

# SCHOOL OF BIOTECHNOLOGY

JULY 2017 NEWSLETTER



## FROM THE DEAN'S DESK

*The recent ranking of Amrita University as the nation's top-ranked private University has certainly come as a big inspiration and morale-booster for all of us. The School of Biotechnology, in its own right, continues to contribute significantly to the strength of the University. The achievements of our students, faculty and research staff in all spheres of activity, over the past year, have been a matter of great pride for all of us.*

*However, we cannot afford to rest on our laurels. With the Biotechnology sector in India poised to make rapid advances over the next decade, we have to continue to put in our best effort and with Amma's grace and blessings, we should be able to go from strength to strength, in the pursuit of our goals.*

*As we begin this new academic year, I take this opportunity to wish everyone the very best in all our endeavors.*



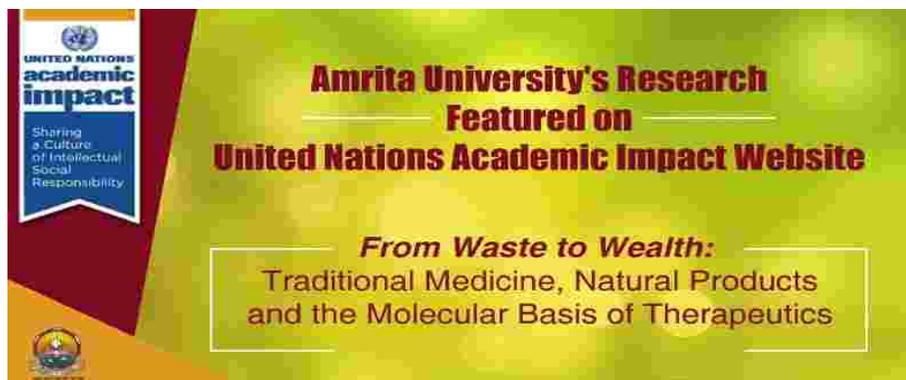
**DR. BIPIN NAIR**

Dean, Amrita School  
of Biotechnology

## AMRITA UNIVERSITY FEATURED ON UNITED NATIONS ACADEMIC IMPACT WEBSITE

An article on Amrita University's research -"From Waste to Wealth: Traditional Medicine, Natural Products and the Molecular Basis of Therapeutics", has been published at the United Nations Academic Impact website. Full article available at this site: <https://academicimpact.un.org/content/waste-wealth-traditional-medicine-natural-products-and-molecular-basis-therapeutics>

Amrita University is a member of UNAI and our work was featured in the first ever Skills and Technology Accelerating Rapid Transformation [START] Conference on Technology for Sustainable Development on July 8, 2015 at the United Nations Head Quarters in New York.



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# BIOCREST 2017

## AN INTERNATIONAL SYMPOSIUM ON MICROBIAL PATHOGENESIS

Amrita School of Biotechnology (ASBT) organized a two day event called the “Biocrest 2017” on January 19-20, 2017. The International Symposium was on Microbial Pathogenesis. This subject has recently become a major worldwide concern due to the global emergence of antibiotic resistant bacteria, predominantly due to overuse and/or misuse of antibiotics. The mechanisms underlying pathogenesis are extremely complex and require creative solutions. BIOCREST 2017 brought together experts in the many diverse areas of pathogenesis, drug resistance and drug discovery, with an effort to create a better understanding of the host-pathogen interaction and antibiotic resistance.

Invited speakers included Dr. Victor Nizet, Professor at UCSD; Dr. Jeff Perry, Assistant Professor of Biochemistry at UC Riverside; Dr. Anirban Banerjee, Assistant Professor at IIT Bombay; Dr. M. D. Nair, retired stalwart of the Pharmaceutical Industry, Dr. Sanjeev K. Singh, of the Amrita Institute of Medical Sciences; Dr. K. Sathyamoorthy of Manipal University and Dr. Bhabatosh Das, Assistant Professor at the Translational Health Science and Technology Institute.

The event started with the lighting of the lamp & Swamini Krishnamritaprana addressing the audience. She stressed the importance of going back to traditional practices in medicine & seeking possible solutions from them to solve the antibiotic resistance crisis of today. The chief guest of the event, Prof. Victor Nizet, started the scientific session by introducing the idea of, “Boosting Endogenous Antimicrobial Activities to Combat Multi-Drug Resistant Bacterial Pathogens”. In this session he also shared the work and areas his lab is currently focusing on. Dr. Anir-

ban Banerjee followed with a talk, “Pneumolysin: The Sword or the Shield?” which looked at *Streptococcus pneumoniae* virulence associated with bacterial meningitis.

The Town hall Meeting, hosted by Dr. Bipin Nair, Dean of Amrita School of Biotechnology (ASBT), and Dr. Anand Anandkumar, CEO of Bugworks, gave all the dignitaries a forum to share their view on the challenges faced globally due to antibiotic resistance, as well as the research work to be done and the policies to be implemented to improve the present scenario.

The event also included Student Tech Talks, a student level competition where students were asked to present a scientific hypotheses related to the topic of the conference. The judges made it a point to mention how impressed they were at the innovative & advanced thought process displayed by the students of ASBT. The day drew to a close with a variety of cultural programs showcased by the student community of ASBT.



The second day consisted of a series of seminars starting with Dr. Nizet's talk on "Unexpected Functions of Five Classical Group A Streptococcal Virulence Factors to Modulate Innate Immunity". This was followed by a talk on "Antibiotic Stewardship & Infection Prevention", by Dr. Sanjeev K. Singh & "Host-pathogen Interactions in Diabetic Foot Ulcers", by Dr. K. Sathyamoorthy. Dr. Jeff Perry spoke on "Improving Early Stage Drug Discovery Through Emerging Structural Biology Techniques", & "Multidrug Resistant Enteric Pathogens: Molecular Insights into Resistance Traits of Isolates from India", by Dr. Bhabatosh Das, was the final talk of the day.

The day concluded with the closing ceremony, in which Mr. Ajith Madhavan, Assistant Professor, Amrita School of Biotechnology, Amritapuri, summarized the proceedings of the conference. All the participants were highly satisfied with the organization of the conference and they spoke highly about the student community of Amrita. Students who presented the best hypotheses and those who asked the best questions were awarded. The conference concluded with vote of thanks by Dr. Bipin Nair.

BIOCREST 2017



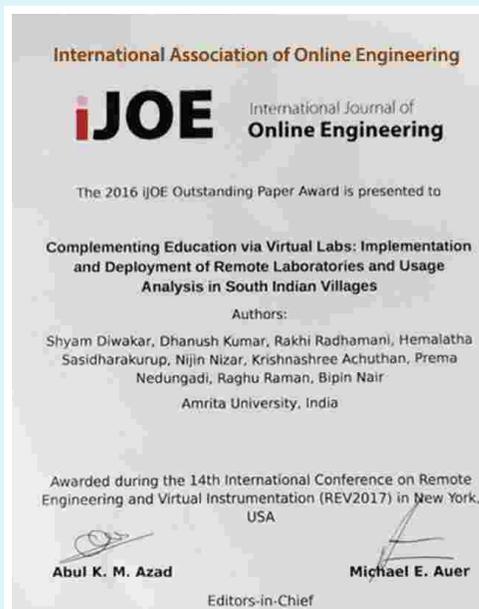
## I-JOE OUTSTANDING PAPER AWARD FOR AMRITA VIRTUAL LAB PAPER

A paper on Sakshat Amrita Virtual Labs titled, "Complementing Education via Virtual Labs: Implementation and Deployment of Remote Laboratories and Usage Analysis in South Indian Villages", published in 2016 by International Journal of Online Engineering (iJOE), was awarded the "**iJOE Outstanding Paper Award**". The paper was authored by Prof. Shyam Diwakar, Dhanush Kumar, Rakhi Radhamani, Hemalatha Sasidharakurup, Nijin Nizar, Prof. Bipin Nair of Amrita School of Biotechnology, Prof. Krishnashree Achuthan, who is the main PI of the Virtual Labs project and is the Dean of PG programs at Amrita, Prof. Prema Nedungadi of CREATE, Prof. Raghu Raman of Amrita School of Business.

The award was presented during the 14<sup>th</sup> International Conference on Remote Engineering and Virtual Instrumentation (REV 2017), held at **Columbia University** from March 15-17, 2017 in New York, USA. The virtual labs project is an initiative of the Ministry of Human Resource Department under the National Mission on Education through ICT. Amrita University partnered with IIT Delhi, IIT Bombay, IIT Kanpur, IIT Kharagpur, IIT Guwahati, IIT Roorkee, COE-Pune, Dayabagh University, NIT Karnataka, and IIITH.

Amrita University's Schools of Engineering, School of Biotechnology, and Amrita CREATE had jointly developed the virtual labs and CREATE had developed the CAP-VL platform on which these labs are hosted.

Since 2012, the VALUE Virtual Labs project at Amrita University had started a Nodal center program and has several colleges and institutes across the country as partners in this program. The Nodal Centre Program allows people to follow the progress of VALUE Virtual Labs and provides a platform for everyone to contribute towards the future development of Virtual Labs and experiments.





## PROF. THOR AXEL STENSTRÖM, DURBAN UNIVERSITY OF TECHNOLOGY, SOUTH AFRICA, VISITS AMRITA SCHOOL OF BIOTECHNOLOGY

Professor Thor Axel Stenström, SARChI (South African Research Chair Initiative) Chair in Development & Optimization of Wastewater Treatment Technology for Developing Economies, at Institute for Water & Wastewater Technology Durban University of Technology, visited the Amrita School of Biotechnology on 27-28 February, 2017, to explore different opportunities of collaboration with **Sanitation Biotechnology Laboratory** of Amrita School of Biotechnology as part of a project funded by the Bill & Melinda Gates foundation.

Professor Thor Axel Stenström, a world authority in sanitation technologies, is acting as an advisor for WHO in Geneva, currently dealing with risk assessment & Sanitation Safety Planning. He was also a Govt assigned focal point for The International Protocol on Water & Health, UN/ECE Secretariat. As such he was responsible for the international summary reporting (Regional report on the status of implementation of the Protocol on Water & Health) of national reports 2010 & 2013. Professor Stenström served as a technical expert for auditing of Water & Sanitation Projects for the European Court of Auditors.

He gave a very enlightening talk on microbial risk assessment related to waste water & sludge treatment technologies & environmental reuse, which is very much in line with the research carried out in the Sanitation Biotechnology lab at the Amrita School of Biotechnology. He shared his vast experience in the field of sanitation by explaining his research carried out in Durban University of Technology (DUT) & discussed the policies adopted by the municipalities in order to tackle the health associated risks upon exposure of enteric pathogens by quantifying the risk of each category of pathogens: virus, bacteria, protists & helminthes, keeping their infective dose in mind.

Different simulation models are followed to do this kind of Quantitative Microbial Risk Assessment (QMRA). There needs to be a multi barrier approach to keep the pathogen exposure minimum. Besides pathogen reduction, the reuse of the wastewater & sludge for irrigation & fertilization of crops. The advantages of drip irrigation over sprinkler irrigation were also discussed.

He explained the use of many methods & the importance of hygiene in the control of infection. The explanations were mainly based on the concept of "frequency of exposure will always increase the risk of infection".

Professor Stenström's talk was followed by a presentation by his PhD student, Mr. Isaac Dennis Amoah, on developing a uniform soil transmitted helminths consortium for analysing fecal waste samples. Mr. Amoah talked about developing molecular tools for testing the viability of *Ascaris* eggs which are highly recalcitrant parasitic eggs, highly resistant to conventional sanitation treatments like chlorination.

## AMRITAKALOTSAVAM 2017

Amritakalotsavam 2017 was celebrated at the School of Biotechnology on April 3 - 4, 2017, showcasing the artistic talents of the students. The festivities were inaugurated by Dr. Bipin Nair, Dean, followed by a lamp lighting and concluded with Ranga pooja to set the joyous spirit for the occasion. Dr. Bipin's speech focused on the importance of participation, stating, "We do it all!", a comment reflecting on the students. He also mentioned that whenever delegates from other countries witness the cultural performances by the Amrita students, they think that the participating students must belong to a School of Arts. Again this year, the students of the School of Biotechnology did not fail to mesmerize the audience with their amazing performances.



Amritakalostavam included a number of cultural events: Bharathanatyam, Kuchipudi, Mohiniyattam, Thiruvathirakkali, Folk dance, Karaoke duet, Tableau, Synchro, Non-Classical group (female), Nostalgia, Semi-classical (solo), Fancy dress, Semi-classical (group), Mimicry, Mime, Non-Classical dance (solo), Non-Classical group (Male), Indian Classical Music, Light Music, Patriotic song, Ashtapathi, Western (solo), Monoact, Folk song, Karaoke solo, Group song, Recitation Malayalam, Recitation English, Recitation Hindi, Recitation Sanskrit, Elocution English, Elocution Malayalam and Elocution Hindi. It was surprising to see that some individual students could perform in many different events, from classical dance to English recitation, from light music to folk song.

Needless to say the halls of the school were resounding with cheer, soulful tunes and heart stomping rhythms. Each event had 3 judges,

# AMRITAKALOTSAVAM 2017



## RAPID MOLECULAR DIAGNOSTICS FOR INFECTION...A NEW FRONTIER?



Dr. V. Anil Kumar, Professor of Clinical Microbiology, AIMS, Kochi, visited the Amrita School of Biotechnology on February 22, 2017, and gave a talk on “Rapid Molecular Diagnostics for Infection - a New Frontier?”, focusing on the molecular techniques used in clinical pathology.

Rapid detection of infectious agents can alter current practices in infection control, therapeutic management, and clinical decision-making and ultimately reduce over-prescription of antimicrobials and associated adverse outcomes. Though cultures are still considered the gold standard of diagnosis, retrieving viable microorganisms to determine the species and their antimicrobial susceptibility require incubation times of up to 96 hours. Some limitations of cultures are: they can only detect cultivable microorganisms, have low sensitivity for slow growing, intra cellular and fastidious microorganisms and in patients pre-treated with antimicrobials.

During the course of his talk he mentioned several different techniques that are commonly used by clinical microbiologists such as plating, multiplex PCR, BACTEC, etc. He, however, did stress the fact that they are time consuming and generate false positives making these techniques not very reliable. He also spoke of how Mycobacterium tuberculosis testing is both expensive and time consuming and raised the issue of how newer experiments and techniques need to be developed to substitute for those available at present. Dr. Kumar also expressed an opinion that certain molecular techniques should be expensive in order to prevent their misuse. He raised the importance of having personnel capable of data interpretation in order to ensure that an accurate diagnosis can be made.

He captivated the audience with his razor sharp wit and offered an interesting clinical perspective to students and staff alike. His talk was greatly appreciated by all.

The Amrita School of Biotechnology (ASBT)'s Annual Sports Meet was hosted on the 3<sup>rd</sup> and 4<sup>th</sup> of March, 2017. The faculty members and students of ASBT recognize the importance of a wholesome education in which physical education and fitness are of great significance. The first day started with the formal session and inauguration of the Sports Meet by the Dean, Dr. Bipin Nair. This was followed by the march past and the torch relay.

Eighteen events were conducted over the two days falling under the categories of track, jump and throw. This year Sports Meet saw the first ever girls' basketball match. The highlight of course of every Sports Meet here at ASBT is the faculty vs. students events. Students won the cricket match, while in the football match, the faculty members' excellent defense proved to be great a challenge for the students to overcome. Excellent saves by our Dean, a former national level football player, clinched the win for the faculty members. At the end of the Sports Meet, medals and certificates were distributed by the faculty members on the victory stand in an atmosphere of acknowledgment, appreciation and pride.

The overall championship was claimed by 3<sup>rd</sup> year undergraduate students' batch. The top female athlete was Aswathy P.V. of S6 B.Sc. Biotechnology and the top male athlete was Abishek Kumar of S6 B.Sc. Biotechnology. The mood was somber when the flag was lowered and handed over to Dr. Bipin Nair, marking the end of two days of activities. This feeling of unity was especially prevalent on the last day of the athletic meet, as all the students, tired and exhausted, yet still enthusiastic, stood together to conclude the event by singing the national anthem. As the event came to a close, students came away with a pride of achievement, satisfaction of leadership, thrill of camaraderie, essence of happiness, and solace of sincere efforts, reminding everyone one more time that we are all one under the aegis of sports.



**Asha Vijayan**, Chaitanya Nutakki (PhD students), Dhanush Kumar, a computer engineer, & **Dr. Shyam Diwakar**, based at the Computational Neuroscience Lab at Amrita School of Biotechnology, are working on bio-inspired robotics & have published a paper: "Enabling a Freely Accessible Open Source Remotely Controlled Robotic Articulator with a Neuro-Inspired Control Algorithm", in the Jan 2017 issue of *International Journal of Online Engineering (iJOE)*. outlining their work on reverse engineering the human brain's capabilities to control devices for patients with movement disabilities.

With a growing number of patients with movement disabilities, prosthesis & exoskeletons have made advances in the recent years with some of them tapping into brain signals & brain-like control mechanisms aiming to provide amputees with impressive new levels of control. Patients control using their mind & a robotic arm moves. Making the robot work without too much computing is not easy, as the human brain can do a lot that makes it very time-consuming & complex for computers.

Amrita is one of the few universities across the globe that have researchers working on brain sciences to develop models & algorithms that work in the way a human brain works to control robotic arms & prosthetic hands. Nerves & brain use a very different model of control, which is not necessarily common in mechanical robots. Nervous systems use signals called action potentials to represent & process how hands & arms function. Through the **Cognitive Science Research Initiative project**, funded by Government of India, the Computational Neuroscience Lab at the Amrita School of Biotechnology proposes to develop a brain-like control for simple robotic arms.

"This is a very initial part of the project. We used the structure of a cerebellum, a small part of the brain that is related to movement coordination, & built algorithms that work as if neurons in the cerebellum circuit are processing the arm's movement. A low-cost robotic arm was also developed as part of the MHRD funded virtual labs project," explained Prof. Shyam Diwakar.

Amrita University has developed a bio-inspired robotics virtual lab, which uses computer programs that allow any user from anywhere on the internet to perform laboratory experiments via a web-page. The project of building virtual labs was funded by Ministry of HRD & this low-cost robotic arm was made available online for students to freely learn & enhance practical skills.



# AMRITA UNIVERSITY'S VIRTUAL LABS STUDY SHOWCASED ON CSI COMMUNICATIONS MAGAZINE



Interdisciplinary & multi-disciplinary studies are key to many success stories of Amrita University's research projects. Ministry of HRD's National Mission in Education through Internet & Communication Technologies (NMEICT) had funded a massive project on building Virtual Laboratories for students who did not have access to laboratory education & skill training.

A success story of this 8-year old project has been reported & covered by the "CSI Communications" magazine of the Computer Society of India as a cover article. Authored by Dr. Krishnashree Achuthan, Rakhi Radhamani, Dhanush Kumar, Nijin Nizar, Dr. Bipin Nair & Dr. Shyam Diwakar, the June 2017 issue of CSI's cover story is titled "Design & Implementation of ICT Based Virtual Labs for Laboratory Skill Education".

Professors & staff from Amrita School of Biotechnology & Amrita School of Engineering including the Center for Research on Advanced Technologies for Education (CREATE), with several artists & animators, have developed interactive learning tools through simulations, data-based animations & remotely controlled equipments, as labs for students, available on the internet. It is called the Virtual Amrita Laboratories Universalizing Education (VALUE). While biologists & biotechnologists looked into mapping data & actions into the simulations, the physicists, data scientists & engineers con-

nects the equipment via devices like Raspberry Pi & Arduino to make remotely-controlled experiments & mathematical simulations that could be accessed over the web.

Since the project's official launch in February 2012, Amrita University has been actively reaching out to other universities, colleges, students & professors to help them use the virtual labs as curriculum content & tools to enhance education. Amrita University used a nodal center program to reach out to colleges & has more than 95 colleges across the country as nodal centers. The Virtual Labs project is a collaboration with Indian Institutes of Technology (Delhi, Kharagpur, Kanpur, Guwahati, Roorkee, Bombay), IIIT Hyderabad, COE Pune, Dayalbagh University & NIT Karnataka & are freely available via Amrita website & national websites

The Computer Society of India (CSI) Communications is the national journal & magazine of CSI. It has a circulation of over 100,000 & has been published regularly for the last 40 years. Prof. Prashant Nair, Vice-Chairman, Department of Computer Science & Engineering, Amrita School of Engineering, Coimbatore is the current editor of CSI communications. Amrita University has been part of CSI with student branches in all campuses & have won best student branch awards.



## PUBLICATIONS

Dammalli M, Murthy KR, Pinto SM, Murthy KB, Nirujogi RS, Madugundu AK, Nair B & Keshava Prasad TS. (2017). Toward Postgenomics Ophthalmology: A Proteomic Map of the Human Choroid–Retinal Pigment Epithelium Tissue. *OMICS: A Journal of Integrative Biology*, 21(2), 114-122.

Vijayan A, Nutakki C, Kumar D, Achuthan K, Nair B & Diwakar S. (2017). Enabling a Freely Accessible Open Source Remotely Controlled Robotic Articulator with a Neuro-Inspired Control Algorithm. *iJOE*, 13(1), 61-75.

Rajendran AG, Nutakki C, Hemalatha S, Bodda S, Nair B, Diwakar S. (2017) Cerebellum in Neurological Disorders: A review on the role of Inter connected neuronal circuits. *Journal of Neurology and Stroke*, 6(1), 95.

Kumar DS, Bose C, Shaji SK, Pandurangan N, Kumar GB, Banerji A & Nair BG. (2017) Coconut shell derived bioactive compound oxyresveratrol mediates regulation of matrix metalloproteinase 9. *International Journal of Pharma and Bio Sciences*, 8(1), 202-210.

## STUDENT PLACEMENTS



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