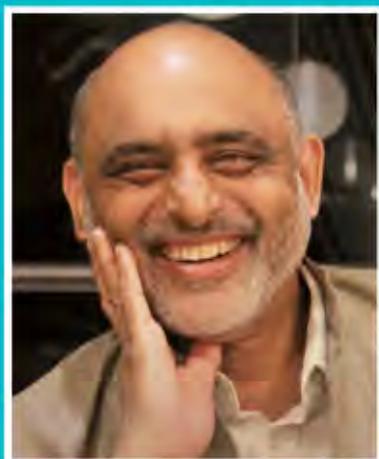


## FEATURED ARTICLES

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FEB 2019

# SCHOOL OF BIOTECHNOLOGY NEWSLETTER



**Dr. Bipin Nair**  
Dean, School of Biotechnology

### FROM THE DEAN'S DESK

Amrita Vishwa Vidyapeetham continued its steep trajectory of growth with significant advances in all spheres of activity during the past year. School of Biotechnology maintained its status as a prominent player in the progress of the University with senior faculty being invited to deliver keynote lectures at University of Cambridge, UK and Munich Center for Neurosciences-Brain & Mind, Germany, to setting up a prestigious collaboration with University of California San Diego (UCSD), with generous funding from the Tata Trust India, to having M.Sc. students securing final semester internships at prestigious institutes including NCBS, IISC, and biotech companies (Lupin, Biocon), to establishing a partnership with ID Genomics and the University of Washington, Seattle, USA, to having a total of 45 publications. Many of these articles appeared in high impact journals. The school has certainly maintained its long-standing reputation as a premier institution for undergraduate and post-graduate training and research in the Life science domain.

As we continue to strive for higher levels of excellence, the tag line for the School of Biotechnology 'Inspired by Creativity, Focused on Excellence' seems very appropriate in capturing the essence of the spirit of activity at the school.



UNIVERSITY OF  
CAMBRIDGE



# Future Trends in Global Healthcare

Dr. Bipin G. Nair, Dean, School of Biotechnology was invited as keynote speaker at an International Conference conducted at the University of Cambridge UK. The conference entitled "Future Trends in Global Healthcare – Fusion of Traditional Medicine and Modern Technologies had participants from premier institutions across the globe including Cambridge UK, WHO, Geneva, Royal Botanic Gardens, UK, Leiden University, Netherlands and University of Hong Kong, China.

The main objectives of the meeting included validation of strategies for implementation and modernization of traditional forms of medicine. Considerable attention was also focused on the conservation and sustainable supply of medicinal plants. Dr. Nair's talk entitled "Natural Products from India as novel drug leads-old wine in a defined new bottle" evoked considerable interest with number of opportunities for international collaboration and future development of projects with the participants.

## GLOBAL UNIVERSITY RANKINGS

Top 500 Globally in  
International Outlook  
Industry Income  
Clinical and Health  
No.1 Private University in India



RANK #168 in ASIA  
NO.1 Private University  
in India, 2018



Top 250 in BRICS  
AND EMERGING ECONOMIES



RANK #140 in BRICS  
NO.1 Private University  
in India, 2018



RANK #8  
University Rankings  
India, 2018



Antimicrobial resistance (AMR) is a rapidly-spreading phenomenon which threatens to make once-treatable bacterial infections deadly again. The collaboration between Amrita Vishwa Vidyapeetham's School of Biotechnology and Tata Institute of Genetics and Society (TIGS) will focus on developing new tools to reverse antibiotic resistance in pathogens like *Pseudomonas aeruginosa* which have been declared as 'critical priority' by the World Health Organization. The joint research by the two institutions holds the potential to develop novel sustainable strategies to counter the global menace of multi-drug resistant (MDR) organisms. Antimicrobial resistance is increasingly globally at an alarming rate, making it difficult to treat even the most common and community-onset infections. However, despite the dangerous increase in multidrug resistance, there are very limited options and strategies available to address this crisis.

Amrita Vishwa Vidyapeetham's School of Biotechnology has joined with Tata Institute of Genetics and Society (TIGS) under the aegis of University of California, San Diego (UCSD) to conduct cutting-edge research in antimicrobial resistance (AMR), a rapidly-spreading phenomenon which threatens to make once-treatable bacterial infections deadly again and jeopardize the delivery of modern medicine. TIGS is a partnership between the University of California San Diego, Tata Trusts and the Institute for Stem Cell Biology and Regenerative Medicine, Bangalore, India.

Talking about the collaboration, Dr. Bipin Nair, Dean of Amrita School of Biotechnology, said: "Recent studies have led to the identification of many genes in pathogenic microorganisms that are responsible for resistance to antibiotics. WHO has classified multi-drug resistant bacteria *Pseudomonas aeruginosa* as a 'Critical Priority' pathogen with a global unmet need for alternative measures of elimination and treatment in hospital environments. The present collaboration between Amrita School of Biotechnology (ASBT) and the Tata Institute for Genetics and Society (TIGS) will focus on developing new tools to reverse antibiotic resistance. It holds the potential to develop novel sustainable strategies to counter the global menace of multi-drug resistant (MDR) organisms."

The tie-up between the two institutions derives inspiration from earlier work done between ASBT and the University of California San Diego (UCSD) in establishing the mechanism of action of natural products like clove bud oil to inhibit quorum sensing in *Pseudomonas aeruginosa* and attenuate virulence. In addition, funding from the Bill & Melinda Gates Foundation and the Department of Biotechnology, Govt. of India as well as Biotechnology Industry Research Assistance Council (BIRAC) to Amrita School of Biotechnology has also resulted in new strategies deploying bacteriophages to counter the virulence of MDR bacterial pathogens.

"This MoU signed between TIGS-UCSD and Amrita School of Biotechnology will pave the way for cutting-edge research in antimicrobial resistance for the benefit of humanity," added Professor Suresh Subramani, Global Director, Tata Institute for Genetics and Society.

## Amrita & Tata Institute for Genetics and Society to Conduct Joint Research Against Antibiotic Resistance



Shines at Bangalore's  
**ICACCI 2018 International Conference**



In another stellar display of its academic excellence, 42 students and young researchers from the Amrita School of Biotechnology (ASBT) have presented 11 peer-reviewed papers at the International Conference on Advances in Computing, Communications and Informatics (ICACCI) held between 11th and 15th of September, 2018 at PES University, Bengaluru, India. The academicians from the computational neuroscience and neurophysiology laboratory submitted themes on computational neuroscience (6 papers), biomedical device technology and methods (3 papers) and ICT-driven virtual labs and digital tools (2 papers) to the prestigious forum.

The focus of Amrita's computational neuroscience modeling has been on reconstructing biological activity and function in order to study neural changes attributed to behavior and specifically, to understand or predict how brain disorders may happen. The institute has been focusing on using such models for building new tools for helping with diagnosis, for treatment and education requirements.

The multi-school team was led by Dr. Shyam Diwakar of ASBT and involved 31 M. Sc. students, 5 B. Sc. students, 5 Ph. D. students and 2 faculty members from ASBT, along with 4 MCA students from Amrita School of Arts and Sciences.

# AMRITA AGILENT ANALYTICAL RESEARCH CENTRE (A3RC)

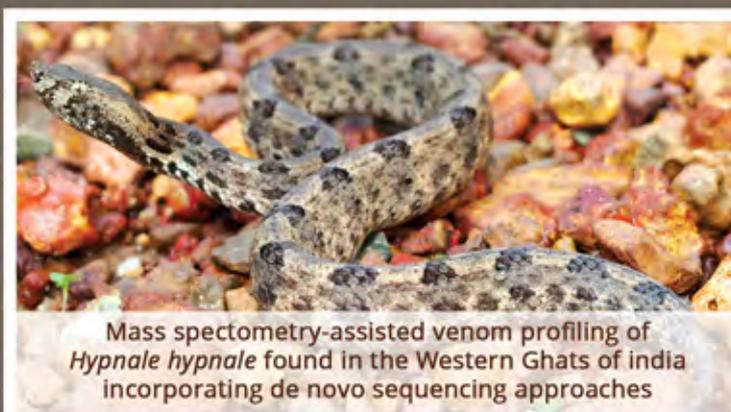


Amrita Agilent Analytical Research centre in the School of Biotechnology is a collaborative initiative with Agilent technologies and was established in the year 2011. The centre is equipped with two high-end mass spectrometers and has the latest state-of-the-art uHPLC chromatographic separation system, which covers the range from analytical to semi-preparative scale. To identify a large variety of chemical and biological compounds, detection systems such as UV/VIS and ELSD (Evaporative Light Scattering) are in use. Additionally, an ultrafast online-UV/VIS spectrophotometer is available for absorption studies. The centre provides its instrumentation capabilities and expertise to in-house researchers and external users to solve diverse research problems such as identification and characterization of natural products, quantification of metabolites and metabolic intermediates and large scale characterization of proteins (proteomics). Occasionally the centre offers education and training to use HPLCs, LC-MS systems and Spectrophotometers

## Research Highlights

Unveiling the complex toxin arsenal of *Hypnale hypnale* venom from the Western Ghats of India

The proteomic analysis of Hump nosed pit viper was spearheaded by Dr. Sudarslal S, Head of Proteomics research in the School of Biotechnology, in collaboration with Dr. Dileepkumar R., Indriyam Biologics, Trivandrum. The study titled "Mass spectrometry-assisted venom profiling of *Hypnale hypnale* found in the Western Ghats of India incorporating de novo sequencing approaches" got published recently in the International



Mass spectrometry-assisted venom profiling of *Hypnale hypnale* found in the Western Ghats of India incorporating de novo sequencing approaches



Journal of Biological Macromolecules on July 2018. In addition to the conventional proteomics workflows, the study mainly highlights the importance of de novo sequencing strategies in exploring the snake venom profiles of unsequenced organisms. This work enabled in the identification of diverse class of snake venom protein families that can be mapped backed to the published reports related to complications associated with its envenomation. To an extent, an overview of *Hypnale hypnale* venom proteome from India can help us better in knowing the complexity associated with its envenomation and also can contribute in making region-specific anti-venom. We assume that in future, the information gained from the current study can contribute towards a societal benefit for treating *Hypnale hypnale* bite victims.

### Quantifying the unknowns- targeted MS analysis of bioactive metabolites and therapeutic drugs

Mass spectrometers are well known to be suited for detecting and estimating the levels of biologically active molecules, drugs, pesticides etc. Using the 6540 Q-TOF LC-MS system, the centre has developed multiple relative quantification methods to determine the quantity of bioactive molecules and therapeutic drugs from both in vivo and in vitro samples. As a part of this project, in collaboration with Dr. Manoj Kumar Bhat, NCCS, Pune, few chemotherapeutic drugs including doxorubicin and dacarbazine were quantified from various cancer cells. Apart from this, multiple research problems focusing on the impact of clove bud oil and phenyl lactic acid on quorum-sensing molecules such as N-(3-oxododecanoyl)-L-homoserine (3-oxo-C12-HSL) and N-butyryl-L-homoserine lactone (C4-HSL) from *Pseudomonas aeruginosa* were quantified using the same quantification strategy. All these results were published in high impact journals including Nature Scientific Reports and Cancer & Metabolism.



# Online Engineering and Virtual Laboratories in India

On October 31st, 2018, Dr. Shyam Diwakar of Amrita School of Biotechnology (ASBT) was invited to give a talk on "Online Engineering and Virtual Laboratories in India: Learners and Teachers Beyond Traditional Classrooms" to professors and their international office team at the Munich Center for Neurosciences- Brain & Mind (MCN) at Munich, Germany.

The MCN is part of the Ludwig Maximilian University of Munich (LMU). The LMU has, particularly since the 19th century, been considered as one of Europe's most prestigious universities with 42 Nobel laureates (as of 2017) associated with the university. By the number of Nobel laureates, it ranks 16th among the world's top universities.

The delegation and visit were facilitated by the Amrita Center for International Programs. The Dean of Postgraduate programs at Amrita Vishwa Vidyapeetham, Prof. Krishnashree Achuthan, also accompanied Dr. Shyam in the visiting delegation and the team met with Prof. Dr. Oliver Behrend, the Managing Director, Prof. Dr. Christian Leibold (LMU Faculty in Biology), Dr. Raluca Goron and LMU's International office team.

In his talk, Dr. Shyam showcased ASBT's functional virtual laboratories for EEG data analysis, Big Data platform and the educational virtual and remote laboratories which were part of India's National Mission on Education through ICT. The highlight was based on the work at the Computational Neuroscience and Neurophysiology Laboratory at Amrita School of Biotechnology, to involve pedagogical and data science platforms for innovation and better education in neurosciences and related topics.

Dr. Krishnashree Achuthan brought the spotlight on Amrita innovations such as the real-time wireless monitoring of landslides, IoT studies, sanitation technology, women empowerment, social work activities and other achievements, including that of Amrita Technology Business Incubator's successes and awards.

The delegation also discussed the Live-in-Labs® experiential learning program, which was pioneered by Amrita Vishwa Vidyapeetham. Amrita's path-breaking initiative to bring social change through research and innovation was lauded by all the academicians alike.



# Swagatham 2018

The School of Biotechnology, Amrita Vishwa Vidyapeetham, welcomed the new batch of students through an induction programme named "Swagatham 2018" which was held at the campus on July 18, 2018. The event brought in many new additions to the Amrita family. A memorable day, filled with fun, music, excitement and hope for the future, marked the beginning of an eventful journey for the new students at the School of Biotechnology, Amrita Vishwa Vidyapeetham.

The day started with the new students receiving a warm and traditional welcome by their seniors. They lit lamps, symbolic of knowledge, to be placed at the feet of the statue of Saraswathi Devi, the Goddess of knowledge, which stands as the centerpiece in the college. The official inaugural function, conducted in the Amriteshwari Hall, began with a prayer and the traditional lighting of the lamp.

Dr. Bipin Nair, Dean, School of Biotechnology, Amrita Vishwa Vidyapeetham, gave the welcome address. He highlighted the growth of biotechnology in India and globally. He reminded the students that they were venturing into the 'Sunrise Sector' and motivated the new minds to explore the various learning opportunities provided by the college to learn and succeed in their fields. Swami Amritageetananda Puri addressed the gathering next, speaking about the value of spirituality in our lives. He told a memorable anecdote about Louis Pasteur, a microbiologist familiar to every biology student, to emphasize the importance of humility in search for knowledge.

The chief guest, Dr. Satya Prakash Dash, Director of Global Innovations at Impact Lab, PATH, addressed the students as well. He talked about the scope of biotechnology and the fields where it can be applied extensively. He urged the students to find sustainable solutions to looming world problems. Lastly, Prof. Bhavani Rao, Director of AMMACHI Labs and Centre for Women's Empowerment and Gender Equality, spoke on the importance of integrating Satyam (truth), Shivam (auspiciousness), and Sundaram (beauty) in every aspect of our studies, work, and life in order to truly gain success.



The informal session paved a way for the new students to interact with everyone and be acquainted with the one another. Filled with music, dance and quirky games, the programs gave the new students a glimpse of student life and all the extra-curricular cultural activities of the School. The event, which will be cherished in memories forever, initiated a new academic year and introduced a pool of new talent into the Amrita family.



## "STRUCTURE BASED DRUG

## DISCOVERY AGAINST POLQ"

Gurudatt Patra, MSc student



Gurudatt Patra (3rd from right)

Structure based drug discovery is based on the knowledge of the three-dimensional structure of the drug and how its charge and shape allows it to interact with the target, finally eliciting a therapeutic effect.

The PolQ gene codes for the enzyme DNA polymerase theta, which is involved in microhomology mediated end-joining, an alternative form of Non-Homologous End Joining (NHEJ). The microhomology mediated end joining is an error prone pathway and it brings about deletions in the strand where repair has taken place which ultimately leads to genetic rearrangement and cellular transformation. It has been found that the PolQ gene is overexpressed in the BRCA-deficient cancer cells and it provides these cells with resistance to ionizing radiation. Inhibition of PolQ in these BRCA-deficient cancer cells radio-sensitizes them, making PolQ inhibitors emerge as potential drug candidates that could be used in combinational therapy for cancer.

During my time at the Biochemistry Department of University of California, Riverside, I was involved in expression studies, purification and characterization, Ligand Based Lead Discovery and setting up crystal trays for PolQ.

We found that PolQ was expressed best by the E. coli strain DE3 and PolQ was finally purified by using Next Generation Chromatography using the His-Affinity column, His-Heparin Column and the Size exclusion column. Lastly, we worked on optimization of ideal conditions to crystallize the PolQ protein, and I also had the opportunity to learn about the Thermal Shift Assays using small molecules from compound libraries to screen for potential compound hits that could be taken for further experimental screening.

The current research on screening of PolQ inhibitors using Structural Biology based methods has the potential to bring about promising novel small molecule inhibitors of PolQ that could be used as an adjunct therapy to make the cancer cells more sensitive towards ionizing radiations.

# UNDERSTANDING THE ROLE OF TOPOISOMERASE I IN MYCOBACTERIUM SMEGMATIS

Anu Susan Kurian, BSc student



I started the process of applying for internship at Jawaharlal Nehru centre for advanced scientific research (JNCASR) in November 2017. A part of the application required the submission of a scientific write-up, which was challenging for me as a 2nd year undergraduate student, however, with the valuable input from my teachers I learned how to frame a scientific question and suggest possible ways to address it.

I was fortunate to be selected for the programme and was placed at Prof. V. Nagaraja's lab at the Microbiology and Cell Biology (MCB) department at the Indian Institute of Science (IISc) in Bangalore. The PhD scholar Phoolwanti Rani to whom I was assigned to work under was a constant source of motivation and a very patient teacher, and we worked together on the project titled "Complementation of RNaseH knockdown with Topoisomerase I in Mycobacterium smegmatis". We were interested in understanding whether Topoisomerase I can complement the function of RNaseH in M. smegmatis. To understand the role of Topoisomerase I in R-loop removal, we complemented the Topo I in RNaseH knockdown background. I aided in the design and completion of several objectives including preparation of suitable vector backbone, insert preparation, and cloning of TopA in the vector for complementation. As a part of the project I was also taught several techniques including competent cell preparation, cryopreservation, cloning, transformation and growth curve analysis etc.

Once I started working in the lab I felt immediately at home and was very fortunate to be surrounded by people who took every effort to ensure that my stay was comfortable. It was truly an enlightening experience to participate in the daily working of a research lab. Each day of the two months in the picturesque campus of IISc was memorable and made even more so by the warm and friendly members of the lab. Importantly, the coursework at Amrita School of Biotechnology really helped me to understand a lot of things in the lab that I had worked on and am grateful to have chosen this college to pursue my degree.



Anu Susan Kurian

# RESCUE EFFORTS BY THE STUDENTS OF ASBT DURING KERALA FLOODS:

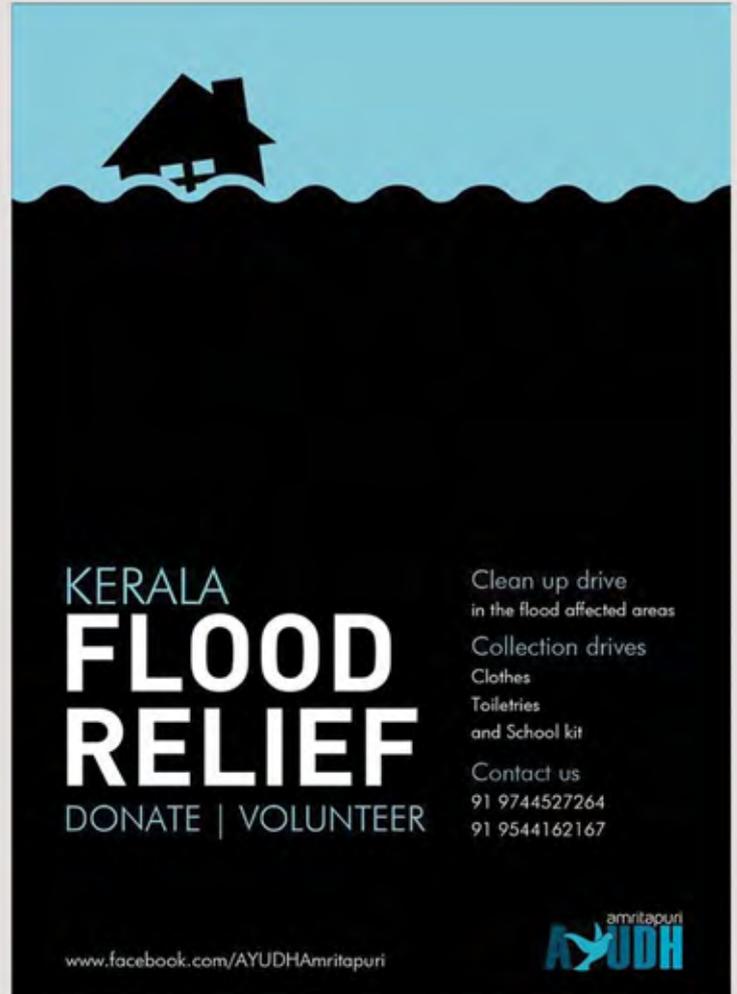
Like all disasters, the floods that hit Kerala and Coorg during August 2018, were sudden and devastating. The excessive torrential rain which claimed more than 500 lives, caused the heaviest rainfall Kerala received in more than a century. The state and its people needed any and all help they could receive. It was in this time of dire need that the students of ASBT came together to contribute in numerous ways to the relief and rescue mission.

The students set up collection centres in the College. On the absence of classes due to floods, all the students collected money and materials in the hostel and contributed to the overall collection drive by AYUDH. The students raised more than ₹ 17,000 in money. They also donated soap, sanitary napkins, biscuits, antiseptics and more.

Along with relief material collection, students of ASBT were an active part of the rescue Helpline set up by the University. The students collectively received more than 25,000 calls and helped many families. They were involved in receiving phone calls from victims, connecting to appropriate rescue teams, checking up on family's status, arranging and connecting volunteers, and updating phone numbers of rescue teams. The students worked in two shifts and their sleepless nights helped save thousands of lives.

The students also worked tirelessly in the relief centre set up in the university. They made sure that the victims were comfortable in times of great grief and stress.

Even though disasters are horrifying, they show us the culture and true nature of the people who respond. Humanity which is often forgotten, shines bright during the gloomy times. The youth, the students, the volunteers and the responders were the beacons of hope. They reassured us that humanity was still alive, that when times get hard, the unity and love of the people will be stronger.



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# Malayalam

# 2018



The celebrations of language and lights were conducted by CREATOME, the students' club at School of Biotechnology, Amrita Vishwa Vidyapeetham, Amritapuri, on November 5, 2018 at the campus. The event was at its pinnacle, elevating the spirit of our mother tongue Malayalam.

The graceful presence of the chief guest Smt. Kartiayani Ammumma, 97 years of age, who became the state literary mission examination topper, brought overwhelming inspiration to the gathering by reciting the poem of celebrated Malayalam poet Changampuzha Krishna Pillai. Her positive spirit influenced Dr. Bipin Nair, Dean of School of Biotechnology, Amrita Vishwa Vidyapeetham, to deliver a charismatic speech in Malayalam. Dr. Sudarshal S., Associate Professor of School of Biotechnology, Amrita Vishwa Vidyapeetham, the Malayalam linguist gave an outstanding speech on Shrestha Bhasha and its importance. Smt. Kartiayani Ammumma and her teacher, Smt. Sathikrishna, was honored by Dr. Bipin Nair. The chief guest also gave away the prizes for the winners of various events conducted as a part of "Malayalam 2018".

Mr. Ananthu Krishna, CREATOME Literature wing Secretary, delivered the vote of thanks for the event stressing his satisfaction on teamwork resulting in the grand success of the event. After respecting the language in a great way the event transformed to explosively energy packed sessions for "PORU 2018" the tug of war competition where teams locked their horns for sparkling performances.

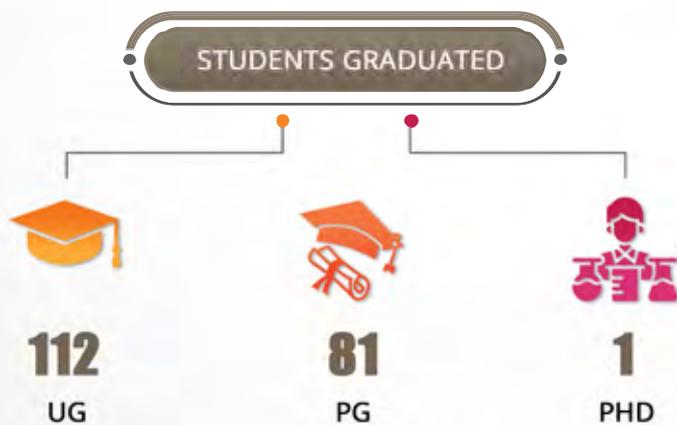
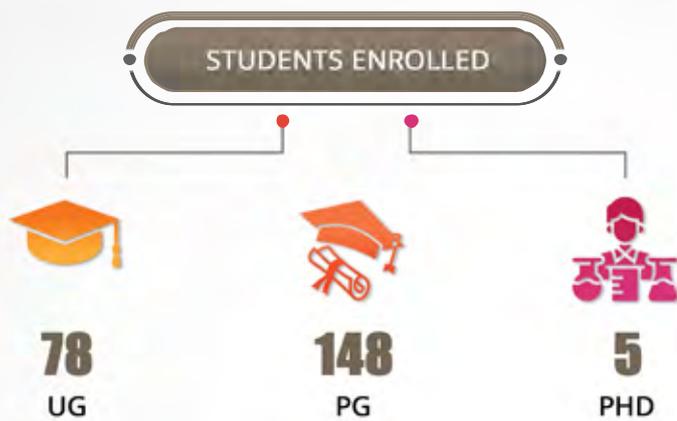
Even after tiring events, the energy seemed to be flowing for the Diwali celebrations which include colorful dance, fun packed games, bursting crackers and a 'lantern contest', with all events happening with great enthusiasm without losing the essence of discipline and culture.





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**BOOK POST**

**TO,**

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