belong to the eighteenth century.

The fourth chapter discusses the details of rites, rituals, various *pujas* and festivals of the temple. The social significance of the festivals is also discussed in this chapter. The conclusion presents the findings of the study.

Title : "Cyber Child Pornography"	
Researcher : Arlene S F	Guide : Dr. Bismi Gopalakrishnan
Subject : Law	
The cyberspace is used by millions of users all over the world. It affords them access to vast amount of valuable information and endless source of entertainment. But these users might also be exposed to some dangers. One such danger is cyber child pornography. The pedophiles have found cyberspace to be a convenient venue for sharing horrific pictures of children being sexually abused. Child pornography is harmful whether or not its production involves real children or not. The number of websites devoted to child pornography is also growing. In the face of the growing threat of child pornography, an in depth analysis is needed to bring out the social and legal challenges in controlling cyber child pornography. The present study is such an attempt. The legal response to cybercrime is not very effective. Being cyberspace a world with no frontiers, a single country can do nothing in curbing the menace of cyber child pornography. Hence in order to facilitate the coordination among world nations and law enforcing agencies, international organizations have drafted a number of conventions and agreements. Across the world existing laws are being amended and new laws are being promulgated to combat this cybercrime. In India though there are penal provisions for dealing with cyber child pornography cases, the real problem lies in the implementation of these provisions especially with extra territorial jurisdiction. As the cyberspace is one single space devoid of any national boundaries, complying with international legal standards and formulation of a uniform legal framework in combating cybercrimes is the need of the hour. An empirical study is conducted to check out the legal awareness level among school children on the issue and to examine the efficacy of existing law enforcement mechanisms in dealing with cybercrimes. Thus the study also analyses the need for a more equipped law enforcing machinery to deal with the changing profile of cybercrimes and requires the existing legislative frameworks to be reviewed from time to time to make it a more stringent law.	
Major publication appeared in : Kerala University Journal of Legal Studies Total number of pages in the thesis : 425 Total number of references cited : 240 Email of Researcher : arlenelinsby@gmail.com	

Title: "The Role of IT in the Collection, Preservation, Organization and Use of Manuscripts in the Manuscript Libraries and Archives in Kerala"

Researcher: Rajalekshmi. R | Guide:- Dr. A. Gopikuttan

Subject:- Library and Information Science

Manuscripts are vital sources of intellectual and literary tradition of mankind. Kerala is a rich reservoir of manuscripts. Many institutions, traditional families and religious centres have significant collection of manuscripts. But a majority of these manuscripts are not organized and preserved systematically. Furthermore, manuscripts in private possessions have not yet been surveyed or assessed. It is found that these invaluable knowledge resources are deteriorating day by day due to a number of factors. Today, preservation and transmission of knowledge contained in manuscripts can be enhanced through proper implementation of information and communication technology. The study tries to explore the various aspects of manuscript collections in twelve libraries of Kerala and the role and status of implementation of IT in these libraries. Many of these libraries house rich collection of manuscripts which clearly reflects the intellectual and scholarly tradition of the past.The study tries to find out the role of information technology in the collection, organization, preservation and use of manuscripts in manuscript libraries and archives in Kerala. It tries to identify the barriers in implementing IT in these institutions. Study found that the role of IT in manuscript libraries and archives in Kerala are inadequate. Most of the libraries are facing shortage of staff and majority of them are outsourcing various agencies for digitization. Inadequate fund and administrative barriers are main factors that impede the digitization programme in the libraries. From the analysis it is found that majority of the users are moderately satisfied with the preservation status of manuscripts. Majority of them preferred digitized manuscript than direct use of manuscript and further, they preferred online use of digitized manuscript.

Keywords:- Library and Information Science, Manuscripts, Manuscript libraries, Kerala
Major publication appeared in :-Journal of Library and Information Services
Total number of pages in the thesis:-378
Total number of reference cited in the thesis:-196
E-mail of Researcher:- lekshmi555@gmail.com

Title: "A correlative analysis of the socio-economic background, reading habit and satisfaction of users: a study with reference to taluk reference libraries in Kerala"

Researcher: Saiju D. I. | **Guide: Dr. S. Humayoon Kabir**

Subject: Library and Information Science

The study focuses on the users of the taluk reference libraries in Kerala, their social, educational and economic background, especially highlighting the reading habit and satisfaction of the users with the present library facilities. Majority of the Taluk Reference Library users fall under the age group of 15- 35 years, taking it as a single unit that represent youngsters. Youngsters prefer reading for academic and reference work, middle age group for acquiring knowledge and senior citizen group for recreation and to acquire knowledge. From this study it is found that, more than 60% of post graduate and technically qualified users spend 1-3 hours for reading, whereas about 70% of the under graduate and graduate users spend less than 2 hours for reading. Users belonging to undergraduate, graduate and technically qualified category choose any spare time for reading whereas post graduate users choose both bed time and any spare time for reading. For undergraduate users their main purpose of reading is for reference work since they have to do project works as part of their education, for graduate users to satisfy their academic needs and for the post graduate and technically qualified users to acquire knowledge. Majority of the users belonging to self-employed, house wives, retired person and student community choose any spare time for reading, on the other hand employed and unemployed person choose both bed time and any spare time for reading. For the users belonging to student community their main purpose of reading is for academic and reference work. User satisfaction is analysed with the help of regression analysis and the investigator arrived at the conclusion that the library users with low educational profile are found to be more satisfied than that of members with high educational profile. The male members in the Taluk library are more satisfied than female members. Among library users the low income group is more satisfied than the high income group. On comparing the locality status it is seen that the semi urban population is more satisfied than the rural population and the urban population. The user satisfaction was found to be more for the library users exposed to adequate library infrastructure facilities. The convenient working hours of library contributes to more user satisfaction.

Keywords: Library and Information Science, Taluk reference libraries, Kerala, Reading habits, User satisfaction

Major publication appeared in: KELPRO Bulletin
Total No. of pages in the thesis: 281
Total No. of reference cited in the thesis: 219
Email of Researcher: saijudi@yahoo.co.in

Title: "Implications of e-Governance on De-centralisation – A Study in the Kerala Setting"	
Researcher: Balagopal. B	Guide: Dr. M. A. Lal
Subject: Public Administration	
In a democratic governance framework local governments are the main interface between citizens and governments and hence they constitute the most important layer of governance. Because of the proximity with the citizens and its importance in service delivery, technology is widely used in the governance of the local governments. This study analyses the implications of e-Governance on decentralisation in Kerala from the standpoint of governance factors. Among the Indian States, Kerala is the highest decentralised state. It has developed its own model in decentralisation to accelerate service delivery and development initiatives with citizen participation. e-Governance play a vital role in the decentralisation in the state. Apart from the specific objective, the thesis addressed some broad issues related to decentralisation and e-Governance in public administration. They include, How far has the public administration in India in general and Kerala in particular absorbed decentralisation and e-Governance? Are the existing governance models in Kerala suited to fulfil the objectives of decentralisation and e-Governance? Are the strategies to provide effective decentralisation and e-Governance capable to address the current and emerging challenges? How far are these concepts inclusive in the context of India in general and Kerala in specific? How are the e-Governance tools performing in democratic decentralisation? The research study examined the change in the factors such as transparency, efficiency, corruption, time for service delivery etc., after the roll out of e-Governance in Local Self Governments (LSGs) in Kerala. The study is mainly empirical, analytical and historical in nature. The study revealed that even after the e-Governance roll out in LSGs, transparency and efficiency have not fully increased in the governance. But corruption has decreased, even though not to the expected level. The study found that there is an average improvement in the citizen participation, but access and awareness about Information Communication Technology tools among stakeholders is still a challenge for e-Governance initiatives in LSGs. The research also found that elected representatives and employees of the LSGs are not adequately empowered to handle emerging e-Governance challenges. The study suggests that the emerging technological innovations in governance has to be fully utilized for making the LSGs an effective and efficient last mile cutting organs of decentralization.	
Major Publications appeared in: Journal of Social Discourse Total number of pages in the thesis: 355 Total number of reference cited in the thesis: 342 Email of the Researcher: drbbalagopal@gmail.com	

Title: "Traditional Knowledge Management in Health Tourism of Kerala"	
Researcher: Deleep. D	Guide: Dr. Nandamohan V
Subject : Management (Tourism Management)	

Ayurveda, the popular ancient Traditional Medical Knowledge of India has been reaching all over the world. The Ayurvedic system has been facing multifaceted challenges in the last two centuries, and its practice is in transition. It has been a victim of bio-piracy as bio-prospectors and commercial entities misappropriate Ayurvedic Traditional Knowledge for taking patents. The traditional cultural health knowledge of Kerala society too is eroding as the younger generations prefer easy going postmodern lifestyle. Ayurveda has been commercialized heavily. Tourism has also embedding with Ayurveda that has evolved health and wellness tourism highlighting the product as health rejuvenating, Ayurvedic spas, Ayurvedic resorts etc. Protection of traditional Ayurvedic knowledge assumes gravity as it is getting distorted at various service points. This thesis presents different aspects of Traditional Knowledge Management in Ayurveda, with special focus on Ayurvedic Tourism of Kerala.

The study highlights the need to develop a comprehensive sui generis system for protection of Ayurvedic Traditional Knowledge at various levels. The views of experts substantiate the study by pinpointing different problems and prospects of Ayurveda in the context of the flourishing health tourism in the state. The study among Ayurvedic health tourists attempts to bring out the perceptions of tourists about Kerala as a land for undergoing Ayurveda. An Ayurvedic Tourist Satisfaction Index (ATSI) has been developed, which explores the satisfaction of foreign Ayurvedic tourists to Kerala. Case studies of three Ayurvedic facilities that cater to tourists in Kerala have also been conducted to make explicit the Ayurvedic knowledge management scenarios. The study concludes by highlighting the need for comprehensive involvement of Government as well as local authorities to develop sui generis system of protection for Ayurveda and Ayurvedic tourism, for ensuring its furtherance in the present context of the existence at the edge of chaos.

Key words : Tourism, Health Tourism, Ayurveda, Traditional Knowledge Management

Total no. of pages in the thesis: 358
Total no. of reference cited in the thesis: 300
Email of Researcher: deleepd@gmail.com

Title: Consumer Perception of Brand Repositioning in the Fmcg Brands in Kerala Market	
Researcher: Lekshmi Vijayan	Guide: Dr. K. S. Chandrasekar
Subject: Management Studies	
The research assessing consumer perception of brand repositioning with a superior consideration of the role of brand heritage and advertisement effectiveness with the repositioned brand has a considerable role in the development and testing of theory, and by this means endow with a substantial contribution to the to the knowledge base with empirical evidence. In addition, the research has empirically established the link between the consumers perception of a heritage or traditional brand undergoes repositioning and the effectiveness of advertisements in the repositioning process, will definitely aid in testing the prevailing theory and to uncover some new facts which are more specific to Keralites. This study will be useful to the education administrators for understanding the concept of brand repositioning and the other elements related to that. The brand managers find the research findings are remarkable as many brands undergo repositioning but understanding the factors drive to improve or deject the consumer perception is worth significant in business. The findings of the study can be set as a reference for both the brand managers and the academicians to find the consumer expectation and liking with respect to brand repositioning. Always the brand managers should consider the consumer expectation clearly with a thorough market study and explore every segment with more customized products. Always come up with the products of best possible quality, more traditional values and good brand image which is boosted with creative advertisement will really make big difference in the product turnover. Media sources like television, print and publicity have profound effect on advertising the brands when compared to other medias like radio, newspaper etc. Hence using television for advertising a repositioned product would provide positive results in terms of business output. Results of this study should be presented to the marketing professionals and brand managers to make them aware of which demographic factors are related to the consumer perception of brand repositioning. The managers should design the repositioning exercises by communicating the reasons, benefits and need for the brand repositioning strategy before adopting it across the geographical territories of Kerala unanimously. It is found that the consumer perception of advertisement effectiveness is related to gender, place of residence, age, marital status, education and income. So the advertisers should exert great effort in presenting the repositioning advertisements as emotionally appealing ones by considering related demographics in order to have better synchronization between their needs and preference which gives the chance to win consumer's trust and attitude to advertisement.Brand heritage is visibly associated with demographic factors like place of residence, marital status, education and income. Consumers perceive as heritage/traditional brands as an icon of prestige and values. So the marketers should maintain the heritage factor untouched in various brands while they reposition their products. Concurrently the marketers should not change the relevance, persuasiveness and credibility of advertisement, unless it may erode the positive perception of repositioning advertisements. In order to retain the brand heritage of the repositioned brand the imagination and identity value should be increased so as to attain a significant place in the minds of youth. Always keep the brand heritage without altering the continuity, bonding, symbol, cultural meaning, identity meaning, familiarity and success image while brand repositioning to keep the brand alive for years.	
Major publication appeared in: International Journal of Research in Banking and Finance (IJRBF), 1(2), 1-19. Management Innovator (ISSN 0974-6749), 7, (1), 198-201., Vaibhav: MCMATian Journal of Management (ISSN 2321 – 967X), 1(2) Review of Social Sciences, (ISSN 0974 – 9004), (January-June),XIV, (1), 19-29	
Total No. of Pages in the thesis: 330	
Total No. of reference cited in the thesis: 241	
Email of Researcher: lekshmivijayan99@yahoo.com	

Title: An Analysis of Customer Churn Behaviour for Developing Strategies in Corporate Retail Sector

Researcher: Arun. S | Guide: Dr. J. Rajan

Subject: Management Studies

Corporate retailers invest more in advertising and marketing than in customer satisfaction that would delight or at least retain customers. Furthermore, they don't seek after the advantage of customer loyalty as much as they chase forcefully for new customers to supplant leaving customers. As a result, corporate retailers have made little progress in reducing customer churn. Therefore, it is critical to understand why customers decide to churn. The importance of purchasing behaviour has increased exponentially, as it has become a corporate competitive weapon to maintain market share. However, in the customer-retailer relationship, churn plays a strong role. Therefore, studying churn is essential for the development and maintenance of successful long-term customer-retailer relationships. The qualitative approach involved face to face interviews with management, store managers and customers of various corporate retailers. The study comprised of a large survey conducted among the general public. The data was analysed by using simple statistical tools like Percentage, Garrett's ranking, Chi-Square test, Two Way ANOVA, and Multiple Regression. The study has brought out some interesting findings: (i) the key churn factors identified in the study are retail store attributes and their ethical standards followed by pricing and convenience which occupied in the first four positions. (ii) corporate retail customers are influenced to churn through word of mouth communication, competitor's attractions except competitors pricing practices. (iii) even social, economic and geographic factors have the capacity to have an effect on customer churn intentions. Focus on improvements earlier in the root causes of churn until the end of the journey. Double down investments on attracting new customers because exiting customers is a major source of annoyance. The best way to improve retention techniques are to hear from the customers themselves. Corporate retailers need to identify the characteristics of their target segments and try to provide facilities and services to meet and satisfy customer's needs and expectations. Key strategies include (i) incentives and bundled products that target the most profitable customers (ii) loyalty schemes that are appropriate to the value of the business (iii) acquisition strategies that attract the right type of customer (iv) reduction of shop lifters (v) proactive customer service and (vi) a commitment to quality in all aspects of the business.

Keywords: Customer Churn, Churn Behavior, Corporate Retailing, Marketing

Major publication appeared in: 1) Arun.S & Dr. K.V. Krishnankutty, Corporate Retail Sector Transforming Themselves with New Shopping Solutions, *Shanlax International Journal of Management*, Vol.1: No.4, 2014, Pages 01-06. 2) Rajan J & Arun.S, Customer Churn Behaviour in Corporate Retail Sector, *Review of Social Sciences*, Vol.xvi: No.1, 2015, Pgs: 39-48.
Total No. of Pages in the thesis: 220
Total No. of reference cited in the thesis: 180
Email of Researcher: sivadas.arun@gmail.com

Title:" Micro Finance and Women Empowerment a Comparative Study between Kerala and Chitagong"	
Researcher: Rajib Chakraborthy	Guide: Dr. C.V. Jayamani
Subject: Management Studies	
Based on the approval of the syndicate held on 12-3-2013 sanction was accorded by the university to Rajib Chakraborty a foreign student of Bangladesh to pursue his Ph D in Management, as a full time student, on the above topic, under the supervision of Dr.C.V.Jayamani Professor,School of Management Studies CUSAT, Kochi. The Centre of	

his study was the University Library, Palayam Thiruvanathapuram. The study has been undertaken to investigate the women beneficiaries of micro finance in Kerala and Chittagong. More

specifically, the study attempted to assess the socio- economic back ground of the beneficiaries, their economic empowerment, psychological development, social empowerment, family empowerment, legal awareness, level of consciousness and their decision making capacity in family matters. The study covered all particulars of personal profile of micro finance beneficiaries, the details of the nature of the micro finance programmes, rules and regulations of the microfinance regulatory authorities, reasons and factors that motivate them to join micro finance, analysis of different variables involving income, awareness, living standard, and way of measuring empowerment level of women beneficiaries.

The study has been carried out in order to probe the socio-economic background characteristics of the women beneficiaries of micro finance in Kerala and Chittagong and to analyze the economic condition of the women beneficiaries of micro finance in Kerala and Chittagong before and after availing micro finance. It also examined the impact of microfinance on beneficiaries' decision making power in the families before and after joining micro finance schemes. It has also gone in detail into the psychological, social, family improvement and level of consciousness and aspirations of women beneficiaries in Kerala and Chittagong before and after availing micro finance.

Keywords: Micro finance, Women Empowerment, Chittagong, Kerala

Total No. of Pages in the thesis: 275
Total No. of reference cited in the thesis: 113
Email of Researcher:

Title: **"Information and Market Valuations-A Study on Linkages with special Reference to BSEMIDCAP"**	
Researcher: Smitha Jose Panakkal	Guide: Dr. G. Simon Thattil
Subject: Management Studies	

The study investigated the relationship of information and market valuation with special reference to BSE MIDCAP. A most widely accepted analytical approach; Efficient Market Hypothesis (EMH) was applied here to investigate the incorporation of information on market valuation by studying the behaviour of stock prices of BSEMIDCAP companies. The research examines the consolidated effect of a set of information on market values of MID CAP securities. This acted as a deterrent to the validity of information. ***The study hypothesized*** that movements of share prices of all BSEMIDCAP companies are random walk, there exists no significant relationship between information and share price, future share price cannot be predicted and fund managers are utilizing information effectively. The study considered all the companies listed in Bombay Stock Exchange under the category of medium capitalization. The study was based on data collected from secondary sources and companies selected using systematic random sampling. The variables used were *Daily Market Valuations (daily closing price of shares)*, Corporate Announcements like *Dividend Announcements*, *Business News* and *Earnings News*, *Stock Views* and *Brokerage Reports* and Major Monetary Policy Announcements like *Bank Rate*, *CRR*, *Repo*, *SLR* and *MFS*. For analyzing the performance of fund managers the variables used were *NAVs of funds* and their *Benchmark Index*. ***Augmented Dickey-Fuller test*** for stationarity was applied. It was evident that share price of all the selected companies under BSEMIDCAP except City Union Bank moved as random walk. Hence the result rejects the null hypothesis that 'Movements of share prices of all BSEMIDCAP companies are random walk'. ***Multiple Classification Analysis*** was carried out using share price as dependent variable and company specific as well as economy specific information as independent variables***. F test*** was used to find out the significance of the effect of information on share price. The result of F test indicated that none of the information was significant in terms of mean but for slope, all the company related information except brokerage report and economy related information like *MSF* and *SLR* exhibited significant changes on share price.

Keywords: BSE, MIDCAP, Securities, India

Major publication appeared in:
1"Impact of Monetary Policy on Share Price with Special Reference to Bank Rate"
Commerce and Business Researcher, Vol.7, Issue3& 4, July 1 – December 31, 2014.
2"Gold Price Dynamics and the Investment Wisdom" , A Journal of Management Science-Prachothan,Vol.01,Issue02,November 2011
Total No. of Pages in the thesis: 212
Total No. of reference cited in the thesis: 132
Email of Researcher:

Title: "Management of NPA in Kerala State financial institutions with emphasis on SME Sector"	
Researcher: Rajeev.K.S	Guide: Dr. Suresh Subramaniam
Subject: Management Studies	

State Financial Institutions in Kerala such as Kerala Financial Corporation (KFC) and Kerala State Industrial Development Corporation play a very important role for the economic development of the State. These two Institutions are the main organisations which promote Small and Medium Enterprises in the State. Though the level of NPA in both the Institutions are in the declining trend, every effort has to be taken to prevent NPA and also to keep the existing assets in standard category. Management of NPA is a very difficult task for the institutions due to several problems existing in the system. After giving due importance to the above, it has been decided to conduct a detailed study to find out the causes and prevention of NPA in Kerala State Financial Institutions. Ishikawa diagram is used to identify the causes of NPA in financial institutions. SWOT analysis is done to improve the performance of KFC. NPA Management of State Financial Institutions in Kerala such as KFC and KSIDC are carried out based on Financial Ratio analysis. A detailed analysis for the identification risky sectors in a financial institution is done using Markov Chain analysis. Ranking of State Financial Corporations in South India like KFC, APSFC and KSFC based on their performance is done using CAMEL Model analysis. Exploratory Factor Analysis for the Identification of dimensions which cause Non-performing Assets in KFC and KSIDC are carried out. This study is conducted based on primary and secondary data. Survey is conducted among officers of KFC and KSIDC using a questionnaire. This instrument is developed in such a way to collect the opinion of officers in these two institutions about the factors leading to assets becoming NPA. The population includes officers of KFC and KSIDC working in the Districts throughout Kerala. As the questionnaire for this Exploratory Factor Analysis has 22 questions, the sample size is fixed at 120 which is more than 5 times number of questions. The causes of NPA identified using Ishikawa diagram consists of four major heads (i) Financial Institution related problems (ii) General causes (iii) Borrower related problems and (iv) Human related problems. For improving the performance of KFC, about sixteen strategies are formulated through SWOT analysis. The main strategy formulated and discussed in this thesis is to rank the performance of branch offices of KFC using Absorbing Markov Chain. Analysis of variance (ANOVA) test done in KFC shows that there is no significant difference between the means of substandard assets, doubtful assets and loss assets of the institution at 5% significance level. ANOVA test carried out in KSIDC shows that there is significant difference between the means of substandard assets, doubtful assets and loss assets at 5 % significance level. Spearman's Rank Correlation Test done based on NPA rank and rank based on loan disbursed to different sectors of branches of KFC reveals that Commercial and Real Estate sector and Hospital sector in South Zone and Hotel sector in Central Zone are risky and no such risky sector is found in North Zone. Ranking based on financial performance of State Financial Corporations in South India shows that APSFC is first in overall performance followed by KFC and KSFC. Exploratory Factor Analysis for the Identification of Dimensions which cause Non Performing Assets in KFC and KSIDC

is carried out and its finding are as follows:

(i) Professional incapability of the borrower in running the firm leading to NPA.

(ii) Borrower nature is wilful and his or her influential nature in financial institutions and Government resulting in NPA.

(iii) Weak internal policy of financial institutions and external environment which aid non-repayment of loan.

Keywords: Non Performing Assets, Financial institutions, Kerala

Major publication appeared in: 1.Rajeev K S and Suresh Subramoniam, A Detailed Analysis for the Identification of Risky Sectors, Journal of Finance, Accounting and Management, 7(1), 1-11, January 2016. 2.Rajeev K S and Suresh Subramoniam, NPA Management in Kerala Financial Corporation, Journal of Economic Development, Management, IT, Finance and Marketing, 7(2), 37-45, September 2015. 3.Rajeev KS and Suresh Subramoniam, Developing strategies for improving performance of Kerala Financial Corporation, Review of Social Sciences, Vol. XV, No. 2, January-June, 2014

Total No. of Pages in the thesis: 184

Total No. of reference cited in the thesis: 157

Email of Researcher: rajeev_kfc@yahoo.co.in

Title: "A Study on Customer Relationship Management in Service Sector with Special reference to Tourism Industry in Kerala"

Researcher: Chitra V.G | Guide: Dr. J. Rajan

Subject: Management Studies

Tourism is an indispensable industry in service sector all over the world. It is one of the fastest growing economic sectors in terms of employment generation and foreign exchange earnings. Service nature of tourism sector demands more closeness to its clients. Personal touch in terms of the offerings in tourism sector is highlighting the significance of nurturing guest- host relationship. Tourism industry in Kerala is attempting to promote and enhance a competitive advantage over the tourism service providers all over the world. How better or successfully CRM strategies may be implemented for better business performance in tourism sector of Kerala state demands consideration due to its growing importance. The aim of this research was to investigate the quality of customer relationship management practices followed by different tourism accommodation providers in Kerala. The study aimed to examine how influential is quality of customer relationship management in building revisit intention and positive word of mouth in Kerala tourism sector. This research tries to explore the existing practices and issues in the CRM practices of Kerala tourism industry and aspires to provide suggestions for further development.

Research methodology involved the collection of primary and secondary data. Keeping in view the objectives, survey methodology has considered suitable of collection of data. Primary data has been collected from both tourists and service providers. Data were collected using questionnaires on a random basis. Area sampling technique has been used to choose the respondents. Secondary data has been collected from books, journals, newspapers and websites. Data collected were analyzed using various statistical tools like percentage analysis, t- Test, One –Way ANOVA, Exploratory Factor Analysis, Confirmatory Factor Analysis and Structural Equation Modeling. The findings of the study point out that there exist a perceptional difference among tourists and service providers with regard to the quality of customer relationship management practices of Kerala tourism. It also discovers that there exists significant relationship between different antecedents like Destination Image, Corporate Brand Image and Referrals on the Quality of Customer Relationship Management in the perception of tourist visiting Kerala and Referrals from previous visitors are having a strong potential to bring quality to the CRM efforts of the service provider in Kerala tourism sector. There exists significant relationship between Quality of Customer Relationship Management and Revisit Intention in the perception of tourist visiting Kerala. There exists significant relationship between Quality of Customer Relationship Management and Positive Word of Mouth. CRM Quality has a strong potential to nurture Positive Word of Mouth from existing visitors and that Positive Word of Mouth is having most strong relation with the quality of CRM and hence the study suggest that service providers should adopt strategies to maintain enduring relationship with their customers. Tourism providers in Kerala should necessarily take steps to build referrals from their present visitors for achieving competitive advantage over their counterparts. (Keywords: CRM, Quality, Tourism, Kerala)

Major publication appeared in: Review of Social Sciences Total No. of Pages in the thesis: 361 Total No. of reference cited in the thesis: 195

Title: "A Study on Agri-Food Supply Chain Management in Kerala"	
Researcher: Resmi A. G	Guide: Dr. J. Rajan
Subject: Management Studies	

India, being a country having the largest number of undernourished people, achieving food security is a significant and growing challenge. According to the Food and Agricultural Organization (FAO), India is having one of the top ranks in the number of death reports due to hunger even though it is self-sufficient in food grains. Ensuring adequate attention to the supply chain management of agri–food products is very much important for alleviating poverty. The agri–food supply chain of a consumer state like Kerala is unique since it possesses characteristics different from other supply chains. Rice and vegetables constitute a major portion of the agri-food products and hence this study has focused on Kerala agri-food supply chain in respect of rice and vegetables and tried to explore its peculiar characteristics.

One of the major problems faced by the Kerala agri-food industry is its poorly performing supply chain, which is caused by lack of proper integration and presence of highly uncertain environmental factors. In light of these, the objective of this research was to study the relationship between Supply Chain Integration (SCI) and Operational Performance (OP) outcomes in the presence of Environmental Uncertainty (EU). This study focused on three dimensions of SCI construct namely internal integration, customer integration, and supplier integration and four operational performance outcomes namely, efficiency, flexibility, responsiveness, and quality. The degree of impact of different dimensions of SCI on the various OP outcomes has also been analysed. The moderating effects of EU on the relationship between different dimensions of SCI and the various OP outcomes of the agri–food supply chain management are also studied. This has enabled to develop a theoretical model for the better understanding of the effect of EU on the relationship between SCI and OP at multidimensional levels. This model is tested using Structural Equation Modeling (SEM) using the primary data gathered. The results of this study establish that there exist significant positive relationship between different dimensions of SCI and various OP outcomes. Further, this study also establish the moderating effect of EU on the relationship between SCI and OP. Moreover, the model developed by the study is acceptable and applicable for both rice supply chain and vegetable supply chain and hence, the applicability of the model could be extended for the agri-food supply chain management as a whole. The outcome of the study has contributed to the theories of Operations Management and SCI by providing insights particularly in the context of agri–food supply chains. Moreover, the findings of this study have implications to operations and supply chain management by providing better understanding regarding the agri–food supply chain management practices. This research also has a noble cause of alleviating poverty by ensuring food security to the vulnerable groups of the society.

Major publication appeared in: Management Researcher, Bloomsbury Publishing
Total No. of Pages in the thesis: 307
Total No. of reference cited in the thesis: 208
Email of Researcher:

Title: "Bio-Ethical Issues in Reproductive technology"	
Researcher: Mehsana R.S	Guide: Dr. P Radharani

Subject: Philosophy

As the medical science grow more sophisticated and the range of treatments, procedures and options increase the ethical aspects of medicine become ever more complex and difficult to resolve. Bioethics investigates ethical issues arising in the life science like medicine, health care, genetics, biology, research etc., by applying the principles and methods of moral philosophy to these problems. The recent developments in biology, technology and medical science have practiced and are still producing innumerable ethical problems.

The field of assisted reproduction is one of the fastest growing areas in medicine. Reproductive Technologies have undergone a rapid evolution from simple procedures like the first insemination of fresh donor semen almost half a century ago to a point where the human beings have the ability to collect sperm for micro injection into oocytes. It will help to transfer donor gametes and embryos, create pregnancies in menopausal women, and in the future may be able to harvest and store eggs from ovarian biopsies. There are various moral issues raised by the advances in reproductive technology. Some of these relate directly to the moral status of what is variously called the embryo, the pre-embryo etc. Today in the day to day life of man reproductive technology has become an unavoidable phenomenon.

The thesis concentrates on the ethical, social and religious dimension of the issues; it also concentrates on the details of scientific factors and makes an attempt to find out whether the traditional ethical theories and principles are in agreement with the new developments. This fact explains the relevance of the topic. The problem was analyzed from ethical, social and religious point of view. Modern innovative and successful human reproductive developments need to be acknowledged and adopted with changing time but those who accept these technologies should have a deep knowledge of ethical issues connected with these technologies and then only they should take decision whereas to accept or reject the new technologies. Love should be the governing principle behind the assisted reproductive technologies treatments then one can minimize the intensity of the problems associated with these technologies.

Major publication appeared in: Social Science Review
Total number of pages in the thesis: 272
Total number of reference cited in the thesis: 71
Email of Researcher: mehsanatvm@gmail.com

Title: "Womens Movement, Identity & Empowerment in Kerala: A Comparative Study of All India Democratic Womens Association & Kerala Sthree Vedi"	
Researcher- Gayathri O	Guide- Dr. J Prabash
Department- Political Science	
An attempt to study autonomous and affiliated political activism in the state of Kerala by looking into activities of All India Democratic Women's Association, a politically affiliated organisation and Kerala Sthree Vedi, a network of autonomous collective; the focus of this research was to track the extent to which the two organisations have succeeded in making women's politics possible and also in forging links with the mass of women and thereby empowering them. Kerala is considered a model state in terms of almost all conventional indicators of social development of women. However, a closer look at the life of ordinary women reveals a different reality, which is that, despite all the favourable conditions, patriarchal control over women remains unabated. Consequently, they remain marginalized in all aspects of Kerala's everyday life. It is more visible in public sphere in general and politics in particular. Over the years, the state has witnessed the emergence of women's movement both autonomous and affiliated to question the anti-women tendencies and to make women as a political force. In this background, the study looks into understanding problems and prospects of women's movement in Kerala's political public. Crux of the problem therefore was how women's movements in Kerala have been able to make women's consciousness at the individual level and women's politics at the collective level. The study sheds light on the following aspects of women empowerment and Women's Movement in Kerala. Women's Movement cannot establish itself as a powerful political force in Kerala's political public. Its major achievement lies in bringing a woman centric perspective in public discourses. On the flip side, it has failed to forge linkage with ordinary women, conscientiousing them against internalised patriarchal values and mobilising them as women. These failures of the movement has to be viewed against the growing acceptance for state led empowerment efforts and caste/religious based mobilisation both of which are depoliticising and, hence ultimately, disempowering in nature. Movement activism is also seriously limited by the highly hegemonic political sphere of Kerala. In a situation like this, institutionalisation of any movement outside the political society needs consistent efforts and material resources both of which are in short supply for Women's Movement. As a result of all these, movements face a deficit in credibility and trust. And this is the greatest dilemma of women's movement in Kerala. Contradiction between individual dynamism and societal conservativism is a major stumbling block in the way of women establishing their identity and a barrier for an effective identity politics in Kerala.	
Major Publications –Women's Link, South Asia Politics, Indian Journal of Political Science Total Pages- 276 Total Number of References- 195	

Email –bijugayu@gmail.com

Title: "**Cuba's Socio-Political Strategies in the Era of Globalization**"

Researcher: Satheesh Kumar P.K | Guide: Dr. G. Gopa Kumar

The study focus on how Cuba responded to globalization even after their strong ally the Soviet Union disintegrated in 1991. The country adopted different style and developed a new strategy to tackle the impact of globalization. Cuba assumes that it would help the country to keep its Revolutionary principles even while it liberalizes the economy. Thus from its pre and post –Revolutionary era, Cuba has made a complete change to survive in the contemporary world order. With the end of the Castro's leadership Cuba opened its economy, transformed its foreign policy and improved its relations with arch rivals. At the same time Cuba wanted to retain the fruits of its Revolution, which includes an inclusive society with egalitarian values, socialist character support to neighbouring and poor nations for improving health –care, education, etc. This indeed is a balancing act for Cuba when one could trace its hard core anti- imperialist and anti- capitalist postures.

In the international scenario, the role of Cuba is very significant. Last 55 years Cuba and America stand in opposite side and U.S. imposed different kinds of embargo on Cuba. Both the countries are just 140 k.m. distance, and many Cuban citizens escaped to U.S. in different times in different reasons. But in the midst of these crises, Cuba stand with socialist values, and help to other poor nations of the world - like frees scholarship to students from other countries, and supplies rarest vaccine in a cheap rate, and in Latin America the country undertaken different regional organizations. They are ALBA, MERCOSUR, UNASUR etc and they planned to their own currency also. On 17 December, 2014 the U.S. and Cuba normalised their relationship and it help both the countries in a larger extent. The U.S. people can enjoy the Cuban tourism and 'Cuban Cigar' and Cuban –Americans can visit Cuba and sent money to their relatives.

The present leader of Cuba, Raul Castro is more pragmatic than Fidel Castro. He allowed more freedom to Cuban citizens and accommodated more members in Cuban administration other than party members. In such a way Cuba is a roll model to the world. Cuba opened its economy without harm its future and revolutionary principles. Cuban leadership is changing according to the situations which bring a balanced growth in the globalised era. Even today the education and health is totally free to every citizen of Cuba. After the disintegration of the Soviet Union, most of them assume that Cuba will wither away very soon. But the country gradually over come all the crisis and at present Cuba is one of the leading countries of the world. This Cuban model can be adopted any countries of the world.

Total Number of Pages in the Title: 298
Total Number of Reference: 313
Email: satheeshdsf@gmail.com

Title: "Socio-Economic And Political Impact Of Retail Trading: A Case Study Of Kerala".

Researcher: Nisand P | Guide: Dr. A. Basheer

Subject: Political Science

Retail trade is considered as important source of livelihood for Lakhs of people in Kerala. The social life of Kerala is very much linked to this sector. The new economic world order has brought many changes in the society as a whole. The retail sector is not an exception to it. The entry of capitalist forces in to the retail trading has brought about drastic changes in this sector. In course of time the traditional retail sector began to acquire a corporate character. The increasing influence of corporate retail on traditional retail sector is a matter of concern. This is the classic example of the negative effects of globalization in third world context where political bargaining power of the workers gets loosened and their economic hardships increased. The post liberalization period witnessed a drastic change in the attitude of the government towards trade, which has negatively affected the trade and agricultural sector all over India. The entry of MNCs in to the Kerala's retail sector creates many social, economic and political problems. Kerala's retail sector is being hijacked by the corporate retailers threatening the livelihood of lakhs of traders, farmers, related workers and consumers. The methodology used for this study is predominantly empirical. Comparative and analytical methods are also adopted. The data for this study was collected both from primary and secondary sources. The respondents are classified in to two, urban retailers and rural retailers. A detailed questionnaire was also prepared for collecting information from the respondents. The study finds that socio- economic and political environment of Kerala played a favorable role in the entry of corporate retailers. Contract farming and mass procurement of products by the companies, artificial shortage of products, customer flow from traditional retail shops to shopping malls, unemployment, debt etc are other findings of the study. The new retail phenomenon also brought about political unity and political awakening among the people of Kerala. From the study it is found that the present day globalization is exploitative and domination oriented. As a solution to this problem it is suggested that the small scale retailers have to 'co-operate against corporate'. This cooperative venture will prevent the traditional retailers from being over powered by corporate retailers. In order to save the society from this quandary, sincere and responsible legislation is also needed.

Key words: Corporate Retail, Traditional Retail, Globalization, Market Usurpation

Major publications appeared in: ISDA Journal (Institute for the Study of Developing Areas
Total no. of pages in the Thesis: 269
Total no. of References Cited in the Thesis: 169
Email of the Researcher: nisandp@gmail.com

Title: "Impact of Globalisation on Service Sector: A Study of Service Organizations in Kerala, With Special Reference To The NGO Union and The NGO Association"	
Researcher: Sreekumar S.L.	Guide: Dr. K.C. Sreekumar
Subject: Political Science	
This thesis emphasised the effects of globalization policies on the service sector. It also stressed the changing nature of employees organisations in the age of globalization and changing strategies of service organizations for the positive utilisation of the service sector. An important message of thesis is that. The employees must be given proper training and orientation programmes in order to develop a strong, competitive and efficient civil service system. They must be utilised for the developmental activities of the nation as a whole. The civil service needs to be made competitive and performance oriented by giving priority to capacity building, quality management and public accountability. A new work culture should be created so as to make the civil servants to become professionals and loyal to the entire society. Another innovative idea is that the activities of trade unions must be for the progress and development of the society. Employees' organizations should develop positive attitudes regarding the socio-economic conditions and should be responsive to the problems of total society. Further, the leadership of the employees' organizations should find out new ways to attract the employees into the organizations. They should provide awareness to their employees about the nobility of work and the aspirations of the people. Finally, the people are the true beneficiaries of any developmental policy. The reform must reflect the needs of the people. By strengthening the provisions like citizens charter, right to information act and the right to service act, a people-friendly civil service system can be created.	
Name of the Journal: *University College Journal Of Politics And Society* (UCJPS). Total number of pages in the thesis: 240. Total number of references: 144. Email: sreekumarkuravankonam@gmail.com	

Title: "**Politico – Strategic Implications of Kargil Conflict 1999"**	
Researcher: Benny Thomas	Guide : Dr. M. R. Biju
Subject: Political Science	
Analysis of the Kargil war 1999 with the help of interdisciplinary theories helped the researcher to draw certain conclusions. During the freedom struggle, some leaders from the Indus provinces and the colonial powers successfully dressed and presented the partition episode on religious line. Obviously, subsequent issues drown out of the partition of the subcontinent also interpreted as their communal origin. Therefore, Kashmir issue, the principal question in normalizing the bilateral relations between India and Pakistan also came to known as religious issue. The real objective in the partition as well as of India-Pakistan disputes centered on water. The Indus water is the single most area of dispute between India and Pakistan, The latter could not psychologically accept its lower riparian status. Whereas the former has conceded maximum concessions via Indus water Pakistan – India wars (1947, Rann of Kutch Conflict, 1965 m 1971 and the Kargil 1999) has had single most objective. All other objectives and areas of disputes are the byproducts of water disputes. Linking of the subcontinental rivers and its river systems is a way to solve Pakistan – India conflicts. The US, and the World Bank, (the chief donor and lender of Pakistan) has a catalyst like a role in this disputes. The World Bank is not at all concerned over the growing poverty in Pakistan. Therefore it hesitated to lend money to Pakistan's rural water sector. Developing a new theory named Enduring dependency became necessary and the same was applied. This study also, put efforts to fill the gaps in some of the popular theories in International relations. bennythomas.trat@gmail.com	

Stream: Arts & Humanities

Title: "Contribution of Ibn Sina to the Medical Science"	
Researcher: Thasni L.	Guide: Dr. A. Nizarudeen
Subject: Arabic	
Abu Ali Al Hussain Ibn Ali Ibn Sina 980-1037,One of the most famous exponents of Muslim Universalism and eminent figure in Islamic learning, known in the westas Avicenna, was also an astronomer, chemist, geologist, Hafiz ,Islamic psychologist, Islamic scholar, Islamic theologian, Mathematician and scientist. His most Important contribution to the medical Science is "Al Qanon fil tib" (The Law of Medicine) was an encyclopaedia of medicine. The Qanon lists 800 tested drugs including plant and mineral substances, with comments on their applications and effectiveness .Avicenna dedicated a chapter of the Qanon to blood pressure, causes of bleeding and haemorrhage. He discovered the cerebella vermis and the caudate nucleus or "nuclear caudates" these terms are still used in modern neuroanatomy and neurophysiology. In Ophthalmology, it explains the physiology of eye movements, which still forms a basic information for modern ophthalmology. He also provided useful information on the optic nerves, Iris and central and peripheral facial paralysis. In cardiology, the Qanon of medicine is the first book to mention the vasovagal syncope and carotid sinus hypersensitivity. It dedicated to brain diseases effecting intentional movements. The first correct expansion of pulsation was given by Avicenna that the modern approach of examining the pulse through the examination of the wrist, which is still practiced in modern times. He also wrote a supplemental treatise on diagnosing diseases using only the methods of feeling the pulse and observing inhalation. The Qanon described the contagious nature of infectious diseases such as phthisis and tuberculosis, the distribution of disease by water and soil and the existence of sexualy transmitted diseases. The Qanon also distinguished between mediastinitis and pleurisy provided careful descriptions of skin troubles, perversions, and nervous ailments, meningitis and also described treatments for cancer, parasitic diseases of ascaris enterobius, tapeworms and guinea worms. He also attempted the earliest known treatments for cancer. One method he discovered was the 'Hindiba', a herbal compound drug which later identified as having 'anticancer' properties and which could also treat other tumors and neoplastic disorders. Another for treating cancer was surgical treatment. It was the first book to describe the symptoms of esophageal cancer and to refer to it as "cancer of the esophagus". In Herpetology Qanon includes in its introduction to new method of hepatitis treatment. In Islamic psychology and neurosciences, Qanon noted close relationship between emotions and physical condition, and he felt that music had a definite physical psychological effect on patients. In neurology and neuropathology, Qanon include its diagnosis of facial nerve paralysis and first described the neuropsychiatric conditions of hallucination, insomnia, mania, nightmare, melancholia, dementia, epilepsy, paralysis, stroke. A chapter of the Qanon was also dedicated to mania and rabies.	
Total no. of pages in the thesis: 387 Total no. of reference cited in the thesis: 99 Email of Researcher: thasnipunnapra@gmail.com	

Title: "Characterization in the Novels of Najeeb Mahfuz – With Special Reference to Althulathiyath (The Trilogy) – A Study"

Researcher: M. Basheer	Guide: Dr. A. Ubaid

Subject: Arabic

Najeeb Mahfuz the celebrated and fitted novelist grabbed the glorious and prestigious Nobel Prize for literature in the year 1988. The present period in Arabic literature may be called as the age of Najeeb Mahfuz.

Born in a middle class family as the son of merchant in Al-Jamiliya district of Cairo on 11th December 1911 A.D., he excelled in Arabic Literature. He seeks to explore his emotional experiences, hidden thoughts and feelings at the most critical moment of life. His works reflect his robust optimism, his faith in the value of human life and trust in God. He attempts to satirize the psychology of the masses. He has more than forty novels and fourteen collections of short stories to his credit. He has also written plays.

His career falls in to three periods:

1. Historical novels, such as: a) The game of the fate (1939), b) Rudubis (1943), c) The struggle of Thebes (1944)
2. Social and realistic novels, such as: a) New Cairo (1945), b) Khan al Khalil (1946), c) The midaq Alley (1947), d) The beginning and the end (1949)
3. Post realistic novels, such as: a) The children of our Alley (1947), b) Palace walk (1956), c) Palace desire (1957), d) Sugar street (1957), e) The thief and the dogs (1961), f) Chat by the Nile and others (1966)

Among these novels "The Trilogy" (Palace walk, Palace desire and Sugar Street) is the most notable one which won the Nobel Prize. It is to be considered that "The Trilogy" is a milestone among novels in Arabic literature. "The Trilogy" covers the history of three generations. The novelist describes the real life of Egyptians and their involvements in politics. He highlights the technical virtuosity and innovative qualities of the three generations.

It is noteworthy that the characters in The Trilogy" have an eminent role in the narration of the realistic life. A study on this field would, undoubtedly provide much light on the characterization in the novel.

Total no. of pages in the thesis: 406
Total no. of reference cited in the thesis: 120
Email of Researcher: firoskhantholoor@gmail.com

Title: **"Effectiveness of Group Investigation Model and Simulation Model in Teaching English at the Higher Secondary Level"**	
Researcher: John George Athyal	Guide: Dr. Maya Dutt
Subject: English	
The success of any process is significantly determined by the product and the quality of the product is established by the effective implementation of a particular method which is in fact a part of the process. The amount of proficiency a learner acquires in a language largely depends upon the methodology of teaching adopted by the teacher. A number of strategies are now in vogue in classroom teaching and Model of Teaching is one among them that invites attention. Model of Teaching is not a novel notion, but its implementation in the present classroom is an area to be discussed and explored. The present study focuses on Models of Teaching with special emphasis on Group Investigation Model and Simulation Model. The study also helps us to understand the prospect and feasibility of adopting them in classrooms. The first chapter gives a general introduction to teaching of English and Models of Teaching. The second chapter elucidates the theoretical framework of Models of Teaching. Models of teaching emerged from the research of Bruce Joyce and Marsha Weil. The chapter also deals with the main features of Models of Teaching and the basic principles and assumptions underlying Group Investigation Model and Simulation Model, namely, Synergy and Cybernetics. The third chapter gives an account of the review of related literature. The methodology adopted for the study is explained in the fourth chapter. Task-based Learning Method was considered the base to conduct the experiment to delineate the effectiveness of the learning strategies. The proponents of the method advocate that effective learning takes place only when learners are involved in real language use. Tools were prepared and pre- and post-tests (to assess both linguistic and communicative competencies) were administered. The facts and figures collected were consolidated and tabulated for statistical analysis. Concluding chapter presents the findings and an introduction to an eclectic model – Drive Actuation Model – derived as a result of the study. An actuator is a motor which enables the movement of a device or system and it needs an initial energy to stimulate its function. Similarly, a learner needs an initial potency which acts as the main source of energy that may further guide him in the learning activity. It is evident from the study how Models of Teaching, especially, Group Investigation Model and Simulation Model are effective in teaching English.	
Publication appeared in 1] *English Activities Update* 2] *languageinindia* [Web] Total Number of pages in the thesis: 277 Total No. of references cited in the thesis: 83 Email of Researcher: johnathyal@gmail.com	

Title: "Staging the Female: De-scribing the Devadasi"	
Researcher: Priya V.	Guide: Dr. G. S. Jayasree
Subject: English	

Staging the Female: De-scribing the Devadasi is an interdisciplinary study that investigates the absent-presence of devadasis in the official historiographies and cultural common sense of Keralam. Contesting the fixities and unpacking the fixations that undergird projections of the 'ritual-prostitute' stereotype as a badly made 'other' with which a selectively re-scripted cultural past of the state and an abstract narration of Malayaleeness discursively insulated from any devadasi connection get to be projected, this study seeks to explore how a mirror composed in a piecemeal manner of the 'disappeared' other shall uncover the narrative of nation-ness formed of its absenting as a master fetish.The texts used to put together this study include a wide array of materials from translated compilations of the earliest medieval temple inscriptions, the early Manipravalam literature, personal interviews with descendants of the *kalavantdasis* of Kochi, Malayalam transcriptions of selected palm leaf temple records, totally unexplored archival documents pertaining to devadasis in addition to a chunk of fragments drawn from newspaper and magazine articles, pamphlets, cartoons, paintings, testimonials and snippets of 'forgotten' representations in Malayalam literature from the late colonial period among others. As an inter-disciplinary research work, my study draws from performance and feminist theories, post-structuralist literary theory and cultural geography to understand how legitimate subjectivities and licit cultural emblems are formed of ghosts of elided entities, disappeared through repeated narrations of the nation-ness imagined and put in place through the invention of boundaries and arteritis. The methodology used involves a combination of ethnographic fieldwork and historical research and seeks to cheat the semantic closure imposed on devadasis within Kerala in attempting a staging of the women who have quite dramatically been elided from commemorations of our cultural selves while also undertaking a de-scribing of trenchantly held notions of the term 'devadasi', as it investigates the complex interfaces between gender, nation-nessand narrations of a region's cultural pasts. In a social scenario where absence of evidence as a fact could be gathered up to cite evidence of absence, a vital distrust of representations that get acknowledged over and again as facts is garnered to open up the violence of the archive which is tackled with dissonances stymied up in the archive itself, dissonances borne of shards that contain other possibilities and consequently other histories. Connecting these missed possibilities to fitful subversions of the totalizing taxonomies of the archive erupting in protean chats at starkly mundane homes of this once criminalized community is undertaken here without bouncing to the other extreme of celebratory enunciations of counter histories. The attempt here hence is to tease out viable glimpses into (hi)stories that resonate among a people as internalizations of their selves, to reflect on how the yarns themselves are weaved out, what other tales reside between the very same warps and woofs, beneath the apparently timeless names branded on the othered bodies.

Publication appeared in: *Samyukta: A Journal of Women's Studies*
Total Number of Pages in the thesis: 403
Total Number of references cited in the thesis:172

Title: "**Text versus Stage: Dramatic Techniques in the Plays of Vijay Tendulkar"**	
Researcher: Ambu. R. Nair	Guide: Dr. K. Radhakumari
Subject: English	
The doctoral thesis "Text Versus Stage: Dramatic Techniques in the Plays of Vijay Tendulkar" examines the structural harmony and the distinct features of the dramatic and theatrical texts of fifteen plays selected from the dramatic output of Vijay Tendulkar. Each of his plays is different from the other; it is the varieddramatic techniques that have made his plays a huge success. He harmoniously blended the eastern and the western dramatic conventions, and such other devices and techniques in his plays. Tendulkar also made use of his knowledge of the classical and folk theatres to make his plays unique and more appealing. Tendulkar's focus on the stage and his directorial outlook enabled him to juxtapose strategy and social issues. Spanning five decades Tendulkar wrote twenty-eight plays and stands outas a premier playwright in Indian theatre. Unlike his conventional counterparts, Tendulkar was unconventional and innovative. He redefined and updated Indian theatre, which existed even before the 1950s. Directors look upon his dramatic texts as theatre workbooks. He has no closet play to his credit. All his plays are intended to be performed on stage. So, to make them appealing to all sorts of audience he experimented with many techniques and perfected them. This thesis explores the dramatic techniques and discusses their significance in the dramatic contexts in order to make the plays communicative to the spectators.	
Publication appeared in *LITTCRIT* Total number of pages in the thesis: 196 Total number of references cited in the thesis: 118 Email of the researcher: ambutvlm@gmail.com	

Title: Textualising History and Historicising the Text: A Reading of the Select Works of William Dalrymple and Indu Sundaresan

Researcher: Hycinth Sophia Paul | Guide: Dr. S. Parvathy

Subject: English

In the present work, "Textualising History and Historicising the Text: A Reading of the Select Works of William Dalrymple and Indu Sundaresan," an attempt is made to analyze three novels of Indu Sundaresan—*The Twentieth Wife* (2002), *The Feast of Roses* (2003) and *Shadow Princess* (2010)—and two novels of William Dalrymple—*White Mughals* (2002) and *The Last Mughal* (2006)—which are rooted in the historical facts of the seventeenth and nineteenth century India, respectively, using new historicism as a pedagogical tool. Indu Sundaresan, an immigrant Indian writer in US, through reconstructing the stories of Nur Jahan and Jahanara, provides alternate historical texts and by telescoping the two, points to the processes involved in historiography—those of selection and deletion; foregrounding and backgrounding; elaboration and compaction. Through the historical narratives, Scottish historian and writer, William Dalrymple assumes the role of a new historicist by using the frame work of the Mughal period and the "mutiny" of 1857 to interpret history in a literary context. The introductory chapter titled "Historicity of History: An Introduction" traces the genealogy of new historicism, giving due emphasis on the concepts put forward by theorists including Stephen Greenblatt, Leonard Tennenhouse, Raymond Williams, Dominick La Capra, and Alan Sinfield regarding the intricate and ambivalent relationship between text and context. The second chapter, "'Self-Fashioning' Nur-Jahan" attempts to explore how *The Twentieth Wife* and *Feast of Roses* are juxtaposed with the Mughal history of the seventeenth century. Emphasis is on Nur-Jahan who becomes a strong power behind the veil, and turns out to be no longer a historical figure but an icon for contemporary women. The third chapter, "De-Shadowing Shadow Princess" analyses how the author has historicized and fictionalized *Shadow Princess*, which deals with the life of Jahanara, who assumes the title Padshah Begum after the death of Mumtaz Mahal. The fourth chapter titled "Textualising Sepoy Mutiny" discusses the true story behind the uprising of 1857. Attempt is made to show how recorded history, which is the story of the victorious or the dominant, has distorted the authentic history of 1857 Uprising The fifth chapter, "Interweaving Transculturation and History", exposes how *White Mughals*, an exotic love story, of James Achilles Kirkpatrick, East India Company's Hyderabad resident and Khair un-Nissa, the grand-daughter of a high ranking official at the court of the Nizam of Hyderabad, is a documentation of the history of that period The concluding chapter, "Total History De-Totalised: Reading the Past in the Present", integrates the essence of the preceding chapters. It is shown how a reading of these works is done by breaching disciplinary boundaries between text and history, and between fiction and reality. It is a "go betweeness" between textualism and contextualism. The chapter also explains how the sense of resonant wonder is aroused in the readers when they identify in these historical characters, themselves and people around them, and hence these works cease to be history of the past but lives of the present.

Publications appeared in Ideagora (I edn.) 978-81-920 711-0-7, Changing Worlds: Reviewing and Reinventing Literature and Culture and *Indian Literary Historiography* and *Counter Currents in Post Coloniality* (I edn.)ISBN 978-81-7821-436-8
Total Number of pages in the thesis: 255
Total No. of references cited in the thesis: 155
Email of Researcher : saral87@yahoo.co.in

Title: "Psychodynamics of Trauma in Select Fiction of Chimamanda Ngozi Adichie, Buchi Emecheta and Yvonne Vera"

Researcher: Shaheen Ebrahimkutty. A.V | Guide: Dr. Krishna Kumar. V

Subject: English

War literature, a genre that predominates in the writings of Zimbabwe, Nigeria, and many of the African states, is an outcome of colonial assertion and anti-colonial expression. War invalidated the fundamental beliefs that gave meaning to the character's pre-war life. Their impasse speaks out through the numbness inflicted by traumatic suffering and the restriction of anguish that psychologists identify in their battle-scarred patients. The war has been rewritten and written from different imaginative and psychological aspects. Wartime brutality and atrocity, such as mass killing, ethnic cleansing, torture and rape can also be psychologically traumatic for both soldiers and civilians who survive. The victims are denied an opportunity to achieve justice or heal their psychological and emotional wounds. Trauma of war affects millions of people. Psychotherapists have a better knowledge of how memory is affected by the experiences of war. For a better understanding of the trauma of war, it is vital to develop a better perception of the psychological and societal factors along with the victim's point of view, in order to analyse the effect of war. Trauma plays a significant role in the psychogenesis of violence. Traumatizing events can have drastic emotional effects on individuals, even if the victim is not injured physically. If a war victim or anyone suffering from PTSD are exposed to multiple traumas during their lives, they will have some psychological difficulties as a result of their bitter experiences, these difficulties hinder the process of their adaptation and integration in society.

The psychodynamics of war trauma and the impossibility of post-war reintegration are dealt with in the milieu of Adichie's *The Purple Hibiscus* and *Half of a Yellow Sun*, Emecheta's *Destination Biafra* and *The Rape of Shavi,* Yvonne Vera's *Nehanda* and *The Stone Virgins*. The importance of the theme of war in the works of Emecheta, Adichie and Vera advocates a deeper understanding of historical time than an emphasis on the post-colonial period. The author's depictions of war are explorations of latent and repressed factors of the psycho-social issues generally configured as traumatic. In this study the focus is on the war trauma and its emotional injury aggravated and perpetuated by a culturally directed process of post-war re-integration that marginalizes and silences the survivors of the tragedy. In order to comprehend the tragedy of African women, the process of recovery and the psychological aftermath of trauma need be analyzed. For this purpose the select literary texts are read with the postulations of psychological theories focusing trauma studies. This study focuses on the journey; the female protagonists had to undergo to find their selves. The study attempts to make a psychoanalytic exploration of their female psyche, trauma, and war time feminine narratives in order to define the contours of a black feminine selfhood. The novels are essentially a search for selfhood, dealing with varied experiences which they had to undergo in the face of violence, oppression and the struggle for freedom.

Publication appeared in *English Activities Update*
Total Number of pages in the thesis: 172
Total No. of references cited in the thesis: 56
Email of Researcher shaheen.ebrahimkutty@christuniversity.in, shaheenshemi@gmail.com

Title: "The Land and the Word: The Aesthetics of Ecology in Select Works of Rudy Wiebe"

Researcher: **Raj Mohan M.S.** | Guide: **Dr. Jameela Begum A.**

Subject: **English**

The plurality of interpretations of the natural world in Canadian literature, which range from the menacing wilderness to the redeeming and healing power that promotes self-knowledge, is an indication of the potential it offers for a researcher in literature.This dissertation is interdisciplinary in scope and its objective is to provide a sociological, cultural and ecological reading of the select works of Rudy Wiebe. The study foregrounds his distinctive bio centric worldview, illustrating the eco-space of the different communities bound together by the history, geography and culture of the region. The first chapter analyses the history of ecological thinking with examples from literary, cultural and artistic expressions. The chapter tries to place Rudy Wiebe among the prominent ecologically conscious writers in world literature. The second chapter analyses the historical background of Euro-American ecological imperialism in Canada and its effect on the rights of indigenous people over their mother land. Historical novels like, *The Temptations of Big Bear* (1973) and *The Scorched-Wood People* (1977), show how the balanced relationship is disrupted by the intrusion of white culture. In the third chapter, Wiebe explores the geographical, linguistic, and cultural border-crossings of the Mennonites and their attempts to create the "Promised Land" / "Kingdom of God" / "Garden" on the earth by seeking separation from the "World." This dimension is explored in the analysis of *Peace Shall Destroy Many* (1962) and *The Blue Mountains of China* (1970). The chapter examines the paroxysm of uprooting from one's homeland and the complexity of resettlement in another country.The fourth chapter throws light on the harmonious existence of the Natives in the Arctic region. It scrutinises the extent to which the Canadian North dared Europe and exposed the inadequacies of its representation frames. The Arctic is central in Wiebe's imagination in *The Mad Trapper* (1980) and *A Discovery of Strangers* (1994). For him, "No Man's Land" becomes "Land beyond Words," a living presence. The concluding chapter substantiates and reiterates Wiebe's bio centric worldview as one that extends beyond a mere centring of nature. The assumption that life close to the wilderness is morally superior sums up Wiebe's works. Wiebe's geographic sense of history and his haunting preoccupation with religion are welded into his fictional frame work. His bio centric worldview redefines the traditional understanding of aesthetics and calls for a complete immersion in nature.

Publications: (1). *Monograph* on Rudy Wiebe, (2). Article in *The New Frontier,*(3). Article in *Various Cultures Variant Readings.*

Total Number of pages in the thesis: 322

Total Number of references cited in the thesis: 141

Email of Researcher: msrajmohan@gmail.com

Title: "Mapping Cross Cultural Identities: LiteraryRepresentation and Colonial Politics in the Select Works of Salman Rushdie"	
Researcher: PadminiSasikumar	Guide: Dr. G.S. Jayasree
Subject: English	

In a world structured by competing power equations, it becomes crucial for the writer/artist to envisage alternative counter narratives. The narrative site becomes a site of contestation as the counter narratives insist that there can be a provisional referentiality and access to the 'real' without relying on foundational precepts. Such texts project tentativeness, ambivalence and paradoxicality. Salman Rushdie deconstructs the pervasive power of dominant narratives through polyphonic multiplicity resulting in a clash of ideologies and political contestations for literary representation. This thesis explores how Rushdie's textual politics opens up an interface between public discourse and private experience that have hitherto remained silenced. The hypothesis of my study is to reiterate and assert the logic of ant foundationalism that evidences from Rushdie's counter representative schema. Alternately the study examines Rushdie's texts that portray identity, language, representation, narratives, culture and colonialism as historically specific constructs and contestable endeavors. My thesis statement is formulated in the introductory chapter. Each of the subsequent chapters will, while reinforcing the thesis, shed light on a new discursive perspective by discussing the selected works of Rushdie. Thus while chapter 1 provides a critical overview of the dynamics of anti-foundationalism that pervades Rushdie's texts, chapter 2 titled "Colonial Politics: Rushdie's counter politico-aesthetics," shows how Rushdie's work places itself strategically in the fissures of dominant narratives thus effective ly*reinscribing* while inhabiting the discipline. Chapter 3 titled "Cultural Politics: Rushdie's plural fictional discourse and the negotiation of progressive politics", reveals Rushdie's inherently transgressed cultural position as a hybrid figure self-consciously writing against cultural stereotypes and representations commanding the field .Chapter 4 "Literary Representation: Politics and Poetics" explore Rushdie's counter narrative transgression that contests the hegemony of status quo by formulating a subversive fictional poetics that has political implications thereby revealing the anti-foundationalist stance of his works. Chapter 5, "Conclusion" analyzes the triple coding of Rushdie's text – inter-textual, inter-subjective and inter-cultural which results in a complex network of signification and representation. The method adopted for my study is a paradigmatic form of analysis envisaged by RanjanGhosh in his application of the in (fusion) approach to literature that rejects limitations in favour of conflicting ideas. As Ghosh emphasizes, it is "naturally ex-centric" and not bound up by any dominant theoretical system. Such a reading analyzes Rushdie's fiction between categories, in an attempt to demonstrate the *worldliness* of Rushdie's texts that is anti-foundational. It goes on to show that with a writer like Rushdie, the logic of anti-foundationalism enhances the discourse of ambivalence and multiple possibilities become the new democratic dominant, instead of univocal impositions, that await us within and beyond the text.

Total Number of Pages in the Thesis:228
Total Number of references cited in the thesis:80
Email of the Researcher:padminis61@gmail.com

Title: The Search for a Womanist Narrative in the Fictional Works of Alice Walker	
Researcher: Asha Krishnan	Guide: Dr. Jameela Begum
Subject: English	
Womanism opened up new avenues of expression for the Black woman who had been silenced within the confines of White feminist theoretical positioning. Alice Walker saw 'womanism' as a term that amalgamated the plurality of Black women's experiences in the context of the slavery of the past and the new found identity of the present, with a strong rooting in the culture and history of the Black race. Cultural beliefs, tradition and practices were seen as fundamental to the depiction of feminine sensibility. The tangible and intangible worlds - the social and the physical, the environment and the spiritual - became concepts that were significant in understanding the black race and experiences of women. This thesis is an attempt to study the complexity of this multi-layered, quilted womanism in Alice Walker's narratives. Walker popularized the concept of womanism that appreciates and celebrates women's culture, emotional stability and strength. She weaves elements of African spirituality and orality into her cyclical vision of motherhood and ancestral worship. Walker positions herself as a writer who boldly acknowledges her African ancestry. Africa with its indigenous practices, rituals, myths and folklore became the raw material for Walker's narratives. Her narratives open up multiple ways of searching for lost roots through a process of re-membering. Myths, legends, folktales and forms of cultural expression serve as the foundation of her narratives. Womanist ideals of cultural rooting, reconnecting with spirituality, celebrating the beauty of nature and womanhood and striving towards the well-being of the entire humanity, find their manifestation in her writings.	
Total Number of pages in the thesis: 232 Total No. of references cited in the thesis: 226 Email of Researcher: asha218@rediffmail.com	

Title: "Transcending Gendered Space: Semiotics of Dressing in Select Fiction and Films on Afghanistan"	
Researcher: Priyanka. M.C.	Guide: Dr. Suja Kurup P.L
Subject: English	
Clothing which a human being acquires soon after birth becomes almost an extension of one's body and identity. It has a major role in fixing gendered spaces. Issues of social control and social hierarchy are often effectively embodied in gender relations. For the safe functioning of a patriarchal world, a fixed gender ideology is essential and the roles and functions of men and women are determined and demarcated unambiguously in the patriarchal order. At first glance, politics and dress stand poles apart but on a closer note they unravel a wide variety of agendas both cultural and power oriented. Social control over who may wear what in terms of style, fabrication, decoration, and even colour go a long way in determining the place of a person in society. Material artifacts and the period during which they attain renowned stature or notoriety best reflect the socio - historical and political context more than anything else. The thesis is a detailed exploration into the modes of repression and resistance in contemporary Afghan society, demonstrated in part by the practice of cross- dressing in select novels and films. It explores issues like the relationships and struggles of power in Afghan society, especially in the concept of gender; the function of clothing in "performing" a gender, in making an individual, in embodying fantasies of gender and sexuality and the gender- space nexus existing in society. The novels selected for the study are *The Breadwinner* (2001), *Parvana's Journey* (2002), *Mud City* (2003), and *My Name is Parvana* (2012) by Deborah Ellis. Films include *Baran (2001)* by Majid Majidi and *Osama (2003)* by Siddiq Barmak. The study hinges on concepts like power, identity, resistance and survival. The indelible presence of the female child cross- dressers become the veritable blue print of a society struggling to exist between two opposing ideologies - rigid Taliban standards and conflicting Western ethics. In spite of their ideological differences, the religious fundamentalists and imperialists are similar in their covert strategies and are quite successful in selecting and attracting the most appropriate collaborators for their much - needed expansions. Violent conflicts and social unrest unquestionably induce trauma and acutely affect the mental health of the populace in diverse ways. This study opens up a can of worms as it shows how dress becomes politicised as the visual and textual narratives progress and gives room for culture wars between the East and the West. The novels and films are examined along two lines of analysis. While the literary analysis focus on the psychological delineation of characters, realism, language and structural organization of the novels, the films are studied on the basis of elements of cinematic composition	
Publications appeared in LITTCRIT & Journal of Literature & Aesthetics Total Number of pages in the thesis: 181 Total No. of references cited in the thesis:106 Email of Researcher: priyankaapanicker@gmail.com	

Title: Tradition in Transition: Jewish Experience in Select Indian Fiction in English	
Researcher: Brinda. V. Nair	Guide: Dr. V. Krishna Kumar
Subject: English	

The Jewish community of India is roughly estimated to be the fourth largest Asian Jewish community. Unlike their experience in other parts of the world, the Jews of India have not endured anti-Semitism. This could be one of the many reasons that have contributed to their integration into our culture. An attempt is here made to trace the anxieties of this community whose tradition is ever in transition, wanting to belong, yet holding on to one's identity. The question that clouds the psyche of the Indian Jews- whether they are Jews or Indians first ?- is a major concern in fictional writings. The Jewish and non-Jewish authors who, in their attempts sometimes to preserve Jewish tradition and just as often to break with it, or to do a little of both, managed to make a major contribution to secular Jewish culture. The present study aims at an understanding of the ethos of the Jewish community in India- their manners, habits, customs, traditions and lifestyle- as reflected in select Indian fiction in English. The thesis makes a comprehensive analysis of select fiction on Jewish life by Indian writers of English, Esther David, Meera Mahadevan, Sophie Judah and Sally Solomon, who unravels the existential angst of this miniscule community. The wrench of having lost their original home continues to haunt Jewish writers. In all the novels under study, they make a conscious assertion of their identity and mirror the psyche of their marginalized community along with their problems and plights. The argument put forward in the study is that the concept of 'home' is a reality and the concept of 'root,' a fantasy or nostalgic sensation. The thesis acclaims that this desire, is the result of a fascination they nurture within them towards a land they have only heard about and believe that they ultimately belong to. One need not necessarily feel at home in the so called 'homeland' just because of one's nativity. The study tries to uphold the view that there can be a home away from one's home or place of nativity. By putting forward various case studies and surveys it is concluded that the Jews of India live comfortably in India and never feels that their life is meaningless, away from their native land. The fundamental premise of this study is thus established.

Publication appeared in *English Activities Update*
Total number of pages in the thesis: 253
Total number of references cited in the thesis:124
Email: brinda.vnair@yahoo.com

പ്രബന്ധവിഷയം : നാടകകൃതിയും രംഗപാഠവും 'ലങ്കാലക്ഷ്മി' 'അവനവൻകടമ്പ' 'ഓരോരോകാലത്തിലും' എന്നിവയെ അടിസ്ഥാനമാക്കി ഒരു പഠനം.

ഗവേഷകൻ : ഡോ. എസ്. വി. സുധീഷ് സാം | മാർഗ്ഗനിർദ്ദേശകൻ : ഡോ. എം. എ. സിദ്ദീഖ്

വിഷയം : മലയാളം

നാടകകൃതിയും രംഗപാഠവും എന്ന അന്വേഷണത്തിന്റെ ലക്ഷ്യം അരങ്ങിനെ സംബന്ധിച്ച മലയാളിയുടെ നിരീക്ഷണങ്ങളെ അടുത്തറിയുക എന്നതാണ്. കൃതിയിൽ നിന്നും സംവിധായകന് രൂപപ്പെട്ടുകിട്ടുന്ന പാഠത്തെ രംഗപാഠനിർമ്മിതിക്കായി ക്രമപ്പെടുത്തുമ്പോൾ അദ്ദേഹം കൈക്കൊള്ളേ ുന്ന സൈദ്ധാന്തിക വശങ്ങളുടെ സമഗ്രവും സൂക്ഷ്മവുമായ പഠനമാണ് പ്രബന്ധത്തിൽ നടത്തീട്ടുള്ളത്. പ്രായോഗിക പഠനത്തി നായി തിരഞ്ഞെടുത്തിട്ടുള്ള മൂന്നു നാടകങ്ങൾ വ്യത്യസ്തമായ മൂന്നു പ്രയോഗതലങ്ങളെ പ്രതിനിധാനം ചെയ്യുന്നു. അവയുടെ രംഗപാഠനിർമ്മിതിയിൽ കൈക്കൊള്ളേ ുന്ന വ്യത്യസ്ത നിലപാടുകളെയും അത്തരം നിലപാടുകൾ കൈക്കൊള്ളാനു ായ സാഹചര്യങ്ങലെയും വ്യക്തമാക്കി പ്രബന്ധം കടന്നുപോ കുന്നു. കൃതിയുടെ അർത്ഥതലങ്ങളെ കെ ത്തുകയും അതിൽ നിന്ന് പാഠരൂപീകരണത്തിന്റെ പ്രാധാന്യ ത്തെക്കുറിച്ച് പരാമർശിച്ചുകൊ ് രംഗപാഠം എന്തെന്ന് വ്യക്തമാക്കുന്നു. കൃതിയിൻമേലുള്ള എഴുത്തുകാര ന്റെയും സംവിധായകന്റെയും വായനക്കാരന്റെയും രംഗപാഠസങ്കൽപമെന്തായിരിക്കുമെന്നു പരിശോധി ക്കുന്ന കൃതി : പാഠം അർത്ഥവും വ്യാപ്തിയും ആദ്യ അധ്യായവും രംഗപാഠനിർമ്മിതി സിദ്ധാന്തങ്ങൾ നവ പരിപ്രേഷ്യം എന്ന ര ാമധ്യായവും പ്രവേശിക്കുന്നു. നാടകത്തിന്റെ ആത്മാവ് സ്ഥിതിചെയ്യുന്നത് ഭാവരസ ത്തിനുള്ളിലായതിനാൽ രംഗപാഠനിർമ്മിതിയുടെ ഒരു സൈദ്ധാന്തിക തലത്തെ അതിന്റെ വെളിച്ചത്തിൽ രൂപ പ്പെടുത്തുകയാണു ായത്. ഭാവരസപഠനം സൂക്ഷ്മമാവുകയും ആൺ പെൺ ശരീരഭാഷയിലെ ഭാവപ്രകട നങ്ങളെ വെവ്വേറെ നോക്കിക ് പെൺ നാട്യഭാഷ്യത്തിൽ പ്രധാന്യം കൽപിക്കുകയും ചെയ്യുന്നു.

നാടകത്തെ സംബന്ധിച്ച് ഇതിവൃത്തം പ്രതിനിധാനം ചെയ്യുന്ന സ്ഥലം അതിപ്രധാനമായ ഘടകമാണ്. കഥ യിടത്തെ ക്രമപ്പെടുത്തി അരങ്ങു നിർമ്മിതി നടത്തുമ്പോൾ വർത്തമാനകാലയാഥാർത്ഥ്യമായി കൃതി രൂപപ്പെ ടുന്നു. അതിനാൽ രംഗപാഠനിർമ്മിതിക്കായി രൂപപ്പെടുത്തിയ മറ്റൊരു സൈദ്ധാന്തികവശമാണ് സ്ഥലതലസി ദ്ധാന്തം. നവ സാങ്കേതികതാ സിദ്ധാന്തമാണ് രംഗപാഠനിർമ്മിതിതത്ത്വങ്ങളിൽ മറ്റൊന്ന്. നാടകത്തിന്റെ അവ തരണത്തിലും പാഠരൂപീകരണത്തിലും നവസാങ്കേതികാംശങ്ങൾ ഉൾച്ചേർക്കുക എന്നതാണ് ഈ സിദ്ധാന്തം വ്യക്തമാക്കുന്നത്.

ര ാമത്തെ അധ്യായത്തിൽ ക്രമപ്പെടുത്തിയ സിദ്ധാന്തങ്ങളുടെ പ്രായോഗികതല പഠനമാണ് മൂന്നും നാലും അഞ്ചും അധ്യായങ്ങളിൽ നടക്കുന്നത്. ലങ്കാലക്ഷ്മിയിലെ രസലോകങ്ങൾ : അരങ്ങിന്റെ ഭൂമികയിൽ എന്നെ

മൂന്നാം അധ്യായത്തിൽ ഭാവാവിഷ്കാരസിദ്ധാന്തത്തിന്റെ വെളിച്ചത്തിൽ 'ലങ്കാലക്ഷ്മി'യെപഠിക്കുകയും സിദ്ധാന്തത്തിന്റെ വെളിച്ചത്തിൽ രംഗപാഠനിർമ്മിതി നടത്തുകയും ചെയ്തിരിക്കുന്നു. സ്ഥലതല കടമ്പകൾ അതിജീവിക്കുന്ന അരങ്ങ് എന്ന നാലാമത്തെ അധ്യാത്തിൽ സ്ഥലതല സിദ്ധാന്തത്തിന്റെ വെളിച്ചത്തിൽ

'അവനവൻകടമ്പ'യുടെ ഭൂമിശാസ്ത്ര ഭൂമികക്കുള്ളിൽ നിന്നുകൊ ുള്ള രംഗപാഠനിർമ്മിതിനടത്തുക യാണ്. പെണ്ണരങ്ങിന്റെ ആകാശവും ഭൂമിയും എന്ന അഞ്ചാമധ്യായത്തിൽ ഭാവാവിഷ്കാരത്തിലെ പെൺ ശീലുകളെ പുത്തൻ അരങ്ങു സമ്പ്രദായത്തിൽ വ്യക്തമാക്കാൻ ശ്രമിച്ചിരിക്കുകയാണ്. താരതമ്യവും വിശല കലനവുമെന്ന ആറാമധ്യാത്തിൽ ഓരോകൃതിക്കും മേൽ വ്യത്യസ്തമായ സിദ്ധാന്തങ്ങൾ പ്രയോഗിക്കാനു ള്ളകാരണങ്ങളെ താരതമ്യപഠനത്തിലൂടെ സമീപിച്ചിട്ടു ്. മുകളിൽ പഠനവിധേയമാക്കിയ വിഷയത്തെ ചില ഉപദർശനങ്ങളുടെ വെളിച്ചത്തിൽ ക്രോഡീകരിച്ചിരിക്കുകയാണ് ഉപസംഹാരത്തിൽ നാടകകൃതിയുടെയും രംഗപാഠനിർമ്മിതിയുടെയും ചരിത്രപരവും പ്രായോഗികവുമായ പഠനരീതിയാണ് പ്രബന്ധത്തിൽ നടത്തിയി ട്ടുള്ളത്.

ഗവേഷണകാലത്ത് ലേഖനം പുറത്തിറക്കിയ ജേണൽ : ഗ്രന്ഥാലോകം 2015 – സെപ്റ്റംബർ തായ്മൊഴി – ആഗസ്റ്റ് – നവംബർ 2013 ആകെ പുറം : 319 ആകെ സഹായക ഗ്രന്ഥങ്ങൾ :

email : samsudhi2010@gmail.com

പ്രബന്ധവിഷയം : ''വൈക്കം ചന്ദ്രശേഖരൻനായർ മലയാള സാഹിത്യത്തിന് നൽകിയ സംഭാവന– ഒരു വിലയിരുത്തൽ''

ഗവേഷക : രമി. ഡി.	മാർഗദർശി : ഡോ. കെ. ജ്യോതിഷ്കുമാർ (അജയപുരം ജ്യോതിഷ്കുമാർ) പോസ്റ്റ് ഗ്രാഡ്വേറ്റ് ഡിപ്പാർട്ട്മെന്റ് ഓഫ് മലയാളം & റിസർച്ച് സെന്റർ മഹാത്മാഗാന്ധി കോളേജ്, തിരുവനന്തപുരം

മലയാള സാഹിത്യത്തിലും പത്രപ്രവർത്തന മേഖലയിലും ഗണ്യമായ സംഭാവനകൾ നൽകിയ എഴുത്തുകാരനാണ് വൈക്കംചന്ദ്രശേഖരൻ നായർ. സാഹിത്യത്തിന്റെ ഒട്ടുമിക്ക മേഖലകളിലും വ്യാപരിച്ചിരുന്ന വൈക്കത്തിന്റെ രചനകൾ ചരിത്രത്തെയും രാഷ്ട്രീയ സാമൂഹിക ജീവിതത്തെയും സ്പർശിച്ച് നിൽക്കുന്നു. അങ്ങനെ സാഹിത്യ ലോകത്ത് ചിരപ്രതിഷ്ഠ നേടിയ വൈക്കംചന്ദ്രശേഖരൻ നായരെയും അദ്ദേഹത്തിന്റെ രചനകളെയും സാമാന്യമായ വിലയിരുത്തലിന് വിധേയമാക്കുകയാണ് ഈ പ്രബന്ധത്തിന്റെ ലക്ഷ്യം.
വിപുലമായ സാഹിത്യ സമ്പത്തിനുടമയായ വൈക്കത്തിന്റെ കൃതികൾ വേത്ര പഠനവിധേയമായിട്ടില്ല. വലിയ അംഗീകാരങ്ങൾ അദ്ദേഹത്തിന് ലഭിച്ചതുമില്ല. നാമമാത്ര പരാമർശങ്ങളാണ് പഠനമായുള്ളത്. അദ്ദേഹത്തിന്റെ കൃതികളിൽ പലതും പത്രമാസികകളിൽ ഖണ്ഡശഃരൂപേണ പ്രസിദ്ധീകരിക്കപ്പെട്ടവയാണ്. ആ നിലയ്ക്ക് അത്തരം കൃതികൾ കത്താൻ പ്രയാസമായതിനാൽ പൂർണ്ണരൂപത്തിലുള്ള കൃതികളെയാണ് ഈ പ്രബന്ധത്തിൽ പഠനവിധേയമാക്കിയിട്ടുള്ളത്.

എഴുത്തുകാരൻ തന്റെ കാലഘട്ടത്തിന്റെ അധീശത്വം നേടുന്ന സംസ്കാരവും ജീവിത ദർശനങ്ങളും കൃതികളിൽ ആവിഷ്കരിക്കുന്നു. ഈ വീക്ഷണത്തിൽ ഊന്നിക്കൊുള്ള സമീപനരീതിയാണ് പ്രബന്ധരചനയ്ക്കായി സ്വീകരിച്ചത്.

വളരെ ദീർഘകാലത്തെ ബന്ധമാണ് വൈക്കം ചന്ദ്രശേഖരൻനായരും പത്രപ്രവർത്തനമേഖലയും തമ്മിലുള്ളത്. പത്രക്കെട്ടുകൾ ക്രമത്തിൽ അടുക്കിവയ്ക്കുന്ന ജോലി ചെയ്തുതുടങ്ങിയ വൈക്കം ക്രമേണ പത്രങ്ങൾക്കും മാസികകൾക്കും ആവശ്യമായ ആമുഖ പ്രസംഗങ്ങളും ലേഖനങ്ങളും എഴുതിത്തുടങ്ങി. കാർട്ടൂൺ ചിത്രങ്ങൾ, ഫലിതങ്ങൾ, കഥ, നോവൽ, നാടകം എന്നീ മേഖലകളിലൂടെ അദ്ദേഹത്തിന്റെ രചനാലോകം വിപുലമായി.

വൈക്കത്തിന്റെ ലേഖനങ്ങളെല്ലാം സമകാല സാമൂഹിക– രാഷ്ട്രീയ– സാംസ്കാരിക വിഷയ സംബന്ധികളാണ്. കഥകളിലൂടെ സനാതന മൂല്യങ്ങൾക്ക് പ്രാധാന്യം നൽകി. സമകാലിക സാമൂഹ്യ നീതിയോടും ദുഷിച്ച രാഷ്ട്രീയ ചലനങ്ങളോടും അധികാരഭ്രമത്തതയോടുമുള്ള അദ്ദേഹത്തിന്റെ പ്രതികരണമായിരുന്നു നാടകങ്ങൾ. വൈക്കം ഏറ്റവുമൊടുവിൽ എത്തിച്ചേർന്ന സാഹിത്യമേഖലയാണ് നോവൽ. ചരിത്ര നോവൽ, സാമൂഹിക നോവൽ എന്നീ മേഖലകളിലൂടെ അധികം സംഭാവനകൾ നൽകി. ജീവിതത്തിലെ വൈരുദ്ധ്യങ്ങളും സംഘർഷാവസ്ഥയും തനിയെ അനുഭവിച്ചറിഞ്ഞ ഈ എഴുത്തുകാരൻ അത്തരം സംഭവങ്ങൾക്കാണ് നോവലുകളിൽ പ്രാധാന്യം നൽകിയത്.

സഞ്ചാരപ്രിയനും വിജ്ഞാനദാഹിയുമായ വൈക്കത്തിന്റെ മാനസിക വ്യാപാരങ്ങളുടെ ആകെത്തുകയാണ് ഈ കൃതികൾ. കൃതികളിൽ ' മാസ്റ്റർപീസി' നെ കത്താൻ കഴിയുകയില്ല. ' ജീവിതമൊരു മാസ്റ്റർപീസല്ലേ' എന്ന് ചോദിച്ചിരുന്ന വൈക്കത്തിന്റെ ജീവിതവും സ്മരണകളുമാണ് അദ്ദേഹത്തിന്റെ കൃതികൾ. അനുഭവങ്ങളെ ഗുരുനാഥനായി കിരുന്നതിനാൽ അനുഭവങ്ങൾക്കാണ് അദ്ദേഹം നന്ദി പറയുന്നത്. താൻ ഭൂമിയിൽ കതും കേട്ടതും അനുഭവിച്ചതുമായ കാര്യങ്ങളെ ഭാവനയിൽ മെനഞ്ഞെടുത്തപ്പോൾ അത് പുതുമയാർന്ന ലേഖനങ്ങളായി മാറി. ഭാവനാലോകത്തെ അദ്ദേഹം ഒരു മാന്ത്രിക പ്രപഞ്ചമായി കു. ആ പ്രപഞ്ചത്തിൽ വൈജ്ഞാനിക ശാഖകൾക്ക് അതിർവരമ്പ് കല്പിച്ചില്ല. അതിന്റെ പരിപക്വ ഫലമാണ് അതിരുകളില്ലാത്ത ആ സാഹിത്യമേഖല. ഏതെങ്കിലുമൊരു രംഗത്തു മാത്രം നിലയുറപ്പിച്ചിരുന്നുവെങ്കിൽ വൈക്കത്തിന്റെ വ്യക്തിത്വം മറ്റൊന്നാകുമായിരുന്നു.

വിഷയം: സ്ത്രീസ്വത്വാവിഷ്കാരം: സി.എൻ ശ്രീകണ്ഠൻ നായരുടെ നാടകത്രയത്തിലും വാല്മീകിരാമായണത്തിലും

ഡോ. ശ്രീലാറാണി എം.എസ്

പാരായണം ചെയ്യപ്പെടുന്ന ഒരു കാവ്യത്തെ ശക്തിയുക്തമായ സംഭാഷണത്തിന്റെ ചടുലത നിറഞ്ഞുനിൽക്കുന്ന ഏറ്റവും മഹത്തരമായ ഒരു കലാരൂപമാക്കിമാറ്റി അതിലൂടെ സമൂഹത്തെ ഒരു പുനർവിചിന്തനത്തിന് പ്രാപ്തമാക്കുകയാണ് നാടകത്രയത്തിലൂടെ സി.എൻ ശ്രീകണ്ഠൻ നായർ ചെയ്തത്. അടിച്ചമർത്തപ്പെട്ടുകഴിഞ്ഞ സ്ത്രീജീവിതത്തെ അതർഹിക്കുന്ന പ്രാധാന്യത്തോടെ വിശകലനം ചെയ്ത് വിധേയത്വത്തിനെതിരെ പ്രതികരിക്കാൻ സ്ത്രീയെയും സമൂഹത്തെയും പ്രാപ്തമാക്കുക എന്ന ലക്ഷ്യം നാടകത്രയത്തിലൂടെ സി.എൻ ശ്രീകണ്ഠൻ നായർ സാക്ഷാത്കരിച്ചു. സാമൂഹികപ്രതിബദ്ധതയുള്ള വ്യക്തി എന്ന നിലയിൽ താൻ ജീവിയ്ക്കുന്ന സമൂഹത്തിലെ അധാർമ്മികതയും മാമൂലുകളോടുള്ള അന്ധവിശ്വാസങ്ങളും മാറ്റേ തിന്റെ ആവശ്യകതയാണ് ഇതിഹാസകഥാപാത്രങ്ങളെ സ്വീകരിക്കുവാൻ സി.എൻ.നെ പ്രേരിപ്പിച്ചത്. സ്ത്രീസ്വത്വത്തെയും സ്ത്രീസമത്വത്തെയും പരിപോഷിപ്പിക്കാനുള്ള ശ്രമം നടത്തുകയും അതിലൂടെ ചിലരെയെങ്കിലും പാരമ്പര്യങ്ങളുടെ മാമൂലുകളിൽനിന്ന് മാറിചിന്തിക്കാൻ പ്രേരിപ്പിക്കുകയും ചെയ്തു എന്നത് മൂലകൃതിയായ രാമായണത്തേക്കാൾ നാടകത്രയത്തിന്റെ മൂല്യം ഉയർത്തുന്നു. ഇതിഹാസത്തിലെ കഥാപാത്രങ്ങൾക്ക് നൽകിയ പുതിയ വ്യക്തിത്വത്തിലൂടെ കേരളീയസ്ത്രീത്വം പുനർവിചിന്തനത്തിന് വിധേയമാകേ തിന്റെ ആവശ്യകത വ്യക്തമാക്കുന്നു. കഥാപാത്രങ്ങളുടെ ചിത്രീകരണത്തിലൂടെ, സമകാലികജീവിതത്തിൽ സംഭവിച്ചുകൊ ിരിക്കുന്ന ജീവിതവ്യതിയാനങ്ങളുടെ പുതിയ വ്യാഖ്യാനങ്ങളിലൂടെ, നാടകത്രയത്തിലെ സ്ത്രീസ്വത്വാവിഷ്കാരത്തെ മികച്ചതാക്കാൻ സി.എന്നിന് കഴിഞ്ഞു. വാല്മീകിയുടെ സീത യേയും ഊർമ്മിളയേയും പൊതുസഭയിൽ കൊ ുവന്ന് ജനങ്ങൾക്കഭിമുഖമായി ഭാഷണം നടത്താനും അതിലൂടെ അവരുടെ വ്യക്തിത്വം പ്രകടിപ്പിക്കാനും ശ്രമിച്ചതിലൂടെ ആധുനികസ്ത്രീത്വത്തിന്റെയും സമകാലികജീവിത യാഥാർത്ഥ്യത്തിന്റെയും പ്രതിനിധികളായി അവരെ പ്രതിഷ്ഠിക്കാനാണ് നാടകകൃത്ത് താല്പര്യം കാട്ടിയതെന്നു വ്യക്തമാക്കുന്നു. സ്ത്രീസ്വത്വത്തെ ആദർശശുദ്ധിയോടെ ആവിഷ്കരിക്കാൻ കഴിഞ്ഞു എന്നതാണ് സി.എൻ ശ്രീകണ്ഠൻ നായർ എന്ന നാടകകൃത്തിന്റെ വിജയം. അന്നുവരെ കേരളം ക സ്ത്രീജീവിതത്തിന്റെ പ്രതിഫലനമാല്ല മറിച്ച് അതിനെതിരേയുള്ള പ്രതിഷേധമാണ് നാടകത്രയത്തിൽ ക ത്. കേരളം പിന്തുടർന്ന ഭാരതീയപാരമ്പര്യത്തിന്റെ നല്ലവശങ്ങളെ ഉൾക്കൊള്ളുന്നതോടൊപ്പം അനാചാരങ്ങളെയും അധാർമ്മികതയേയും ചോദ്യംചെയ്യാനും കഥാപാത്രങ്ങളിലൂടെ സമൂഹത്തിന് അവസരമു ാക്കിക്കൊടുക്കുകയാണ് സി.എൻ. ചെയ്തത്.

വിഷയം : നിയമവ്യവഹാരവും കേരളസംസ്കാരവും	
	ഡോ. അരുൺ. എസ്. ശശി

സുസ്ഥിതമായ സമൂഹത്തിന് അത്യന്താപേക്ഷിതമാണ് നിയമവ്യവസ്ഥ. സമൂഹം, വ്യക്തി, കുടുംബങ്ങൾ എന്നിവയെ ആശാസ്യമായി നയിക്കുന്നതിൽ നിയമങ്ങൾക്കും നിയമവ്യവസ്ഥക്കുമുള്ള പങ്ക് അനിഷേധ്യമാണ്. വ്യക്തികളെയും സമൂഹത്തെയും ആസ്പദമാക്കി സാഹിത്യസൃഷ്ടികളിൽ നിയമവ്യവസ്ഥ സ്വാഭാവികമായി വന്നു ചേരുന്നു. പല സാഹിത്യ-കലാരൂപങ്ങളിലും നിയമത്തിന്റെയും നിയമവ്യവസ്ഥയുടെയും സ്വാധീനം പ്രകടമാണ്. കേരളത്തിൽ പാശ്ചാത്യകോളനിവാഴ്ച ആരംഭിക്കുന്നതിനു മുമ്പ് പ്രാദേശിക വഴക്കങ്ങളും, നാട്ടുമര്യാദകളുമായിയിരുന്നു നീതി നടപ്പിലാക്കുന്നതിനും, ശിക്ഷാവിധികൾക്കും അടിസ്ഥാനമായി സ്വീകരിച്ചിരുന്നത്. ജാതീയമായ ഉച്ചനീചത്വങ്ങളെ അടിസ്ഥാനമാക്കിയതും സ്മൃതികളാൽ നിയന്ത്രിക്കപ്പെട്ടതുമായ നീതിന്യായ സംസ്കാരവും കേരളത്തിൽ നിലനിന്നിരുന്നു. ഈ പ്രാചീന നിയമസംസ്കാരത്തിന് അടിസ്ഥാനപരമായ ഒരു മാറ്റം സംഭവിച്ചത് പാശ്ചാത്യ കോളനിവത്കരണത്തിലൂടെയാണ്. പ്രാകൃത നിയമങ്ങളിൽ നിന്നും ആധുനിക നിയമവ്യവസ്ഥയിലേയ്ക്കു വരുമ്പോൾ കേരളീയ സമൂഹത്തിൽ സാംസ്കാരികമായി ചെലുത്തുന്ന സ്വാധീനങ്ങൾക്കിടയാക്കിയ നിയമവ്യവസ്ഥയെക്കുറിച്ചുള്ള പഠനമാണ് ഈ പ്രബന്ധത്തിൽ. നിയമ പരിഷ്കാരങ്ങളെക്കുറിച്ചല്ല; നിയമപരിഷ്കാരങ്ങൾ സാംസ്കാരിക സാമൂഹിക തലങ്ങളിലു ാക്കിയ മാറ്റങ്ങളെക്കുറിച്ചാണ് പഠനവിധേയമാക്കിയിരിക്കുന്നത്. പ്രാകൃത ഗോത്രവർഗ്ഗ സംസ്കാരവും നിയമ നീതിസമ്പ്രദായങ്ങളും പിന്തുടർന്നിരുന്ന ഒരു ജനത പാശ്ചാത്യ ഭരണത്തെയും നിയമ നീതി സമ്പ്രദായങ്ങളെയും ഉൾക്കൊ ്, നിയമനിർമ്മണങ്ങളിലൂടെ പടിപടിയായി മാറ്റപ്പെട്ട് നിയമ സംസ്കാരത്തിന്റെ ഭാഗമായിത്തീരുന്നത്, ഈ നിയമ വ്യവസ്ഥയുടെയും നിയമസമ്പ്രദായങ്ങളുടെയും പഠനത്തിലൂടെ കാണാൻ കഴിയും. നിയമവ്യവഹാരവും സാമൂഹിക സംസ്കാരവും പരസ്പരം സ്വാധീനം ചെലുത്തുകയും നിയന്ത്രിക്കുക തന്നെയും ചെയ്യുന്നു ്. വ്യവഹാരപഠനത്തെക്കുറിച്ചുള്ള നിരീക്ഷണങ്ങളും താരതമ്യവിശകലനങ്ങളും അപഗ്രഥനങ്ങളും എല്ലാം ഈ ദിശയിലുള്ള വെളിപ്പെടുത്തലുകളാണ് നൽകിയത്.

വിഷയം:ഭാരതീയ മൂല്യസങ്കല്പം മലയാള കവിതയിൽ – അക്കിത്തത്തിന്റെയും വിഷ്ണുനാരായണൻ നമ്പൂതിരിയുടെയും കവിതകളെ ആസ്പദമാക്കി ഒരുപഠനം

ഗവേഷക : അഖില. എസ്. നായർ. | മാർഗ്ഗനിർദ്ദേകശൻ : ഡോ. എസ്.ഗോപാലകൃഷ്ണപിളള

ഭാരതത്തിന്റെ സംസ്കാരം മൂല്യങ്ങളിൽ അധിഷ്ഠിതമാണ്. മനുഷ്യൻ സാമൂഹികജീവിതം ആരംഭിച്ചതുമുതൽ മൂല്യങ്ങളിൽ വിശ്വസിക്കുന്നു ു. ഈ മൂല്യസങ്കല്പങ്ങളാണ് മനുഷ്യനെ മനുഷ്യനാക്കിമാറ്റുന്നത്. സ്നേഹം,. കാരുണ്യം, ദയ, വാൽസല്യം, സത്യം, അഹിംസ, ധർമ്മം തുടങ്ങിയ സനാതന മാനവിക വിഷയങ്ങളാണ് ഭാരതീയ മൂല്യങ്ങളുടെ അന്തർധാര . മനുഷ്യന്റെ ജീവിതവുമായി ബന്ധപ്പെട്ട വ്യത്യസ്ത മൂല്യങ്ങളു ു. ഭാരതീയ സങ്കല്പമനുസരിച്ചുളള പുരുഷാർത്ഥങ്ങൾ കവിതകളിലും പ്രധാന മൂല്യമായി കടന്നുവരുന്നു ു.

നവോത്ഥാന കാലഘട്ടത്തിൽ പുതിയ മൂല്യങ്ങളുടെ വളർച്ചയ്ക്ക് കാവ്യങ്ങളിലൂടെ യത്നിച്ച മഹാപ്രതിഭകളാണ് അക്കിത്തംഅച്യുതൻ നമ്പൂതിരിയും വിഷ്ണുനാരായണൻ നമ്പൂതിരിയും. അവർ സത്യസന്ധതയോടെ അനുഷ്ഠിച്ച മൂല്യങ്ങളാണ് അവരുടെ കാവ്യങ്ങൾക്ക് ചാരുത നൽകിയിരിക്കുന്നത്. ഭാരതീയ മൂല്യങ്ങളിൽ അധിഷ്ഠിതമായ ഒരു കാവ്യ സംസ്കാരം പുലർത്തുന്നവരാണ് ഇരുകവികളും. കവിത മനുഷ്യമനസ്സിനെ ചിന്തിപ്പിക്കുകയും നന്മയിലേക്ക് നയിക്കാൻ സഹായിക്കുകയും ചെയ്യണം. എന്ന ഉദ്ദേശത്തെ സാധൂകരിക്കുന്നതാണ് ഇവരുടെ കവിതകൾ. ജനിച്ചുവളർന്ന സമുദായത്തിന്റെ സംസ്കാരം ഇരുവരുടെയും കവി വ്യക്തിത്വത്തിൽ ആദ്യകാലം മുതൽ സ്വാധീനം ചെലുത്തിയിരുന്നു. അഗാധമായ മൂല്യബോധത്തിന്റെ ശക്തിസൗന്ദര്യങ്ങളുടെ സൂക്ഷ്മതലങ്ങളെ പ്രബന്ധത്തിൽ അനുധാവനം ചെയ്യുന്നു ു. ഭാരതീയ മൂല്യങ്ങൾ ഇരുകവികളുടെയും കവിതകളെ മനോഹരമാക്കുകയാണ് ചെയ്യുന്നത്.

വിഷയം: ഭക്തിസങ്കല്പവും അദ്വൈതദർശനവും ഹരിനാമകീർത്തനത്തിൽ

ഗവേഷകൻ: സുരേഷ്. എം	ഗൈഡ് : ഡോ. കെ. എസ്. രവികുമാർ

അതിഗഹനങ്ങളായ വേദാന്തതത്ത്വങ്ങളെ ഭക്തിപ്രധാനമായി ആവിഷ്കരിക്കുന്ന സാഹിത്യകൃതിയാണ് ഹരിനാമകീർത്തനം. 'മലയാളത്തിന്റെ ഉപനിഷത്ത്' എന്ന വിശേഷണം അർഹിക്കുന്ന ഹരിനാമകീർത്തനത്തിന്റെ പ്രമേയത്തിലും ആഖ്യാനത്തിലും രചയിതാവ് പിൻതുടർന്നിട്ടുള്ള വൈരുദ്ധ്യാത്മകതത്ത്വത്തെ (Dialectics) ഭക്തിസങ്കല്പത്തിന്റെയും അദ്വൈതദർശനത്തിന്റെയും അടിസ്ഥാനത്തിൽ ഈ ഗവേഷണപ്രബന്ധത്തിൽ വിശകലനം ചെയ്യുന്നു. അസ്തിത്വദർശനത്തിന്റെയും മാർക്സിയൻവിചാരത്തിന്റെയും ഭാഗമായി ഡയലക്റ്റിക്സ് സിദ്ധാന്തം പല ചിന്തകന്മാരും ചർച്ച ചെയ്തിട്ടു ്. ശങ്കരാചാര്യർ, ശ്രീനാരായണഗുരു എന്നിവരുടെ കൃതികളും വൈരുദ്ധ്യാത്മകതത്ത്വത്തിന്റെ പശ്ചാത്തലത്തിൽ വിശകലനവിധേയമായിട്ടു ്. അനുഭൂതിതലത്തിൽ ഭക്തിയുടെ സാപേക്ഷികമായ ജീവിതദർശനങ്ങളെയും നിരപേക്ഷമായ ജ്ഞാനമൂല്യങ്ങളെയും ഹരിനാമകീർത്തനം ഉൾക്കൊളളുന്നു. ഭക്തിപ്രധാനവും ദാർശനികോന്മുഖവുമായ കൃതി എന്ന നിലയിൽ ഹരിനാമകീർത്തനത്തിന്റെ വൈരുദ്ധ്യാത്മകമായ സവിശേഷതകൾ പഠിക്കാനാണ് ഈ പ്രബന്ധത്തിൽ ശ്രമിച്ചിട്ടുളളത്. മലയാളത്തിലെ ഭക്തിപ്രസ്ഥാനവും അതിന്റെ സാംസ്കാരിക സ്വാധീനവും ഇവിടെ പഠനവിഷയമാണ്. അദ്വൈതചിന്തയെ നിരവധി സന്ദർഭങ്ങളിലായി പലഭാവരൂപങ്ങളിൽ സാക്ഷാത്കരിക്കുകയും യോഗാധിഷ്ഠിത മൂല്യങ്ങളിൽ സമന്വയിപ്പിക്കുകയും ചെയ്യുന്ന ആഖ്യാനതന്ത്രം ഹരിനാമകീർത്തനത്തെ മലയാളസാഹിത്യത്തിലെ പരമജ്ഞാനകീർത്തനമാക്കി ഉയർത്തുന്നു.

പ്രതിഭാസങ്ങളെ തത്ത്വങ്ങളിൽ ഉളളടക്കി നിരൂപിക്കുമ്പോൾ ദ്വൈതഭേദം അറിയുകയും അദ്വൈതാനുഭൂതി പ്രകാശിക്കുകയും ചെയ്യുമെന്ന് വ്യക്തമാക്കുന്നവയാണ് ഹരിനാമകീർത്തനത്തിലെ സാംഖ്യതത്ത്വം ഉൾക്കൊളളുന്ന ശ്ലോകങ്ങൾ. ഞാൻ, ഈശ്വരൻ എന്നീ ജ്ഞാനദ്വയങ്ങളെ ഒന്നായി ഗ്രഹിച്ചുനിരൂപിക്കുന്ന തത്ത്വാഖ്യാനം ഹരിനാമകീർത്തനത്തിൽ ആവർത്തിച്ചുപ്രത്യക്ഷപ്പെടുന്നു. ആത്മതത്ത്വം വിഗ്രഹവത്ക്കരിക്കപ്പെടുകയും ഏകാഗ്രത, ഭക്തിയായി മാറുകയും ചെയ്യുന്ന സർഗവ്യവഹാരമാണ് ഈ കൃതി. അന്തർദർശനത്തിലധിഷ്ഠിതമായ പരമതത്ത്വം, ഭൗതികവും ആത്മീയവുമായ സന്ദിഗ്ധതകളെ അതിവർത്തിക്കുന്ന ഒന്നാണെന്ന ദർശനമാണ് ഹരിനാമകീർത്തനത്തിന്റെ അടിത്തറ. അതിനാൽ ഭക്തിസങ്കൽപത്തിന്റെ പ്രകീർത്തനം മാത്രമല്ല അദ്വൈതദർശനത്തിന്റെ അനുഭൂതിപാഠവുമാണ് ഈ കൃതി.

ജ്ഞാനബോധത്തിൽ അടിയുറച്ചു നിൽക്കുന്ന ഭക്തിഭാവന എന്ന നിലയിൽ ഹരിനാമകീർത്തനം യോഗാത്മകദർശനത്തിന്റെ ജനകീയശാസ്ത്രം കൂടിയാണ്. വിഭിന്നങ്ങളായ ദാർശനികചിന്തകളുടെ സമാഹാരമായ ഹരിനാമകീർത്തനത്തിന്റെ സാഹിതീയ ധാര സജീവവും സാർവകാലികവുമാണ് എന്ന നിഗമനം ഈ ഗവേഷണപ്രബന്ധം പങ്കുവെയ്ക്കുന്നു ്.

കേരള സർവകലാശാല മലയാള വിഭാഗം

ഗവേഷണ വിഷയം : നോവൽ വിവർത്തനത്തിലെ പ്രശ്നങ്ങൾ ബഷീർ നോവലുകളുടെ പരിഭാഷകളെ ആസ്പദമാക്കി ഒരു പഠനം

മാർഗദർശി : **ഡോ. കെ. അബ്ദുൾഅസീസ്**

ഗവേഷകൻ : **കുമാർ ജെ.**

കേരളീയ സാംസ്കാരിക പരിസരത്തിൽ രചിക്കപ്പെട്ട ബഷീർ നോവലുകളിലെ സംസ്കാരം ഇംഗ്ലീഷുകാർക്ക് അറിയുന്നതിനും ആസ്വദിക്കുന്നതിനുമുള്ള സാഹചര്യമുണ്ടായത് വിവർത്തനത്തിലൂടെയാണ്. എന്നാൽ സംസ്കാര സമമൂല്യതയുടെ അഭാവവും ബഷീറിയൻ ശൈലിയുടെ സവിശേഷതകളും ബഷീർ നോവലുകളുടെ വിവർത്തനത്തിൽ ഒട്ടേറെ പ്രശ്നങ്ങൾ സൃഷ്ടിച്ചിട്ടുണ്ട്. അവയെ സംബന്ധിച്ച് പഠനത്തിലൂടെ കണ്ടെത്തിയ പ്രധാന വസ്തുതകൾ ചുവടെ ചേർക്കുന്നു.

- വൈദേശികാടിത്തറയുള്ള നോവലിന്റെ വികാസ പരിണാമങ്ങൾ പ്രാദേശിക ഭാഷകളിൽ സംക്രമിക്കാനുള്ള മുഖ്യപ്രേരകം വിവർത്തന പ്രക്രിയയാണ്.
- വിവർത്തനത്തിലൂടെയാണ് നോവൽ എന്ന സാഹിത്യരൂപം മലയാളത്തിൽ ഉദയംചെയ്തതും വികാസം പ്രാപിച്ചതും.
- മലയാളം ലക്ഷ്യഭാഷയെന്നതുപോലെ സ്രോതഭാഷയെന്നനിലയ്ക്കും പ്രകീർത്തിതമാണ്.
- മഹത്തായ സാഹിത്യം ഏതുഭാഷയിൽ എഴുതപ്പെട്ടാലും അവതങ്ങൾക്കും അവകാശപ്പെട്ട സാംസ്കാരിക പൈതൃകത്തിന്റെ ഭാഗമാണെന്ന ചിന്തയാണ് വിവർത്തന പ്രക്രിയയെ സജീവമാക്കാൻ വിവർത്തകരെ പ്രേരിപ്പിക്കുന്ന മുഖ്യഘടകം.
- സംസ്കാരവിനിമയമാണ് വിവർത്തനത്തിന്റെ മുഖ്യലക്ഷ്യം.
- ഓരോ വിവർത്തകനും സ്രോതകൃതിക്കും ലക്ഷ്യഭാഷയ്ക്കും ഇണങ്ങുന്നതും തനിക്ക് അഭിരുചിയുള്ളതുമായ വിവർത്തന രീതി തെരഞ്ഞെടുക്കുന്നു.
- സംസ്കാരമെന്ന സങ്കീർണ്ണവും ആപേക്ഷികവുമായ ഘടകത്തെ വിവർത്തകർ എങ്ങനെ കൈകാര്യം ചെയ്യുന്നുവെന്നുള്ളത് വിവർത്തനത്തിൽ പരമപ്രധാനമാണ്.
- സ്രോതപാഠത്തിലെ സാംസ്കാരിക ചിഹ്നങ്ങളായ പദങ്ങൾക്ക് ലക്ഷ്യഭാഷയിൽ സമാനപദങ്ങൾ കണ്ടെത്തുക ശ്രമകരമായ യജ്ഞമാണ്.
- വിവർത്തനത്തിലെ പ്രധാന പ്രശ്നങ്ങൾ അന്തർഭവിച്ചിരിക്കുന്നത് പദവാക്യതലങ്ങളിലാണ്.
- ഓരോപദവും രൂപമെടുക്കുന്നത് അതത് ദേശത്തിന്റെ സാംസ്കാരിക പരിസരത്തു നിന്നാണ്. അതിനാൽ ഓരോ പദത്തിനും സാംസ്കാരികവും ചരിത്രപരവുമായ പ്രാധാന്യമുണ്ട്.
- അനുരണനാത്മക ശബ്ദങ്ങൾ മറ്റൊരു ഭാഷയിലേക്ക് അതേപടി സ്വീകരിച്ചാൽ ശബ്ദജന്യമായ അർത്ഥപ്രതീതി ലഭിക്കുകയില്ല.
- പ്രാദേശിക ഭാഷയിൽ വ്യക്തിഭേദത്തോടുകൂടിയ സംഭാഷണ വാക്യങ്ങളെ മാനക രൂപത്തിലാക്കി വിവർത്തനം ചെയ്യുന്നത് മൂലഗ്രന്ഥകാരൻ രൂപകൽപ്പന ചെയ്ത കഥാപാത്രങ്ങളുടെ വ്യക്തിത്വത്തെ സാരമായി ബാധിക്കും.
- സ്രോതലക്ഷ്യഭാഷകളുടെ വ്യാകരണഭേദം വിവർത്തനത്തിന് വിഘാതം സൃഷ്ടിക്കും.
- പ്രകരണസമമൂല്യത സൃഷ്ടിക്കാൻ വിവർത്തകർക്ക് സാധിച്ചില്ല.
- പ്രാദേശിക തനിമ പുലർത്തുന്ന ശിശുഭാഷ വിവർത്തനത്തിന് വഴങ്ങുകയില്ല.
- വിവർത്തകരുടെ അല്പജ്ഞാനവും പ്രതിഭാരാഹിത്യവും ഗൗരവക്കുറവും വിവർത്തനത്തെ സാരമായി ബാധിക്കും.
- ലക്ഷ്യഭാഷയുടെ പരിമിതികൾ മറികടക്കാൻ വിവർത്തകർക്ക് കഴിയില്ല.
- വിവർത്തകർക്ക് വഴങ്ങാത്ത ഭാഗങ്ങൾ വിവർത്തനത്തിന് വിധേയമാക്കാത്തത് വിവർത്തന കൃതിയുടെ മികവിനെ ബാധിക്കും.

- ഇസ്ലാമത വിശ്വാസ പ്രകീർത്തിതങ്ങളായ സന്ദർഭങ്ങൾ പാശ്ചാത്യർക്ക് താല്പര്യമില്ലാ ത്തതിനാൽ ആഷർ ബോധപൂർവം വിവർത്തനത്തിന് വിധേയമാക്കിയില്ല.
- സ്രോതകൃതിയെ വിവർത്തകൻ പൂർണമായി ഗ്രഹിക്കുന്നില്ലായെങ്കിൽ വിവർത്തനം പരാജയ മായിരിക്കും.
- ഒരു പ്രത്യേക പ്രദേശത്തെ പ്രത്യേക സമുദായത്തിന്റെ പുരോഗമനലക്ഷ്യം മുൻനിർത്തി എഴുതിയ കൃതിയെ വിവർത്തനംചെയ്യുമ്പോൾ പൂർണമായും ലക്ഷ്യപ്രാപ്തിയിലെ ത്തുകയില്ല.
- സാഹിത്യകൃതികൾ വിവർത്തനം ചെയ്യുമ്പോൾ ഉണ്ടാകുന്ന ഏറ്റവും മുഖ്യ പ്രശ്നം സംസ്കാര സമമൂല്യതയുടെ അഭാവമാണ്.
- സർഗാത്മകപ്രതിഭയും ഭാഷാനൈപുണിയും ഒത്തിണങ്ങിയ ആഷറിനെപ്പോലുള്ള വിവർത്തകർക്ക് ഭാഷാസംബന്ധിയായ വിവർത്തന പ്രശ്നങ്ങളെ ഏറെക്കുറെ മറികടക്കാൻ സാധിക്കും.
- സർവമത സാഹോദര്യവും ഏകലോകവീക്ഷണവും സർവചരാചര പ്രേമവും അന്തർധാരയായി വർത്തിക്കുന്ന 'ബഷീറിയൻ ഭാഷ'യിൽ രചിക്കപ്പെട്ട ബഷീർ സാഹിത്യം വിവർത്തകർക്ക് എളുപ്പത്തിൽ വഴങ്ങുന്നതല്ല.
- ബഷീറിയൻ ശൈലിയെ അതിന്റേതായ ഗരിമയിൽ വിവർത്തനം ചെയ്യാൻ വിവർത്തകർക്കോ അതുൾക്കൊള്ളാനുള്ളശേഷി ഇംഗ്ലീഷ് ഭാഷയ്ക്കോ ഇല്ലായെന്ന് വിവർത്തന കൃതികൾ സാക്ഷ്യപ്പെടുത്തുന്നു.
- വിവർത്തകനുണ്ടായിരിക്കേണ്ട പ്രതിഭ, വിശ്വാസ്യത, ആത്മാർത്ഥത, പ്രത്യുല്പന്ന മതിത്വം, സ്രോതലക്ഷ്യഭാഷകളിലുള്ള അവഗാഹം, മൂലഗ്രന്ഥകാരനുമായുള്ള തന്മയത്വം എന്നീ ഗുണങ്ങൾ ലക്ഷ്യഭാഷ മാതൃഭാഷയായ ബഷീർ കൃതികളുടെ വിവർത്തകനുമായി (റൊണൾഡ്.ഇ.ആഷർ) തുലനം ചെയ്യുമ്പോൾ സ്രോതഭാഷ മാതൃഭാഷയായ വിവർത്തകർക്ക് (എൻ.കുഞ്ഞ്, നിവേദിതമേനോൻ) പരിമിതമാണ്.
- പോരായ്മകളും പ്രശ്നങ്ങളും നിരവധിയാണെങ്കിലും വിവർത്തനം അനുസ്യൂതം നടക്കേണ്ടത് ഭാഷയുടെയും സാഹിത്യത്തിന്റെയും വളർച്ചയ്ക്ക് അനിവാര്യമാണ്. മാത്രമല്ല വിശ്വമാനവികത എന്ന ദർശനം സാക്ഷാത്കരിക്കാനുള്ള ശക്തമായ മുന്നൊരുക്കം കൂടിയാണ് വിവർത്തന പ്രക്രിയ.

Title:**"Contribution of Kerala to Sanskrit Yamakakavyas"**	
Researcher : Abdulla Sha. R.	Guide : Dr. P. Visalakshy
Subject: Sanskrit	

The Study titled "Contribution of Kerala to Sanskrit Yamakakavyas" focuses on how Yamaka, a major figure of speech in Sanskrit poetry developed in Sanskrit literature and how Kerala made a significant contribution to its development. It delineates how Yamaka school of poetry flourished from ninth Century to the early part of nineteenth Century. Citing Yudhisthiravijaya by Pattattu Vasudeva Bhattatiri, the study deals with the features of Yamaka in detail. It also refers to the twenty one important Yamakakavyas from Kerala. There is also a reference to the use of Yamaka in works which are not classified as Yamakakavyas. Somany definitions are formulated by various scholars and some of them are highlighted here to make a study on alankara in general and Sabdalankara in particular, effective. It also refers to the different varieties and sub-varieties of Yamaka and the commentaries of stalwarts in the field, in this regard.

Key words: Yamaka, Yamakakavyas, Alankara, Sabdalankara, Vasudeva Bhattatiri Yudhisthiravijaya

Published work: Nil
Total No. of Pages in this thesis: 298
Total No. of reference cited in the thesis: 155
E-mail of Researcher:abdullashar@gmail.com

Title : Modern Short Story women writers – a study	
Researcher: Prabha. F	Guide: Dr. O. Padmakumari
Subject : Tamil	

The study of modern literature in feministic perspective is one of the sources for the growth of feminine freedom. The analysis of feminist freedom leads to reread the old Literature and redefine the feministic ideals. Feminism is not expunged in a particular period of time and it cannot be deployed in a limited space. It designs itself according to the messianic growth of the society. Modern writers differcentiate themselves from commercial writing and focus deeply on the problems faced by women in family as well as society. Modern short stories highlight the problems faced by women some short stories highlight only the problems and they will be ended without a proper solution to solve the problem. The choice is given to the readers to conclude the story with a solution. Some writings enhance the confidence, courage and thought of feministic Freedom is the minds of women. The writers like Ambai, Su. Tamil Selvi, Aandal Priyadharshini, Thilagavathy, Uma maheswari exhibit feministic freedom through their writings. The above writers can be seen in the short stories written during 1990 BC to 2010. Their writings and their feministic thoughts are identified and explained in detail. The women bounded and tied with social culture and their sufferings due to the society are examined and penned deeply in this analysis. Moreover, it is also highlighted that women should free herself from this social bond and walk with self-confidence without gender discrimination. The awareness about the problems and their solutions are brought to time light through this dissertation.

Key words : Modern short story Tamil women writers sight, Feminism

Major Publication : Appeared in International conference on dimensions of Tamilzhiyal Aarachi

Total no. of pages in the thesis : 244

Total no. of reference entered in the thesis : 35

E mail of Researcher : sharonindia143@gmail.com

Title: Sangam Literature *&* Kerala Folklore	
Researcher: Senthil. N	Guide: Dr. O. Padmakumari
Subject : Tamil	

Sangam literature is the compilation of Tamil poems, which were written in the ancient period. These compiled poems were written on the basis of type of land (Thinai) they had lived. These poems are still keeping their individual traditions of people within the boundaries as mentioned in the Tholkappiyam. Nowadays those boundaries had broken. The region 'Tamizhagam' mentioned in the Tholkapiyanm included today's Tamil Nadu, Kerala, South East of Karnataka and Southern region of Andhra Pradesh.

Slang, Culture, Functional practices of people belonged to the region 'Tamizhagam' have changed in different aspects now, but not completely. It is interesting to note that, even now some of the people follows those slang, culture, functional practices, etc. especially the folklore of Kerala. If we compare the folklore of Kerala with Sangam Literatures, we can realize the cultural maturity of Tamil, traditional continuations and the changes within it.

In the introduction section of the thesis is describing the hypothesis, methodology, review of literature and scope of the study. This thesis is divided into four chapters except introduction and conclusion. The first chapter deals with the peculiarity of the people and their culture in *Sangam* Period. *Ettuthokai* and *Pathupaattu is* the basic source for this study. *The second chapter* describes the theoretical background of folklore and its relation to the Sangam literature.This chapter deals with the traditional folk performances like Theyyattam, Porattunatakam and Veerar Vazhipattu Marabu of Kerala and its relation to Sangam references in particularly the relations of Velan Veriyaattu and Theyyaattam. The performances of Theyyaattam, Poratttunaatakam and Pallippaana are briefly explained in this chapter.

Conclusion gives the summery of findings and suggestions for future studies. This thesis is proposing that the historical root of Kerala folklore is based on Sangam literature but these forms performing in Kerala have their own divergence form its mother forms.

Part C: Recent Patent Filings