NEWSLETTER

Department of Biotechnology
Bhupat & Jyoti Mehta
School of Biosciences

ISSUE 6
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MESSAGE FROM THE EDITORIAL DESK

We are pleased to present the sixth issue of our Departmental Newsletter, and the first of the new year. In this edition, we are delighted to share that the department's inaugural Alumni Reunion was a resounding success, made possible by the overwhelming support and enthusiastic participation of our alumni community. This encouraging response puts us in good standing to organize many such reunions in the future. We also concluded the previous year on a high note with the CARE Conference, organized by the department faculty, which witnessed excellent participation from scientists across the globe. The conference aptly showcased the department's growth and scientific contributions, particularly through the active engagement of our alumni in the scientific discussions over the two and a half days event. This issue also highlights the accolades earned by our students and research scholars, exemplified by publications in reputed journals such as Nature Communications and eLife. We are especially proud to acknowledge our undergraduate iGEM team, which was awarded a silver medal for their innovative research project. Additionally, this edition features a special interview with one of our senior colleagues, Prof. K. Subramaniam, offering insights into his research journey and contributions to developmental biology. We invite you to explore this issue and welcome your feedback and suggestions as we continue to improve the newsletter.

FACULTY AWARDS

Dr. Richa Karmakar received the INAE Young Associate 2025 award from Indian National Academy of Engineering.

Prof. M. Michael Gromiha received the Outstanding Contribution Award for excellence in research and innovation from the Asia-Pacific Biotechnology and Drug Design Alliance (APBA), Taiwan.

Prof. Amal Kanti Bera received the DHR-HRD Short-Term Fellowship from the Department of Health Research, Government of India.

STUDENT AWARDS

Janani V (Prof. Nitish R Mahapatra Lab) received the Best Poster Presentation Award at the Symposium on "Immunometabolism in tissue homeostasis, infections and sterile inflammation", held at Manipal School of Life Sciences, MAHE, Manipal

Anand Kumar Patel (Prof. Nitish R Mahapatra Lab) received the Best Oral Presentation Award in Basic Sciences at the "Cardiovascular Research Convergence-2025", held at the Gujarat Biotechnology University, Gandhinagar.

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Radhika.K (Prof. G K Suraishkumar Lab) received the Conference Chair Special Award at the 39th Annual Meeting of the “Japanese Society for Biological Sciences in Space (JSBSS39)”, held at Teikyo University, Tokyo, Japan.

Ushasi Chakrabarti (Prof. Nitish R Mahapatra Lab) received the Best Poster Presentation Award at the “TREAT-DM 2025 Conference”, held at IISc Bangalore

Anwita Sarkar (Dr. Richa Karmakar Lab) received the Best Poster Award at the “International Conference on Micro Nano Fluidics (ICOM) 2025”, held at the Indian Institute of Technology, Guwahati.

Meera Alagu Sundari P M (Dr. Meiyappan Lakshmanan Lab) received the First Prize for the oral presentation and the Young Scientist Award at the “BioProcessing India Conference 2025”, held at IIT BHU, Varanasi.

Sandhya N (Dr. Greeshma Thrivikraman Lab) received the Best Poster Award at the “International Conference on Biomaterials and Healthcare (BioHeaL) 2025”, held at the Indian Institute of Technology, Roorkee.

Nilesh Kumar (Dr. Krithika Ravi Lab) received multiple international recognitions, including selection for the Digital Green Talent Program (a three-month program in Germany), the International Immersion Program (travel grant), and the RWTH Aachen–IIT Madras JRF Fellowship.

Varsha Goyal (Prof. Himanshu Sinha Lab) received the Best Flash Talk Award at the “13th International Conference of Yeast Biology (India Yeast Meeting 2025)”, held at the Indian Institute of Science (IISc), Bengaluru, India.

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The iGEM team, led by Karthik Rajesh (BS22B022) and Aldis Daniel Gunapandian (ME22B070), and a group of undergraduate students won the silver medal for the project "Epigenetic Programmable Intervention and Control (EPIC)", a genetically engineered fluorescent sensor strategy that enables the study of gene activity across different environments. This team was mentored by Dr. Arumugam Rajavelu and Dr. Meiyappan Lakshmanan.

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STUDENT RESEARCH HIGHLIGHTS

Pavani Hathi

Title: *Extracellular adenosine deamination primes tip organizer development in Dictyostelium*
Authors: Hathi P, Ramamurthy B
Journal: *Elife*. 2025 Dec 17;14:RP104855.
DOI: 10.7554/eLife.104855

Summary

- ADGF-mediated extracellular adenosine deamination regulates tip organizer development in Dictyostelium by controlling ammonia production.
- The generated ammonia modulates cAMP signaling, influencing multicellular patterning and differentiation.
- This establishes a mechanistic link between nucleotide metabolism, cell–cell adhesion, and spatial polarity during development.

Title: *Interaction of genetic variants activates latent metabolic pathways in yeast.*
Authors: Sasikumar S, Taylor Parkins S, Sudarsan S, Sinha H
Journal: *Nature Communications*, 2025 Aug 27;16(1), 8014.
DOI: doi: 10.1038/s41467-025-63306-4

Srijith Sasikumar

Summary

- Multi-omics analysis shows *MKT1(89G)* and *TAO3(4477C)* activate a latent arginine biosynthesis pathway in yeast.
- This interaction boosts mitochondrial activity and sporulation while suppressing ribosome biogenesis.
- The study explains how variant interactions rewire metabolism, shaping complex traits and disease mechanisms.

Subhrojyoti Ghosh

Title: *Hydrodynamic Modulation of Bacterial Biofilm Formation via Cellular Motility*
Authors: Ghosh S, Ramakrishnan C, Sharma P, Ghosh A, Karmakar R
Journal: *Physics of Fluids* 2025 October 1 ; 37 (10): 102107.
DOI: 10.1063/5.0291301

Summary

- Hydrodynamic parameters (shear rate and flow-induced alignment) directly influence bacterial swimming, surface attachment, and early biofilm formation.
- The study provides a mechanistic understanding of how flow conditions regulate biofilm development.
- These insights can guide flow engineering to suppress pathogenic biofilms or promote beneficial biofilms in biomedical and bioprocessing applications.

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RESEARCH HIGHLIGHTS

Prof. K Subramaniam

Prof. K. Subramaniam received his PhD from the Indian Institute of Science in 1994. His postdoctoral training was at the Johns Hopkins University School of Medicine. He joined the faculty of IIT–Kanpur in the Department of Biological Sciences & Bioengineering in 2002. He was an International Senior Research Fellow of the Wellcome Trust during 2003-09. He joined the Department of Biotechnology, IIT Madras in 2014.

1. What sparked your interest in the field of Developmental Biology?

I was fascinated by the specific nature of the developmental defects reported in top journals during my PhD years. For example, a mutant flower with sepals and petals where stamen and carpel should be present, a fruit fly with a leg in the place of an eye or a nematode with multiple or no vulva! Through these papers, I saw that the formation of complex organisms from a simple cell, the zygote, with no apparent asymmetry, is the coolest thing on earth!

2. What are the central questions your lab is currently addressing in developmental biology?

Presently, we are focused on a protein called PLP-1 in *C. elegans* (the human ortholog is PURA). PLP-1 is a conserved protein present in organisms as diverse as bacteria and humans. In humans, mutations in this protein affect neurodevelopment, leading to behavioural abnormalities collectively known as the PURA syndrome. Our recent work revealed a role for PLP-1 in safeguarding the genome of the germline, which produces the egg and sperm, from foreign genetic elements. In both neurons and germline, this protein is present on RNA-protein granules, which are crucial for post-transcriptional control of gene expression. Why is PLP-1 present on these granules? Does PLP-1 / PURA help in the assembly of these granules? These are some of the questions that we are currently investigating.

3. Can you recall any formative experiences during your early academic years that influenced your research path?

Yes. During my PhD years, I constructed a cDNA library and performed differential screening of it—first such experiment in India—which helped me identify three mRNAs that were highly upregulated during an organ development. But, in the organism that I worked with, I had no way of testing if these upregulations were essential for that organ to develop! This realization fundamentally altered the course of my research: for my postdoctoral training, I joined a lab that heavily relied on genetics for discovering genes that regulate development and follow such an approach even now.

4. What was the most challenging period in your research journey, and how did you overcome it?

Setting up a lab in an institution that was just setting up its first biology labs was not easy. Lack of talented postdoctoral researchers made this task particularly challenging. I became busy helping fresh MSc and BPharm students learn pipetting, preparing buffers, casting gels, setting up genetic crosses, etc. So, instead of building a large group, which was my initial intention, I set up a small group focused on a few key research questions.

5. What advice do you have for young researchers trying to navigate the complexities of academia today?

Firstly, take the time and be open-minded to think about if research suits you as a person. Research is not just a job to earn a livelihood; it is a passion and a way of life! Secondly, clearly identify a worthwhile problem; your pursuit should have the potential, at least in the best possible scenario, to be a substantial advancement of knowledge in the field. Thirdly, join a team that is already working on that problem and has been productive. Finally, you need to persevere.

6. Looking back, what would you consider your proudest achievement or contribution to your field?

A couple of months ago, I met my postdoctoral mentor at a meeting. She was very excited to see me and described how fascinated she was with the model that my lab proposed to explain how nanos-2 translation is activated at a specific time and space. She then mentioned that her ongoing work reveals that “my model is absolutely correct”. That made me proud.

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ALUMNI REUNION 2025

The Department of Biotechnology, along with Alumni and Corporate Relations (ACR) and IIT Madras Alumni Association (IITMAA), hosted the first Biotech Alumni Reunion at the Terrace Hall on 6 th December 2025. The event was attended by 36 department alumni and their families. Former undergraduate and postgraduate students of the department travelled from all over India and overseas to participate in the event. The half-day programme was organised by an enthusiastic team comprising of Dr. Richa Karmakar, Dr. Mamata Bangera, Prof. Michael Gromiha, Ms. Rajitha, Mr. Madhankumar, Ms. Sneha and student volunteers, it included felicitation of former and current Heads of the Department, interactive fun-filled sessions, a visit to the department, high tea and dinner. Alumni spoke fondly about faculty and their association with the department as they reminisced about their time on the beautiful campus. Senior faculty and alumni bonded over their recollections of early years in the department as they worked together to build its foundation. Conversations over food were filled with memories and a desire to reconnect with the department and institute. The event culminated in a database, now being maintained by ACR and IITMAA, to stay connected to the expanding number of department alumni.

CARE CONFERENCE 2025

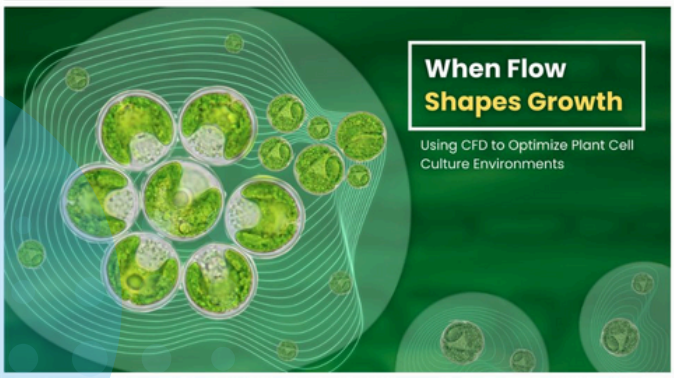
The Department successfully organized the **Collaborative Academic and Research Excellence (CARE) Conference** 2025 from December 4–6, 2025, under the convenorship of Prof. Sanjib Senapati and co-convenors Dr. Greeshma Thrivikraman, Dr. Santhosh Sethuramanujam and Prof. S. Mahalingam. With the theme “Molecules to Medicine: Bioengineering for One Health”, the conference, generously supported by the Mehta Family Foundation and over 15 external sponsors, brought together more than 250 participants, including international speakers from Germany, Japan, USA, and Australia. The scientific program was structured into five sessions covering Disease Biology, Systems Biology, Interventional Biology, Translational Biology, and Structural Biology. The event featured two panel discussions on improving R&D funding success rates and strengthening Industry–Academia connect, alongside 79 poster presentations, 12 flash talks, and 6 postdoctoral talks by researchers aspiring to secure faculty positions. A parallel meeting of Heads of Biosciences and Bioengineering Departments from IITs, IISERs, and IISc focused on shaping a strategic vision to elevate biomedical engineering research in India. Overall, the two and a half days were marked by intense scientific exchange, collaboration, and forward-looking dialogue on advancing life science research in India.

MEDIA OUTREACH

Prof. Richa Karmakar with Prof. S. Pushpavanam from Chemical Engineering developed a low-cost lab-on-chip device (ε-μD) for rapid antibiotic susceptibility testing. Specifically, the device uses screen-printed carbon electrodes embedded in a simple microfluidic chip and works on electrochemical impedance spectroscopy to track bacterial growth and antibiotic response, enabling results within three hours and making antimicrobial resistance testing more accessible in smaller clinics and rural healthcare settings.

IITM TECH TALK

Contributing to a better world



Rethinking Plant Cell Growth Through the Lens of CFD

Prof. Smita Srivastava, and her team studied how fluid flow inside shake flasks and bioreactors influences the growth and productivity of plant cell cultures. Specifically, they used computational fluid dynamics (CFD) to analyze how different flow patterns shape culture conditions, and identified flow environments that support healthy cultures while minimizing stress, enabling smarter and more reliable plant cell bioprocessing.

The SNP Conundrum

Prof. Himanshu Sinha and his team studied how interacting genetic variants (SNPs) can jointly activate hidden molecular pathways and influence complex traits. Specifically, using a multi-omics systems genetics approach in *Saccharomyces cerevisiae*, they showed that the SNP pair *MKT1(89G)* and *TAO3(4477C)* activates a latent arginine biosynthesis pathway while suppressing ribosome biogenesis, creating a metabolic trade-off that enhances mitochondrial activity and improves sporulation efficiency, providing a mechanistic framework for understanding gene–gene interactions in complex traits and human diseases.

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DEPARTMENTAL GATHERING

Our department hosted “Happy Hour” event on 26 September 2025 for the undergraduate students, research scholars, staff, and faculty colleagues to come together for a fun-filled evening.

VISITS BY DISTINGUISHED SCIENTISTS

- Dr. Rajasekaran Namakkal-Soorappan, University of Alabama, Birmingham (UAB)
- Prof. Mukund Thattai, TIFR-NCBS, Bengaluru
- Prof. Soumitra Das, National Institute of Biomedical Genomics, Kalyani
- Dr. Catherine Goodman, Senior Assosciate Publisher American Chemical Soceity

HIGHLIGHTS

82	33	7	19	3340.96 lakhs
Publications	Patents Applied/Granted	Consultancy projects	Sponsored Projects	Grant Amount

Newsletter Committee:
Prof. M. Michael Gromiha, Prof. Himanshu Sinha, Prof. Greeshma Thrivikraman, Prof. Santhosh Sethuramanujam & Mr. Amit Phogat