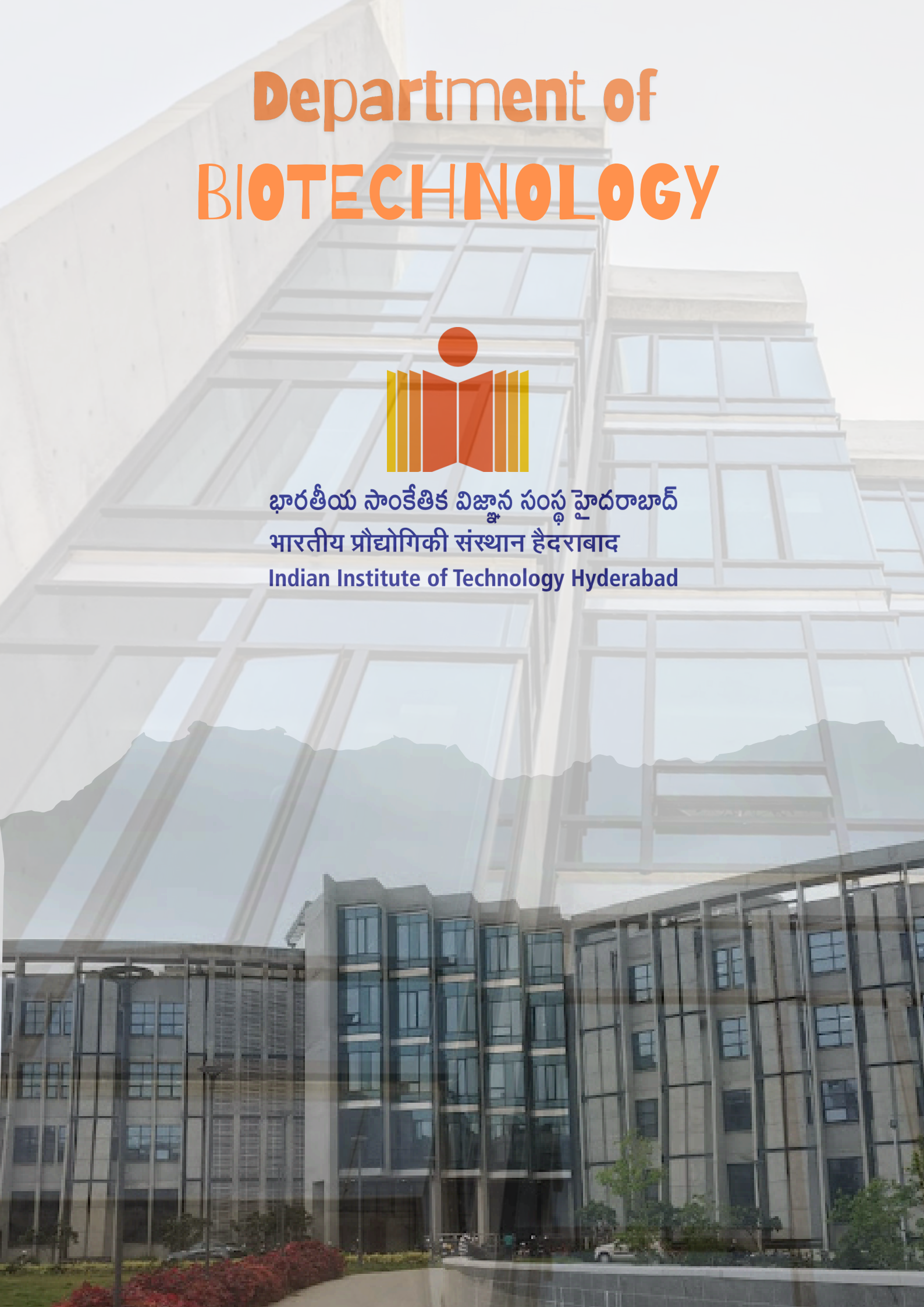
Department of BIOTECHNOLOGY



భారతీయ సాంకేతిక విజ్ఞాన సంస్థ హైదరాబాద్
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Content

Vision, Mission, and Values

Our **vision** is to foster a world-class teaching environment and state-of-the-art facilities for cutting-edge biotechnology research to drive an academic space that is dedicated to cultivating innovative opportunities and systemwide collaboration for discovery beyond boundaries.

Our **mission** is to accelerate as an outstanding educational hub with an equal emphasis on excellence in teaching, research, and community engagement. We are committed to the utmost professional and academic standards to ensure intellectual excellence and to create a global impact by transmitting advanced knowledge.

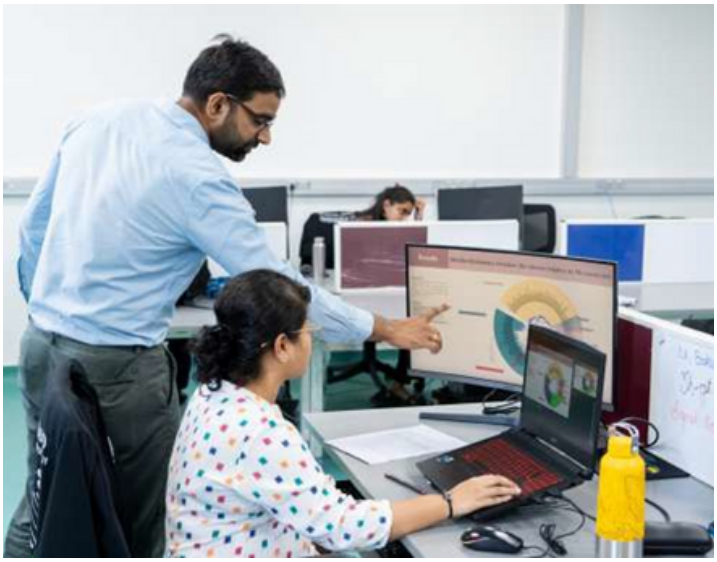
We aspire to **value** the highest academic and professional integrity, scientific ethics, and excellence in teaching and research to realize the full potential of biotechnology. We promote equality and empower our students, staff, and faculty to achieve intellectual rigor, academic leadership, and global recognition to best serve the nation and society.

Message from the HOD

Since the biotechnology department started its journey in 2010, the department has been striving for excellence in teaching and research. We have been continuously acquiring new capabilities and producing brilliant future scientists. We recently moved to our newly constructed state-of-the-art building in 2022, which is in the shape of a chromosome, further asserting our commitment to excellence. We have 17 world-class research laboratories and a dedicated teaching laboratory for students. The department offers B.Tech. in Biotechnology and Bioinformatics, M.Tech. in Medical Biotechnology, and Ph.D. in various Biotechnology and allied multidisciplinary areas at the forefront. Over the years, our uniquely formulated and tailored academic programs have attracted the best students. The total number of students in our department is currently 203. Our curriculum provides multifaceted opportunities to the students, including exposure to industrial problems so that we can address critical challenges not only faced by society but also industries which is the first and foremost requirement for "AatmaNirbhar Bharat". We also have a unique biannual hands-on lab training, an out reach programme, for researchers or students from Indian universities and institutes, and industrial professionals who want to enhance their wet-lab or computational biology research skills.

We are noted for our 17 excellent faculty members with varied expertise, trained in India and abroad. This brochure provides an overview of our department. I also invite you to learn more about the department faculty, research facilities, latest announcements and developments at https://biotech.iith.ac.in.

Anamika Bhargava, PhD
Head, Department of Biotechnology
Professor
head@bt.iith.ac.in

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Our Department

Hyderabad, the capital city of Telangana in India, has emerged as a prominent hub for the biotechnology industry, tackling a wide range of medical, industrial, and environmental challenges. In line with this growth, the Indian Institute of Technology Hyderabad established its Department of Biotechnology in 2010. Its mission is to cultivate a new generation of scientific leaders equipped with scientific rigor, critical thinking, ethics, and multitasking managerial skills to thrive in the rapidly evolving technology-driven industry and academia.

With 17 distinguished faculty members, the department excels in frontier areas of biotechnology research, including Structural Biology, Nanobiotechnology, Microbiology, Infection Biology, Cancer Biology, Computational Biology, and Bioprocess Technology. Working with various model systems such as bacteria, yeast, mouse, drosophila, zebrafish, and human cells, the research groups employ a range of molecular biology techniques and high-throughput omics-based platforms to address critical challenges in healthcare, agriculture, and environmental sustainability. The department boasts state-of-the-art laboratories equipped with advanced technologies and instrumentation, providing students and researchers with the necessary resources to conduct cutting-edge research.

While research takes center stage, the department also emphasizes high-quality teaching to nurture the next generation of biotechnologists. It offers undergraduate (B.Tech. in Biotechnology and Bioinformatics), postgraduate (M.Tech. in Medical Biotechnology), and doctoral programs (Biotechnology) that provide students with a solid foundation in biotechnology and its applications. The curriculum seamlessly integrates theoretical knowledge with practical training, enabling students to develop critical thinking, analytical skills, and a profound understanding of the subject matter. This research-centric approach cultivates a culture of inquiry and innovation, preparing students for successful careers in academia, industry, or entrepreneurship.

In addition to research and teaching, the department actively collaborates with industry partners, government organizations, and national/international institutions. These collaborations facilitate the exchange of knowledge, technology transfer, and the translation of research findings into real world applications.

In the coming years, through its commitment to research excellence, quality teaching, and collaborative efforts, the Department of Biotechnology at IIT Hyderabad aims to play a pivotal role in advancing the biotechnology field and nurturing the next generation of biotechnologists.


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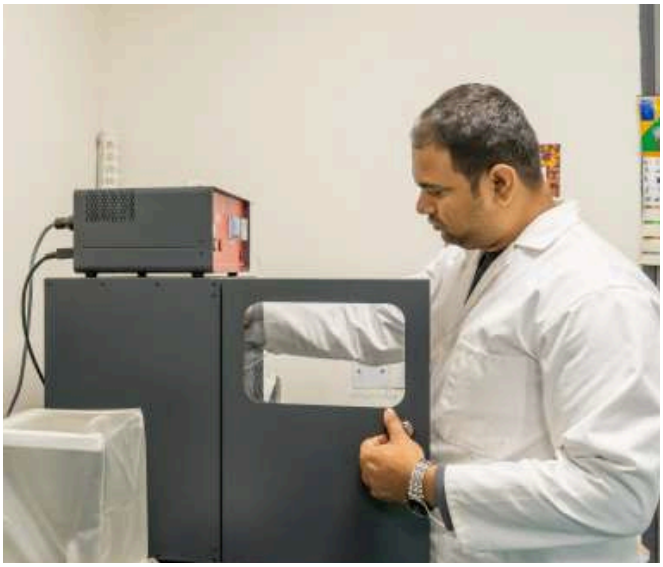


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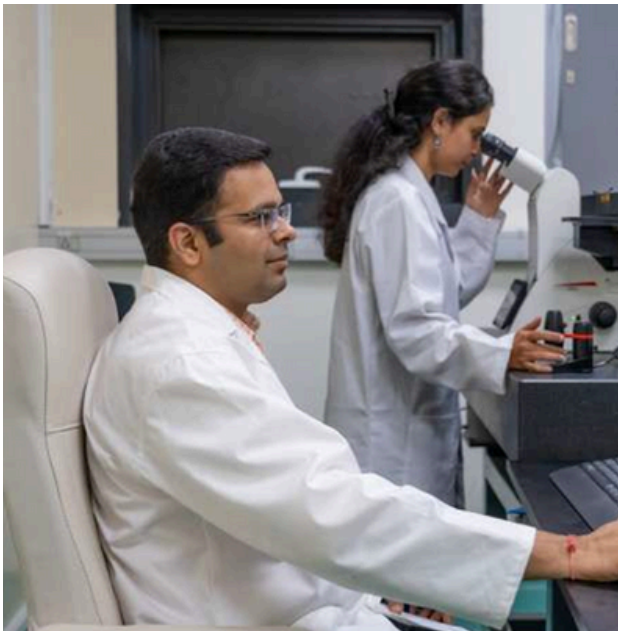
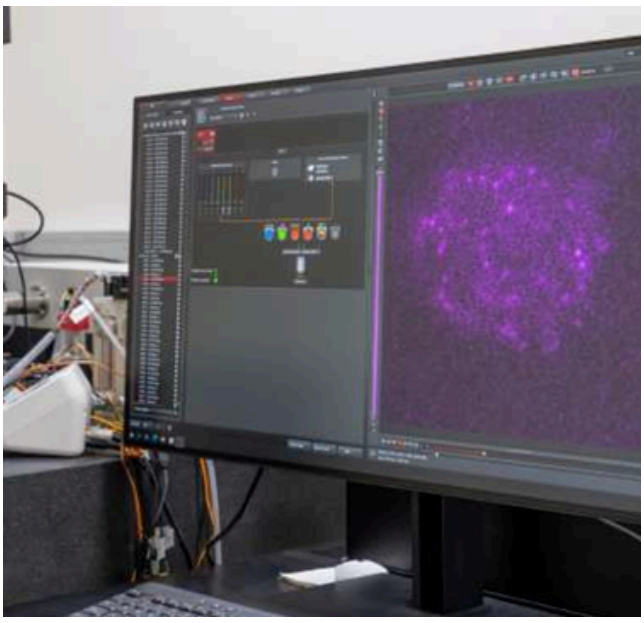




Courses Offered

B.Tech (Bioinformatics and Biotechnology)

Course Objectives: Develop a foundation for Biotechnology and Bioinformatics in young minds and inculcate interest by showing real-life challenges that can be addressed by biotechnology and bioinformatics. It is the first course among all the IITs that places equal emphasis on both experimental and computational aspects of biological sciences.

Duration: 4 years (8 semesters) **| Eligibility Criteria:** Based on JEE **| Admission procedure:** through JEE advanced

Features: 57 credits of core courses, 36 credits of elective courses, 5 credits of soft skill courses, 20 credits of practical, and 6 credits of internship/departmental projects.

M.Tech (Medical Biotechnology) (admission through GATE or self-sponsored)

Course Objectives: Inculcate interest in the subject by nurturing a fundamental understanding of biological processes/phenomena and their medical applications, hands-on training with cutting-edge technologies, and effective science writing, presentation, and communication skills. This program makes the students ready to excel in academia/industry.

Duration: 2 years (4 semesters)

Eligibility Criteria: (through GATE) B.Tech/B.E./M.Sc. in any area of life sciences/M.Pharm, with a valid GATE score (in BT or XL). IIT B.Tech graduates with a CGPA of 8 or above without a GATE score are eligible to apply. (self-sponsored) B.Tech/B.E./M.Sc. in any area of life sciences/M.Pharm with a CGPA of 7 and above (GATE score not required).

Admission procedure: (through GATE) based on GATE score through COAP, (self-sponsored) Online interviews

Features: 26 credits of coursework (first two semesters), 24 credits of research thesis (last two semesters), exposure to scientific writing, presentation, and communication, a stipend of Rs. 12,500 per month for MoE students

Ph.D. (Biotechnology)

Course Objectives: Our research-intensive Ph.D. program intends to develop future leaders of biotechnology by developing skills such as independent and intellectual thinking, interdisciplinary research, scientific writing, presentation, communication, and science ethics. Students are given independent research projects on frontier areas of biotechnology and they are taught cutting-edge technologies to address biological problems.

Duration: 5 years

Eligibility Criteria: B.Tech/B.E./M.Tech/M.Sc./M.E. in any area of life sciences, M.Pharm, MBBS, MD/MS. A valid national-level JRF (CSIR-JRF/UGC-JFR/DBT-JRF (category I), DST-INSPIRE) or GATE qualification is required for B.Tech/B.E./M.Sc.

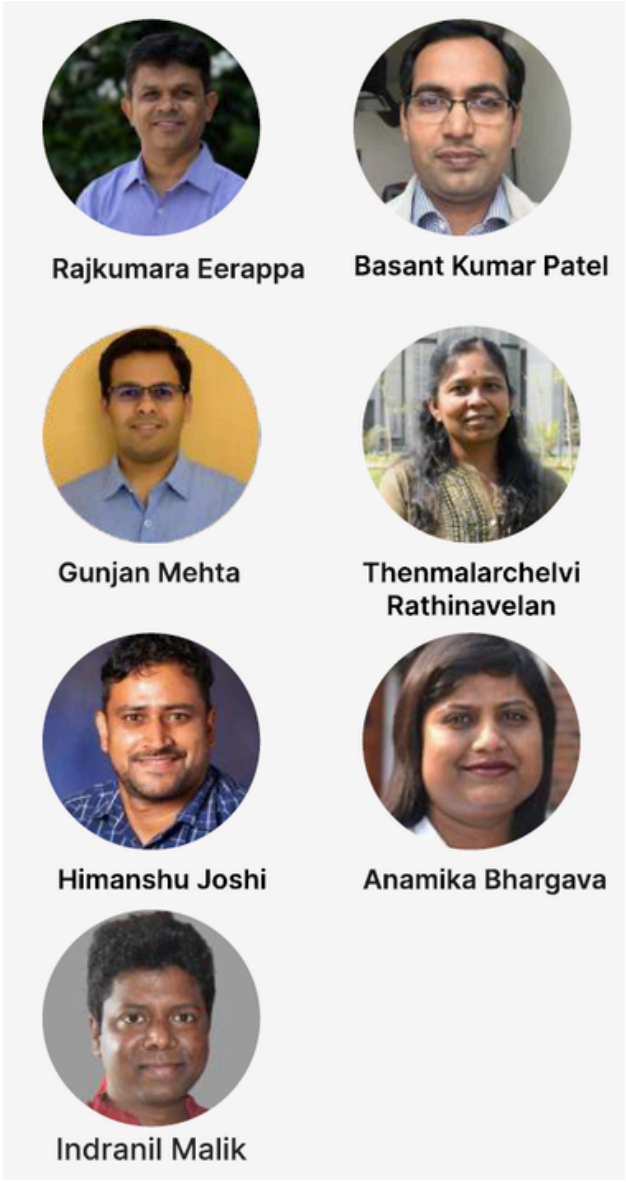
Admission procedure: Interview (twice a year, in June and December)

Features: 12-24 credits of coursework, publications in international peer-reviewed journals, patents, presentations at national and international conferences, skill development workshops, opportunities for Joint Doctoral Programs (JDPs) with renowned foreign universities, and Interdisciplinary Ph.D. programs.

Faculty Broad Theme Area

Faculties	Structural Biology, Biophysics and Nanobiotechnology	Biology of Diseases and Disorders	Cancer Biology and Diagnosis	Big Data Biology: Omics to function	Bioprocess Technology and Microbiology
Dr. Basant Kumar Patel	✓	✓			
Dr. Anindya Roy		✓			
Dr. NK Raghavendra		✓			
Dr. Thenmalarchelvi Rathinavelan	✓	✓		✓	
Dr. Rajakumara Eerappa	✓	✓	✓		
Dr. Anamika Bhargava	✓	✓	✓		
Dr. Ashish Misra		✓	✓	✓	
Dr. Sandipan Ray		✓	✓	✓	
Dr. Gunjan Mehta	✓	✓	✓		✓
Dr. Rahul Kumar		✓	✓	✓	
Dr. Himanshu Joshi	✓				
Dr. Alturi Avanti					✓
Dr. Gaurav Sharma				✓	✓
Dr. Abhishek Subramanian		✓		✓	
Dr. Indranil Malik	✓	✓			
Dr. Narahari Sastry	✓			✓	
Dr. Savita Devi		✓	✓		

Broad Theme Area



Structural Biology, Biophysics and Nanobiotechnology

Structural studies of epigenetic marks reader proteins

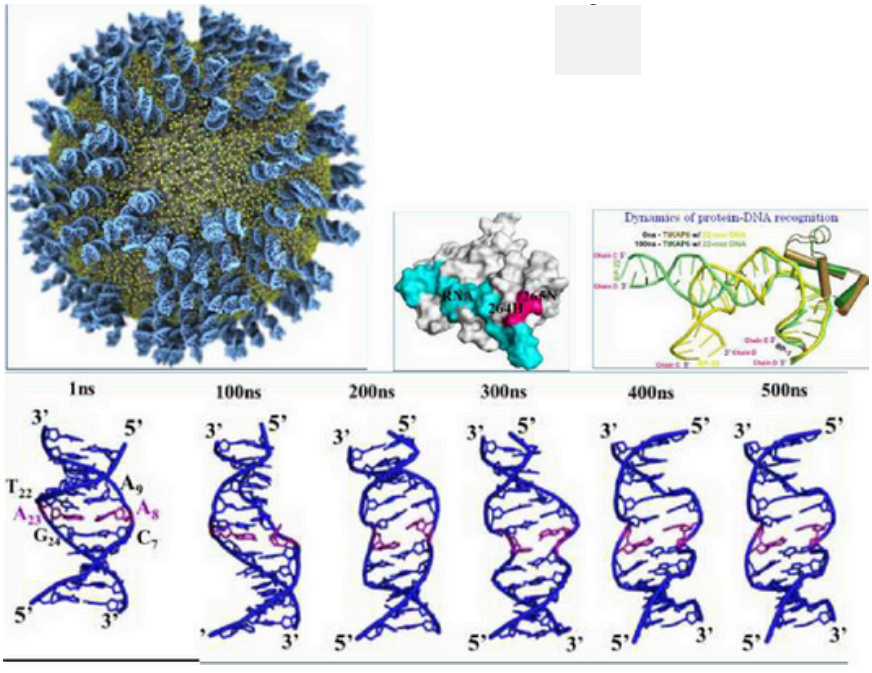
Electrophysiological measurements through voltage-gated calcium channels

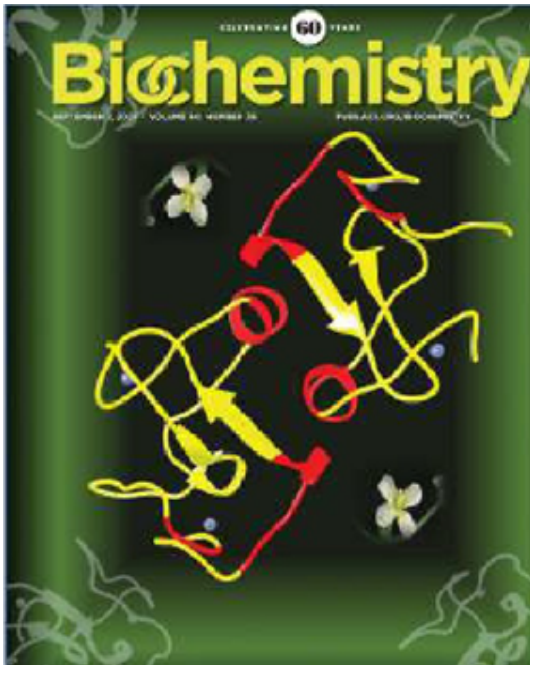
Harnessing the high-performance computing (HPC) to decipher the nanoscale structure and dynamics of self-assembled synthetic nano-biosystems.

Developing computational models to illustrate the physics of living cells and the interaction of nanomaterials with the biological matter.

RRM1-2 domain structure of the TDP-43 protein showing predicted Zinc binding amino acids in pink.

AFM image of amyloid-like aggregates of E540V familial mutant bearing Fibrinogen A alpha chain fragment protein.





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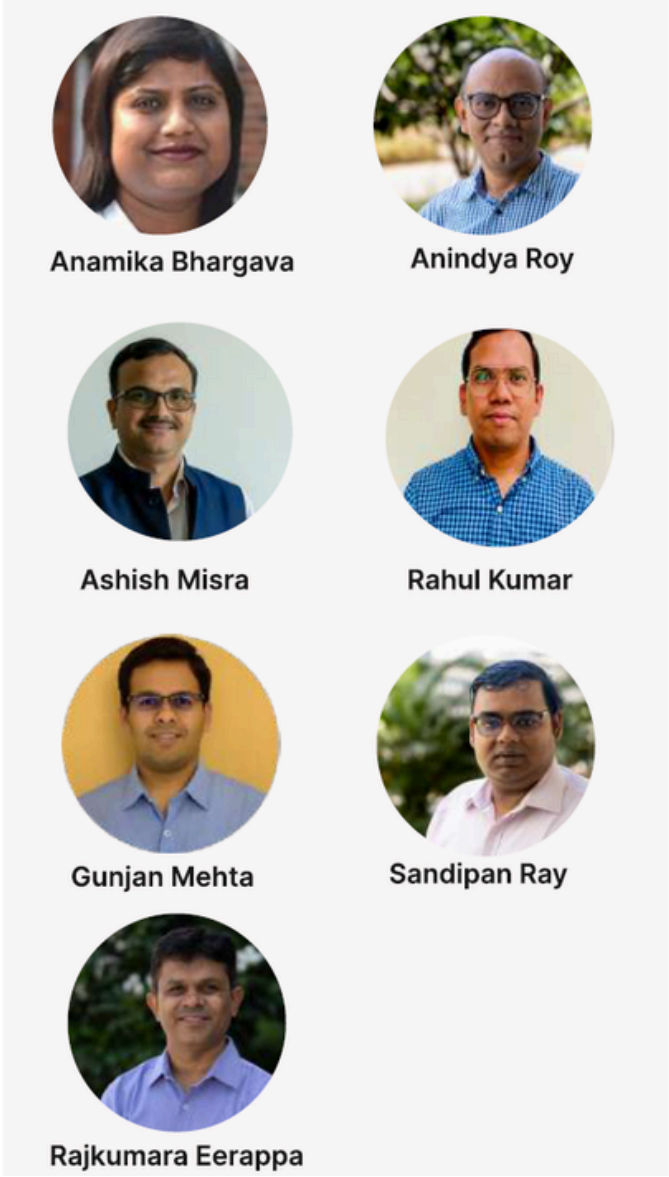


Cancer Biology and Diagnosis

A reliable, rapid, cost-effective method for detection of TBI biomarker UCHL1

Characterization of regulation of cancer drug targetsPARP1 and PARP2

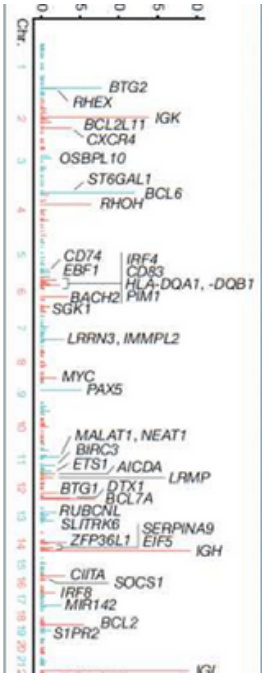
Ion-channel dysfunction in breast cancer

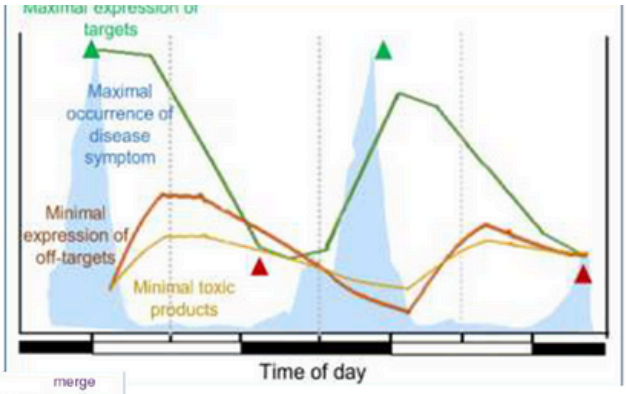
Development of zebrafish xenotransplantation models for the analysis of breast cancer subtypes

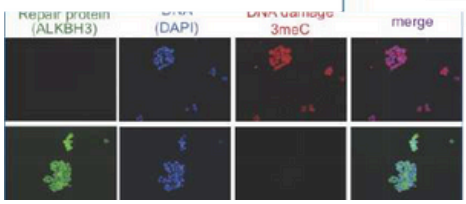
Identified details of the enzymes engaged in removing the alkyl groups from the modified DNA bases in cancer cells

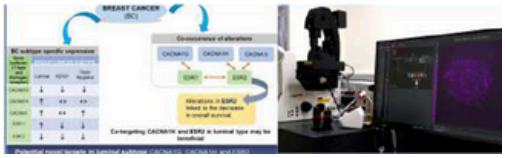
Chromatin remodelers play essential roles during meiosis.

Dosing time dependency of anticancer drugs









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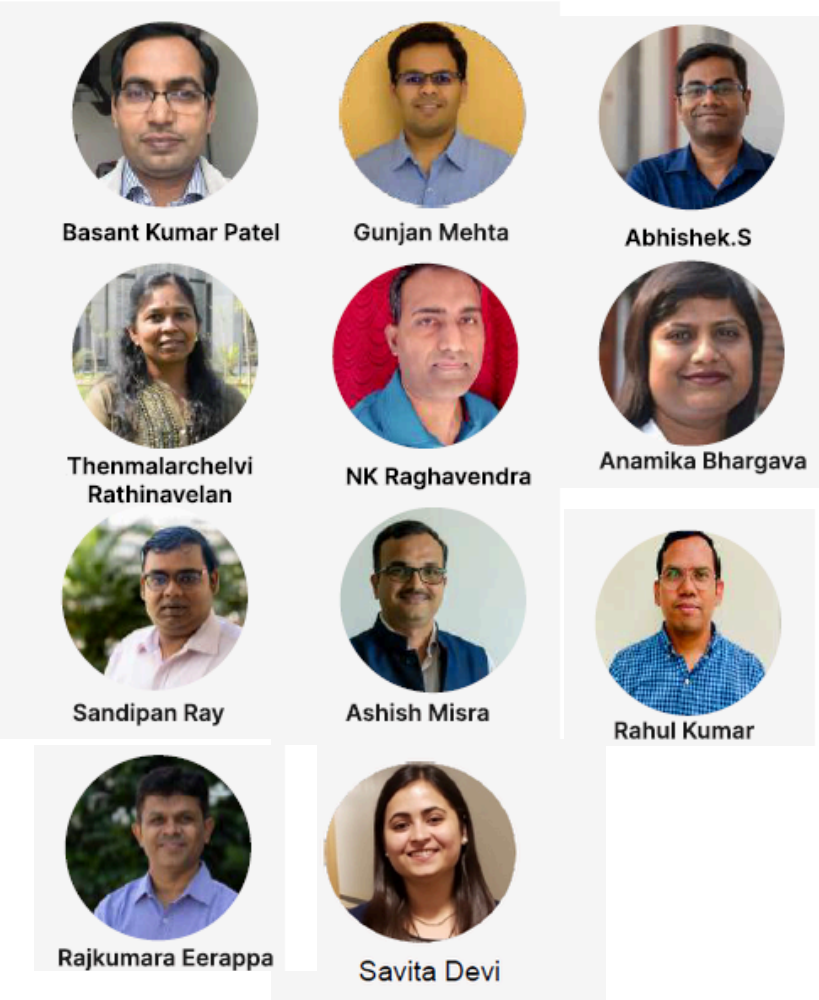


Biology of Diseases and Disorders

Designing and evaluation of small molecule phosphodiesterase inhibitors to modulate sperm competence for IVF

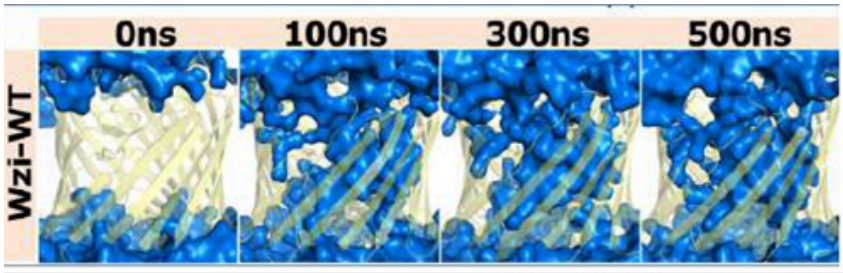
Mechanisms of diseases/toxicity caused by chemicals and pollutants

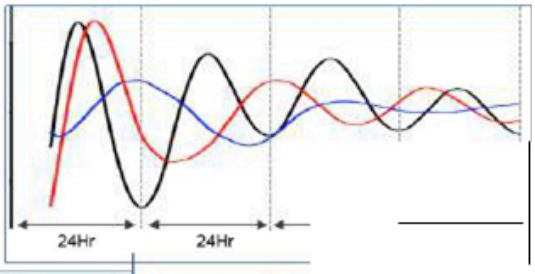
Use of zebrafish model for toxicity and biocompatibility studies

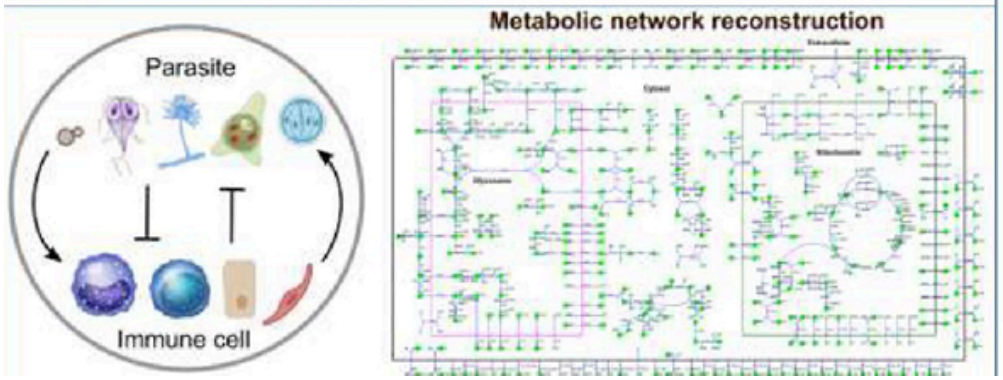
Computational reconstructions of parasites & host immune cell metabolism for deciphering infection-induced metabolic changes

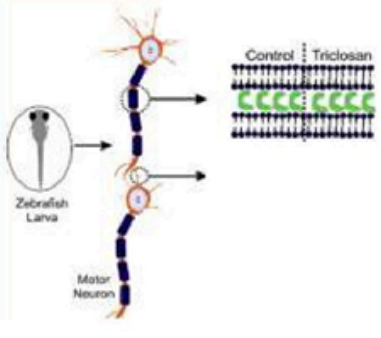
In vitro liquid-Liquid phase separation of Alexa fluor-labelled A315T familial mutation bearing fragment of TDP-43 protein implicated in ALS disease. Underpinning the mechanistic basis of disease pathology

Circadian regulation and irregularities in cardiovascular disease patients









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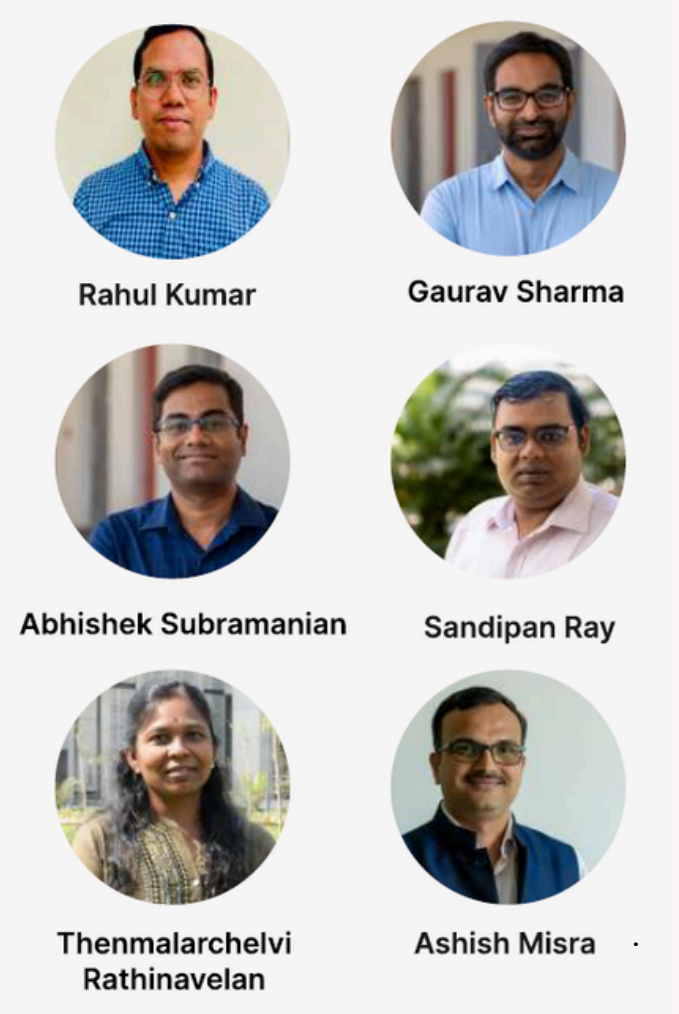


Big Data Biology: Omics to function

Omics data analysis, integration and machine learning

Gene regulatory network inference

Developing Al/ML based tools to identify diagnostics and prognostic biomarkers of various cancer types using large volume of omics data.

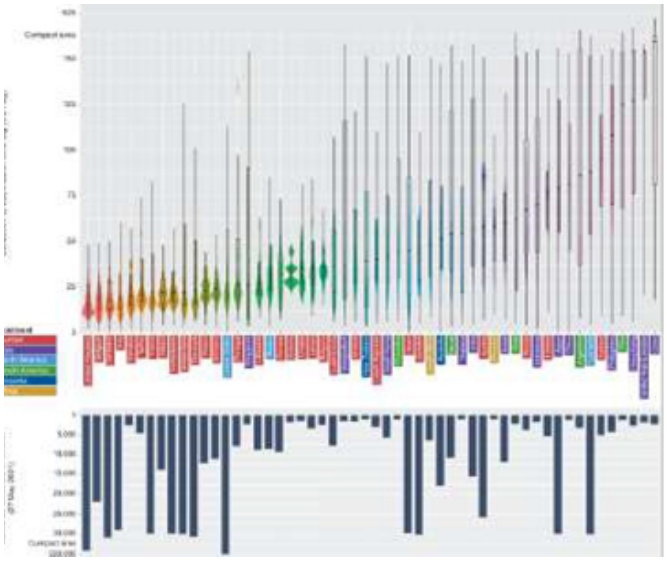
High-throughout pan kingdom bacterial genome analysis to understand their physiology, function and evolution

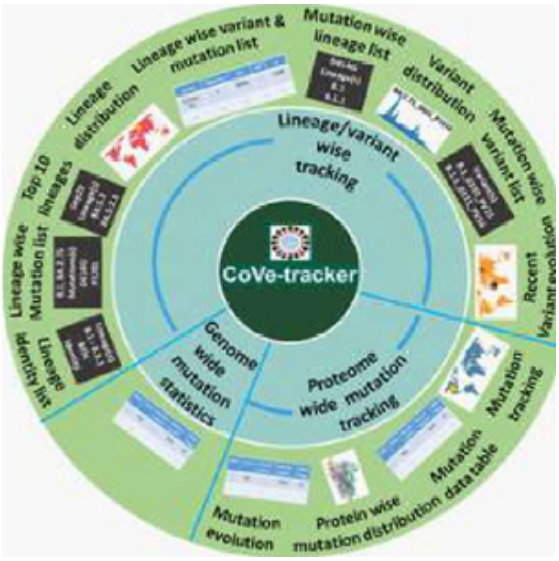
High-throughput genome and metadata analysis of SARS-CoV-2 sequences

Circadian regulations of kinome and signaling

Developmentof zinc finger motif prediction tool and in silico diagnostic tools for Gram-negative bacterial serovar prediction

Genomic and transcriptomic profiling of Indian cancer patients for personalized medicine



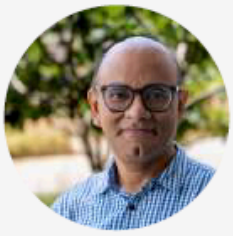


Broad Theme Area

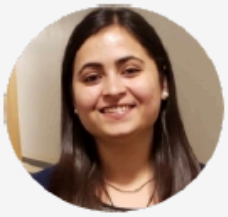
Althuri Avanthi

Gaurav Sharma

Gunjan Mehta



Anindya Roy



Savita Devi

Bioprocess Technology and Microbiology

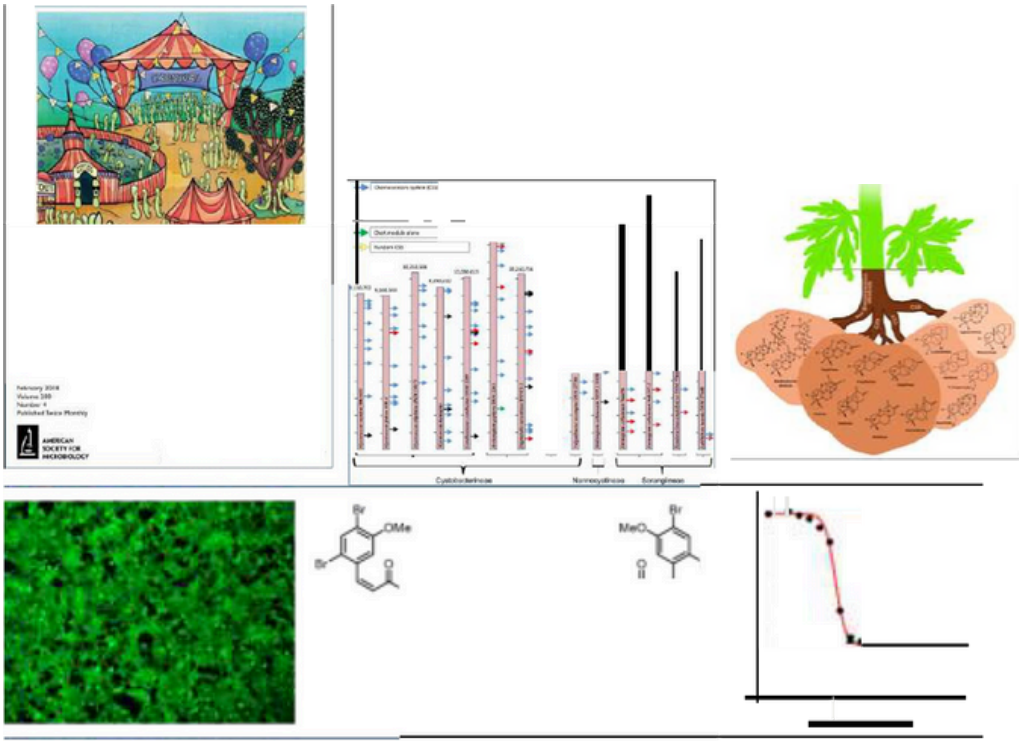
Development of waste valorization technologies for the production of Biofuels, Biochemicals, and Biomaterials

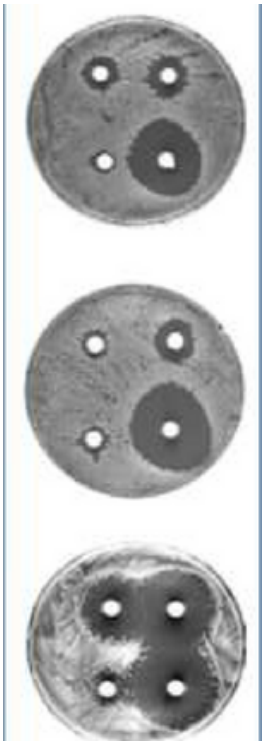
Exploring ways to transform linear economy to circular economy through multi-product approach

Identification and taxonomic classification of novel bacterial organisms from diverse niche followed by their comparative genomic studies

Identification of ML0190 as the Mycobacterium leprae DNA repair protein by genetic complementation

Comparative genomics and phylogenetic approaches to understand the physiology of microbes





Professor

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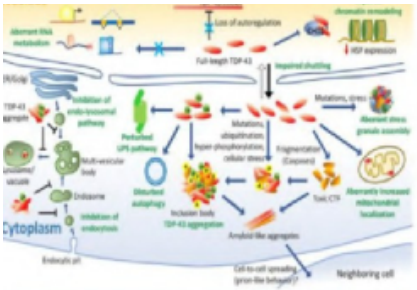
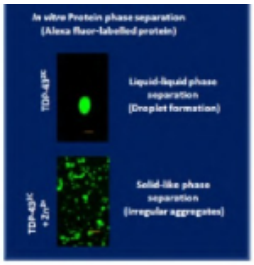
Email: basantkpatel@bt.iith.ac.in
Lab website: https://sites.google.com/ iith.ac.in/protien-misfolding-lab
Scholar: https://scholar.google.co.in/citations?user=Boh2iMkAAAAJ&hl=en

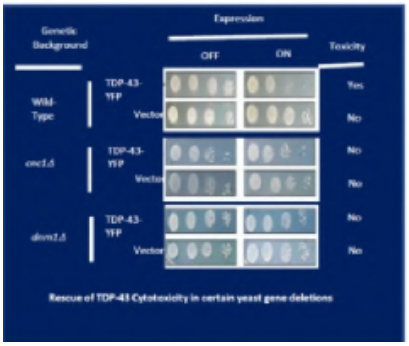
Dr Basant Kumar Patel

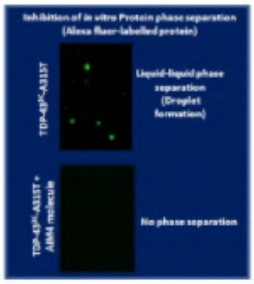
- **Protein misfolding- mechanisms and prevention**
- **Yeast prions genetics and cell biology**

In our laboratory, molecular mechanisms pertaining to misfolding of proteins and their consequent cytotoxicity is investigated. We use the yeast Saccharomyces cerevisiae model system and biochemical & biophysical tools for these studies. Another key focus of our laboratory is to find small molecule inhibitors to target protein misfolding towards therapeutic research. We also examine the role of chaperones and cellular pathways in mediating or mitigating the cytotoxicity due to protein misfolding and protein dyshomeostasis. We have carried out protein misfolding studies on TAR DNA binding protein 43 (TDP-43) implicated in the pathogenesis of amyotrophic lateral sclerosis (ALS) disease which is characterized by the loss of motor neurons that leads to the loss of movement, breathing and finally death of the patient. Our data suggests that Cyclin C, Dnm1 and Ybh3 proteins are important in mediating the TDP-43-induced oxidative stress mediated cell death in the S. cerevisiae model. Also, using Alexa-fluor
fluorescently labelled TDP-432C and TDP-432C-A315T proteins, we have shown that while these proteins manifest in vitro liquid-liquid phase separation (LLPS) giving spherical droplets, an additional presence of Zn2+ causes a solid-like phase separation. Also, recently we have shown that elevated constitutive expression of Hsp40 chaperone Sis1 reduces the TDP-43 aggregation-induced oxidative stress in the lre1 pathway dependent-manner in the yeast TDP-43 proteinopathy model. Also, using in vitro studies we showed that a small organic molecule, AIM4, inhibits the aggregation and pathogenic LLPS of a familial ALS mutation (A315T)-bearing mutant C terminal domain, TDP-432C-A315T.









AWARDS

1. Excellence in Teaching awards-2014, IIT-Hyderabad, India

Professor

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Lab website: https://sites.google.com/ iith.ac.in/arlab
Scholar: https://scholar.google.com/citations?user=VPIpc1AAAAAJ&hl=en

Dr. Anindya Roy

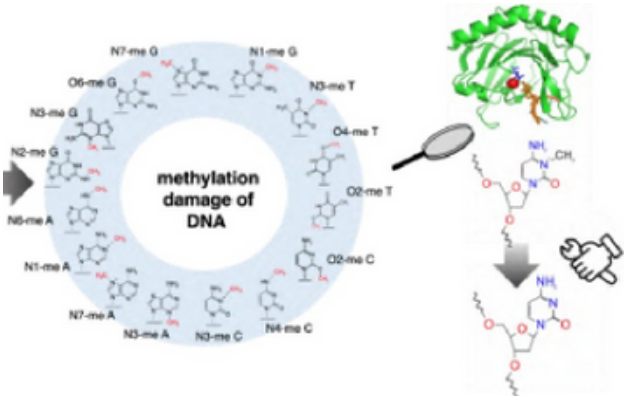
Molecular characterization of DNA alkylation damage repair enzymes

Role of DNA alkylation in cancer, autoimmune and inflammatory diseases

The lab has a long-standing interest in DNA alkylation modifications and their repair. While some of the key enzymes that repair these modifications are known, their relationship to genome integrity is less clear. We previously established roles for E coli AlkB, S cerevisiae Tpa1 and human ALKBH3 and ALKBH5 DNA demethylases in DNA repair (Shivange et al, JBC, 2014; Shivange et al, NAR, 2016, Nigam et al BBRC 2018, Akual et al, BBRC, 2021).

This ledus to the discovery of a RAD51C-dependent mechanism that recruits ALKBH3 demethylase to the DNA (Mohan et al, NAR, 2019).

We now have several lines of investigation related to this pathway: What are the factors that may regulate this pathway? Can this pathway be targeted for cancer therapy? How this pathway is connected to other nucleic acid metabolism pathways? What is the effect of this pathway on inflammation and innate immune pathways? Mice deficient in DNA alkylation repair enzymes are highly susceptible to acute and systemic inflammation. We are also studying the molecular mechanism behind it. We have also broadened our studies on DNA alkylation repair enzymes to development of highly sensitive quantitative approaches to analyse DNA alkylation repair rates. We aim to apply these methods in discovering new inhibitors for the DNA alkylation repair enzymes. To this end, we found some novel lead molecules (Nigam et al, CBDD, 2021; Negi et al, OBC, 2022) and our lab is researching to discover more such inhibitor molecules.



AWARDS

1. Gandhian Young Technological Innovation (GYTI) Mentor Award (2015)
2. Excellence in Teaching Award, IIT Hyderabad (2015)
3. Innovative Young Biotechnologist Award (IYBA), Govt. of India (2008)

PATENTS

1. Composition, method and kit for rapid risk stratification of traumatic brain injury, PCT/201741042270, Published

Associate Professor

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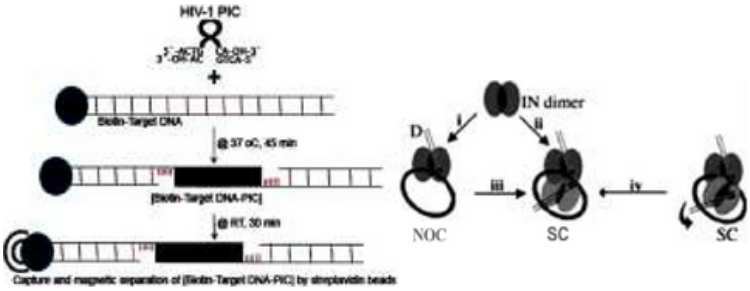
Scholar:https://scholar.google.co.in/citations?user=4q0QnuIAAAAJ&hl=en

Dr. N.K. Raghavendra

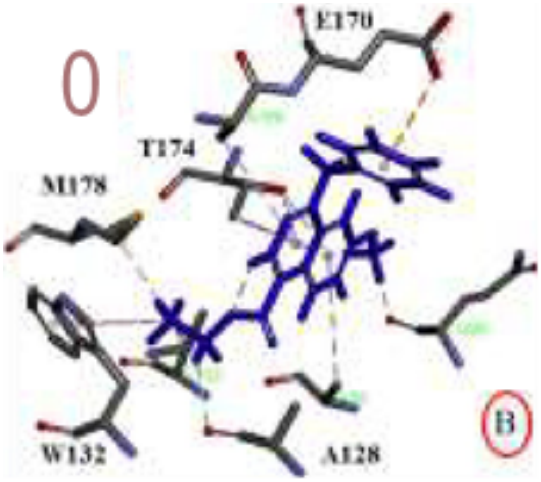
Human - virus: protein-protein and DNA protein interaction

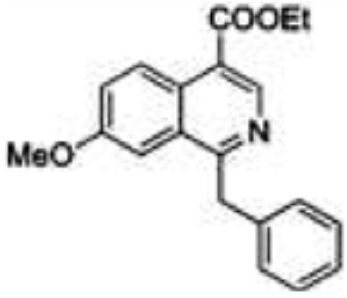


AWARDS

1. Member, BoS, Biotechnology, K.L.E. Technological University, Hubli. KA. (2022- present)
2. External member, IBSC, University of Hyderabad (2020-2023).
3. Illustrious alumnus at Silver Jubilee celebrations of St. Joseph's Degree College, Kurnool. AP. (2020).
4. Invited Speaker at International Conference on Biology And Therapeutics of HIV & Associated Infections, University of Hyderabad. (2018)
5. Invited Speaker at TRendys in Biochemistry, Ancharya Nagarjuna Univeristy, AP (2014)
6. Invited Speaker at NanoTech Conference, Ancharya Nagarjuna Univeristy, AP (2012)
7. 'Excellence in Teaching' award by IIT Hyderabad (academic year 2012-13)

The focus of research in the laboratory is primarily on proteins of two viruses that infect humans. First, is the interaction of HIV-1 enzyme integrase with the cytoplasmic proteins of the susceptible cells. Second, is that of SARS-CoV-2 structural protein Spike with ACE-2 and TMPRSS-2 of susceptible cells. Site-directed mutagenesis of virus and human protein partners are used to understand the chemistry at the protein protein interface. The knowledge obtained fromsuch studies is extended to design small molecule inhibitors of the interaction. Apart from studying the interactions using recombinant proteins, pseudovirus having the mutant form of the proteins are used to analyse the effects of mutations on the levels of infection in the susceptible mammalian cell lines. Docking software is employed to assist the design of mutants, as well as, to interpret the observations of the in vitro experiments.





Professor

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Lab website:https://people.iith.ac.in/tr/ Home.html
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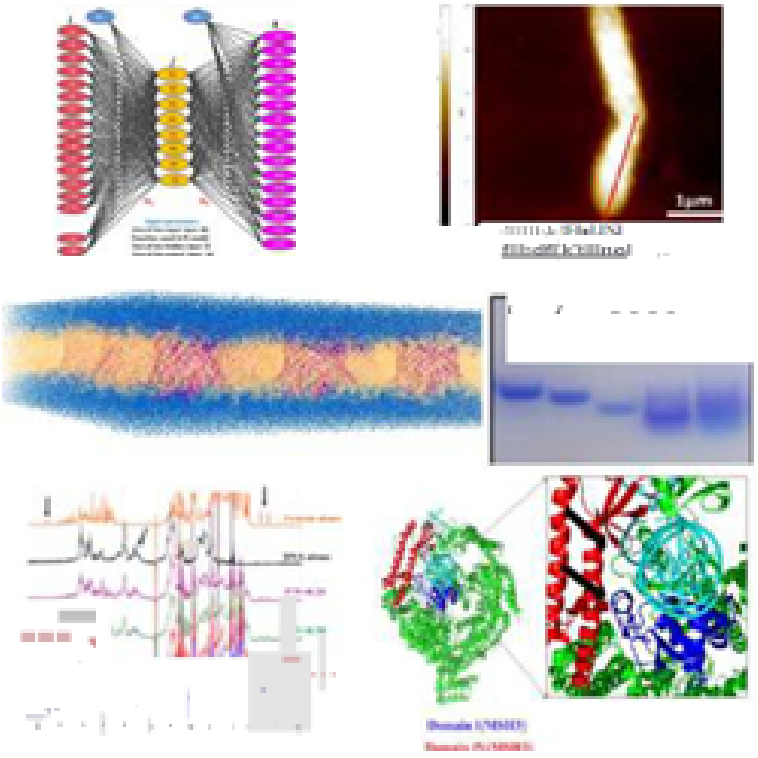
Dr. Thenmalarchelvi Rathinavelan

- **Molecular mechanism behind microsatellite repeat expansion disorders**
- **To understand the physical principles behind the biological phenomena by employing computational, biophysical, biochemical and structural techniques.**
- **Antimicrobial resistance in Gram negative bacteria**
  Microbial genomics
- **Amyloidogenic characteristic of an intrinsically disordered Saccharomyces cerevisiae protein**
- **Development of algorithms, databases and web tools**
- **Utilization of SERBP1 as an anticancer drug target**
- **Identification of ligand molecules to target microsatellite repeat expansions**
- **Biomolecular structure and interaction prediction using machine learning algorithms**

Molecular biophysics lab explores the biological mechanisms in the perspective of human diseases and disorders by employing computational and experimental techniques. We are involved in the development of sophisticated databases and algorithms to store and analyze multi omics biological data to derive the hidden biological information. Development of web tools to i) predict proteome wide zinc finger domains/ motifs, (i) track the evolutionary dynamics of SARS-CoV-2, (iii) predict the secondary structure of the nucleic acids from circular dichroism spectra using machine learning algorithms, (iv) predict the secondary structures of Klebsiella, Acinetobacter and Salmonella and (v) automatically model nucleic acids secondary structures and, a repository of (vi) K-antigen E coli structures are the examples in this line



AWARDS

1. Innovative Young Biotechnologist Award 2012, DBT Government of India, 2013
2. Excellence in Teaching Award 2014-2015, IIT Hyderabad, 2015
3. BIRAC-SRISTI-GYTI-Award, Honeybee Network Department of Biotechnology, 2019
4. BIRAC-SRISTI-GYTI-Appreciation, Honeybee Network Department of Biotechnology, 2018
5. BIRAC-SRISTI-GYTI-Award, Honeybee Network Department of Biotechnology, 2017

Professor

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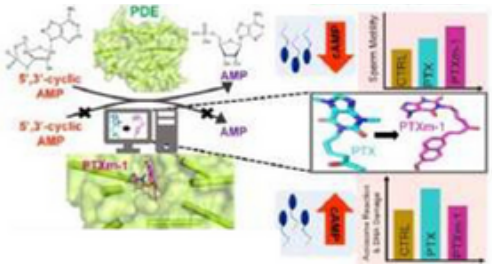
Dr. Rajakumara Eerappa

- **Epigenetics, DNA repair and allosteric regulation of receptors and enzymes**
- **Characterization of cancerdrug targets, Inhibitor/lead compound design**
- **Thermodynamics of phase separation of biological macromolecules and hydrogel design**
- **X-ray crystallography and Structural Biology**

AWARDS

1. DAAD Scholarship, Research Stays for University Academics and Scientists, German Academic Exchange Service (2019).
2. Guest Professor in Prof. Dr. Ulrich Schwaneberg Group, Chair of Biotechnology, ABBt Institute of Biotechnology, RWTH Aachen University, Germany (2019.
3. Early Career Research Award, Science & Engineering Research Board (SERB), Department of Science & Technology (DST) (2016).
4. Ramalingaswami Re-entry fellowship, Department of Biotechnology (DBT), Government of India (2014).
5. Structured International Postdoc Program (SIPAD) fellowship sponsored by European School of Molecular Medicine and, co funded by European Commission in the context of 'FP7 program Marie Curie Actions- people'

Poly (ADP-ribose) polymerase (PARP) 1 and 2 are referred to as "genome guardians", as they play a very crucial role in maintaining the genome integrity. PARP inhibitors (PARP(i)) are approved for the treatment of multiple cancers. We unravel the mechanism of allosteric regulation of DNA breaks recognition and catalytic activities of PARP1and 2 by their catalytic product poly ADP ribose (PAR) polymer, RNA and PARP(i)s. The outcome of this work would lead to the development of PARP-specific inhibitor drugs for different cancers treatment. We also design phosphodiesterase inhibitors to modulate sperm functions, such as sperm motility, longevity, and pre acrosomal reactions, for assisted reproductive technologies including IVF and intracytoplasmic sperm injection.



PATENTS

1. 202341028077
Enzymatic synthesis of a novel anionic polymer: Poly(Cytidine diphosphate ribose) Dr. Rajakumara Eerappa, Ms. Deeksha Waghela
2. 202341028076
Synthesis and evaluation of inhibitor against phosphodiesterases PDE4A, PDE4D, and PDE10 Dr. Rajakumara Eerappa,Prof. G. Satyanarayana, Mr. Raj Virendra Gupta, Mr. M. Ramachandra Reddy

Professor

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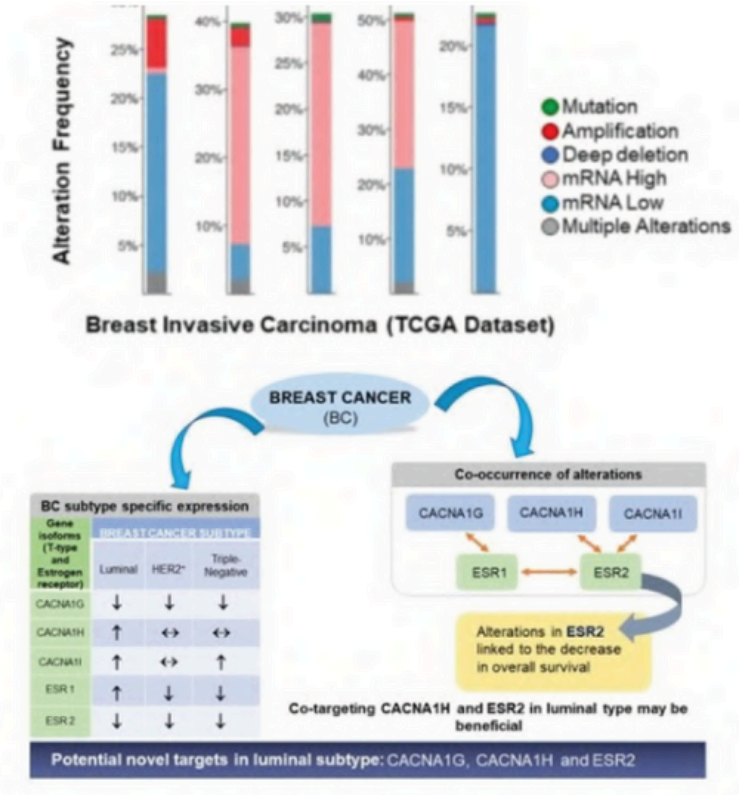
Dr Anamika Bhargava

- **Voltage-gated calcium channels in health and disease**
  Ion channels in cancer
- **Cell signaling through ion channels**
- **Investigation of disease and toxicity mechanisms using zebra fish model**
- **Development of zebrafish models of xenotransplantation**

Our lab works at the interface of heath and disease. We use molecular biology, protein chemistry, cell culture and specialized techniques such as calcium imaging, patch-clamp electrophysiology and advanced microscopy to understand how membrane receptors work and how they contribute to diseases where they are dysfunctional. We aim to understand the importance of ion channel receptors in maintaining health and balance of organs such as heart, brain, etc. and how their dysfunction may be detrimental for humans. Currently we are studying the role of T-type calcium channels in triple negative breast cancer and their interaction with estrogen receptors. We are interested to observe the expression of calcium channels in Indian breast cancer patients and understand whether calcium channels can be drug targets in breast cancer.

AWARDS

1.Invited Review Editor, Frontiersof physiology: cardiac electrophysiology (2021).
2.Early Career Research Award, Science & Engineering Research Board (SERB), Department of Science & Technology (DST) (2018).
3. Outstanding women in science award by Venus international foundation (2017).
4.Honorary research associateship, Imperial College London (2016).
5. Lewis MacDonald Award for best proposal, Heart and Stroke Foundation of BC and Yukon, Canada (2009).



Assistant Professor

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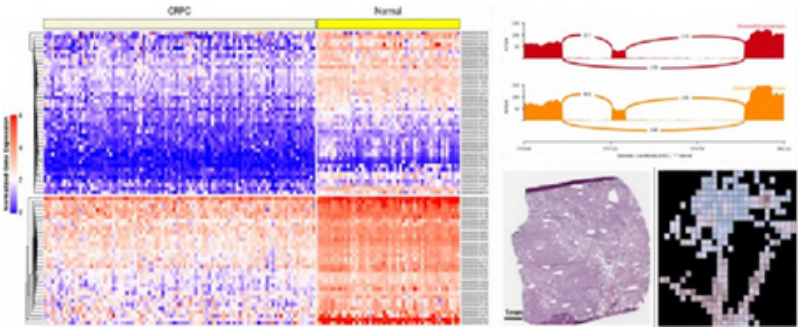
Dr. Ashish Misra

- Pre-clinical validation of tissue-based prognostic and predictive biomarkers in therapy resistant Indian prostate cancer patients.
- Identification and pre-clinical validation of therapeutically targetable oncogenic drivers of castration-resistant prostate cancer
- Constructing the Genomic and Transcriptomic landscape of Indian pediatric B-cell Acute Lymphoblastic Leukemia patients to identify novel prognostic and therapeutic targets.
- Understanding the role of Long non-coding RNAs and alternative splicing in cancer progression

AWARDS

1.Review Editor-Frontiers in Genetics (2021-present)
2. Review Editor- Frontiers in Molecular Biosciences (2021-present)
3. Early Career Research Award, Science and Engineering Research Board (SERB)" 2018
4. Student fellowship from the organizers of 32nd FEBS conference held in Vienna, Austria (2007)
5. INSA fellowship for attending the 32nd FEBS conference in Vienna, Austria. (2007)

We employ a constellation of tools and methodologies to investigate the mechanisms regulating drug resistance, with the overarching aim of providing clinically actionable solutions for the treatment of the disease.
B-cell acute lymphoblastic leukemia (B-ALL) is characterized as pestiferous multiplication of nascent B-cell lymphocytes, which is very detrimental to the immune system, severely affecting both children and adults. Although, in past few decades, in well developed countries, the survival rate of pediatric patients with B-ALL has jumped to more than 90%, but intriguingly, developing countries like India still reportdismal cure and high relapserate. The most common complications arising due to current chemotherapy treatment are drug induced cytotoxicity and late relapse due to whichthe mortality rate is still very high in India when compared to other developed countries. Therefore, targeting molecular pathwaysand drivers involved in B-ALL pathogenesis, in addition to conventional chemotherapy treatment, can assuagethe existing treatment protocol available for B-ALL.
Understanding the genomic and transcriptomic landscape of B-ALL is key to understanding the underlying reasons of relapse and developing personalised medicine. Evolving data on genome and transcriptome of pediatric B cell ALL indicates significant contributions from ethnic, racial,and geographical variations.



Assistant Professor

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Dr. Sandipan Ray

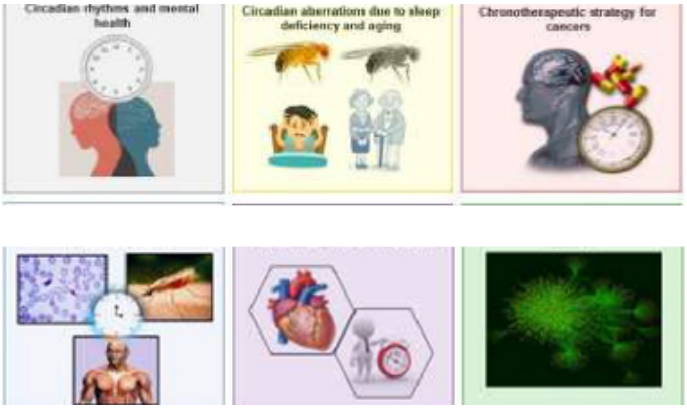
- Circadian rhythms and sleep
- Neuropharmacology
- Aging
- Mental health Systems biology

Circadian Involvements in Mental Health Mental illnesses are one of the significant causes of disease burden. In this project, we intend to compare the circadian amplitude parameter in bipolar disorder (BD) patients measured by actigraphy and by rhythmic expression or abundance of core clock genes and metabolites. We also intend to understand the circadian control of pathogenic disease factors and therapeutic drug targets.

AWARDS

1. 2023: Elected as an Executive Committee member of the Indian Society for Chronobiology (lnSC)
2. 2021: Selected for Affiliate Membership of the Institute for Translational Medicine and Therapeutics, USA
3. 2020: Elected to the Royal Society of Biology, UK
4. 2018: Thermo Scientific Annual Tandem Mass Tag Research Award (International)
5. 2015: Excellence in Ph.D. Research Award 2014-2015- IIT Bombay, Mumbai, India

We are investigating circadian clock oriented therapeutics for chronic human diseases such as mental disorders, cardiovascular diseases, and cancers. We are conducting systems-level studies to integrate physiological underpinnings among circadian rhythms, sleep, mental health, and aging.



PATENTS

1. Prof. Sanjeeva Srivastava, Dr. Sandipan Ray, Dr. Veenita Grover Shah. Label-Free Method for Detection and Quantification of Protein Biomarkers [India-Patent No. 394414 (Granted, Award Date: 07/04/2022)].
2. Prof. Sanjeeva Srivastava, Prof. Swati Patankar, Dr. Sandipan Ray, Dr. Urmila Thatte, Dr. Nithya Gogtay, Dr. Durairaj Renu, et al. Protein Biomarkers for Plasmodium vivax Malaria [India-Patent No. 336131 (Granted, Award Date: 28/04/2020)].
3. Prof. Sanjeeva Srivastava, Prof. Rajneesh Srivastava, Dr. Sandipan Ray, Mr. Vineet Vaibhav. Protein Biomarkers for Leptospirosis [India-Patent No. 336123 (Granted, Award Date: 28/04/2020)].
4. Prof. Sanjeeva Srivastava, Prof. Swati Patankar, Dr. Sandipan Ray, Dr. Urmila Thatte, Dr. Nithya Gogtay, Dr. Durairaj Renu, et al. Protein Biomarkers for Plasmodium falciparum Malaria [IPA No. 201922050215; Publication Date: 05/12/2019].
5. Prof. Sanjeeva Srivastava, Dr. Sandipan Ray, Mr. Vipin Kumar. Method for Detection of Protein Biomarkers for Different Complications of Falciparum Malaria [IPA No. 202021002027; Publication Date: 23/07/2021].

Assistant Professor

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Dr Gunjan Mehta

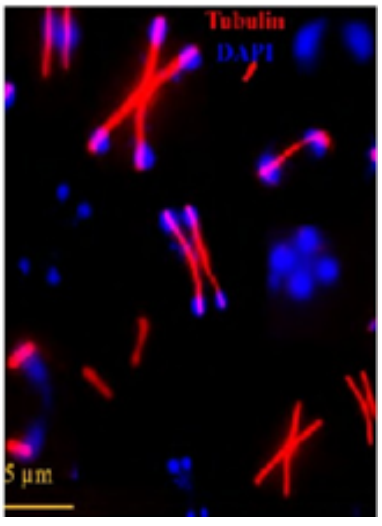
- **Chromosome Dynamics and Cell Division**
- **Gene Regulation**
- **Aneuploidy, Genetic Disorders,**
- **Cancers**
- **Single-Molecule Imaging and Tracking**

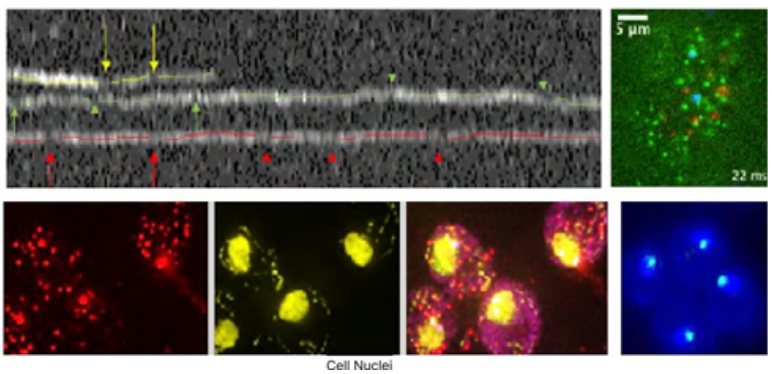
Cell division and gene regulation are fundamental processes of life and they are tightly regulated for the precise execution of the cell survival, growth and reproduction. My lab aims to understand the molecular mechanism of cell division/chromosome segregation and gene regulation during mitosis and meiosis using cutting-edge single-molecule imaging, genomics, transcriptomics, cell and molecular biology and yeast genetics.

Understanding the molecular mechanism of chromosome segregation and gene regulation during mitosis and meiosis with cutting edge single-molecule imaging, cell and molecular biology, genomics/ transcriptomics, and yeast genetics.

AWARDS

1. JICA FRIENDSHIP2 Research Grant in collaboration with Osaka University, Japan (2023)
2. Ramalingaswami Fellowship from DBT, Govt. of India (2021)
3. Har-Govind Khorana Innovative Young Biotechnologist Award, DBT, Govt. of India (2020)
4. Fellows Award for Research Excellence (FARE), NIH, USA (2019)
5. Best Review Paper of the year 2014, IIT Bombay, India (2014)





Cell Nuclei

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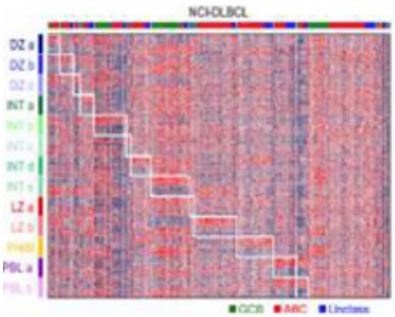
Dr Rahul Kumar

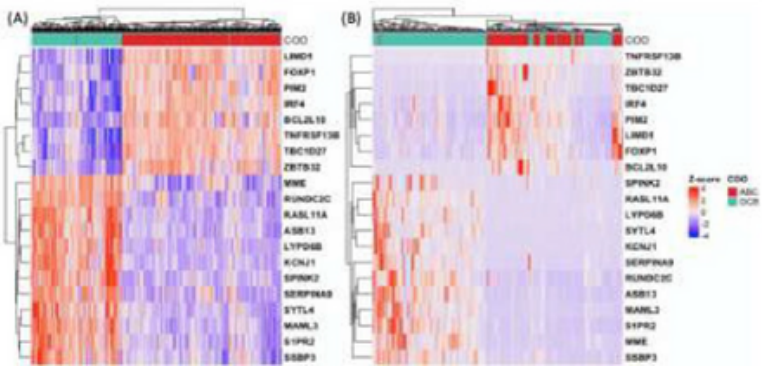
- Radiogenomics based biomarkers for glioblastoma prognosis and diagnosis
- Developing Al/ML based methods to design novel anticancer compounds
- Developing multi-omics biological databases
- Developing Al/ML based algorithms to identify novel molecular subtypes
- Exploring non-coding elements for disease pathology

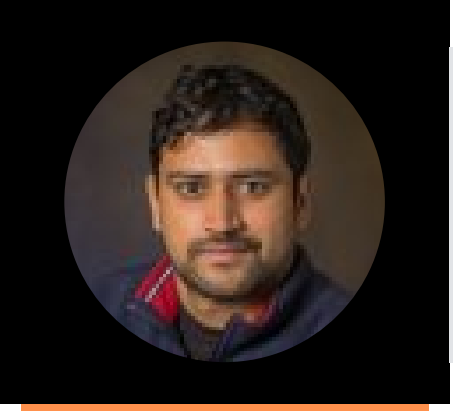
AWARDS

1. Best PhD Thesis award
2.Committee member in Telangana State Council of Higher Education (TSCHE) for designing Bioinformatics curriculum at UG & PG level in Telangana state colleges.
3.Selected as one of the best performers in Network Verification Challenge (NVC) conducted by Philip Morris International (PMI) and IBM all over the world in 2014.

Advancement in sequencing technologies lead to the generation of high volume (big data) of multi-omics data for almost all the cancer types. This big multi-omics data of thousands of cancer patients provides an unique opportunity to understand the disease pathophysiology and design new therapies.
Recently, our research group developed a deep-learning based classification method to stratify diffuse large B-cell lymphoma (DLBCL)patients into ABC and GCB subtypes using transcriptomics data. We have also developed two multi-omics database for acute myeloid leukemia (AML) and multiple myeloma (ML) and identified novel biomarkers of these two cancer types. Along with multi-omics data, there is a surge in drug screening data which we utilised to develop Al/ML based quantitative structure activity relationship (QSAR) models to design effective molecules against colorectal cancer.







Assistant Professor

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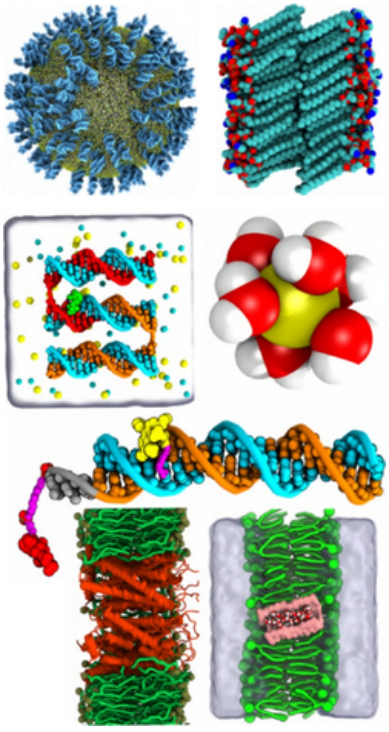
Dr Himanshu Joshi

- **DNA Nanotechnology**
- **Lipid-DNA, DNA-protein, and DNA-DNA interaction**
- **Artificial water channels**
- **Nanopores**
- **Nanoparticles and biological materials**

Richard Feynman once said, "everything that living things do can be understood in terms of the jigglings and wigglings of atoms.JI Using computational methods, our group thrive to understand the bulk behaviour of the biological matter that emerges from the detailed structure and dynamics of molecules at the nanoscale. We use physics-based computational methods blended with statistical mechanics to understand and predict biological form and function.

Our group excels in the all-atom and coarse-grained molecular dynamics simulation method and harnesses the power of high performance supercomputers to create advances in the area of nanobiotechnology. The goal of our research group is to decipher the interaction that governs the behaviour of biomolecules and led up to what we call "Life". In this process of understanding the biomolecular form and function, we ask the question "can we create the synthetic analogue of the cellular components and use them to solve real-world problems like water desalination, drug design, nanomedicine etc.



AWARDS

1.SHELLIndia Computational Talent Prize, 2016,
2.DSTInspire Faculty Fellowship, 2021.
3. Start-Up ResearchGrant, SERB 2022

PATENTS

1.High-Affinity Oligonucleotide Nanomatrix and Nanocarrier system. Submitted, Indian Patent Application no. 202341006125

Assistant Professor

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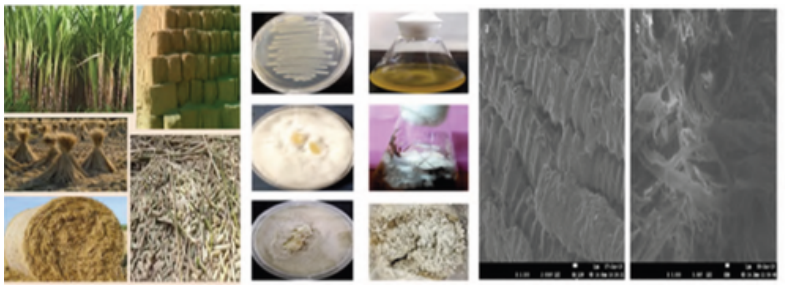
Dr Althuri Avanthi

- **Biofuels, Biochemicals, and Biomaterials**
- **Bioprocess technology, Fermentation, and Downstream processing**
- **Nanobiotechnology and Hydrothermal Liquefaction**
- **Waste valorization and Circular economy**

The lab is focused on unravelling the challenges in lignocellulosic biomass/ Agro-residue/ bio-genic waste valorisation. These are potential feedstocks for synthesis of biochemicals, biofuels and biomaterials that are sustainable alternatives to the conventional synthetic equivalents. This approach can reduce the dependency on non-renewable fossil resources for meeting the burgeoning market demand and thus can effectively minimize virgin resource depletion. Our goal is to utilize diverse bio-genic wastes and process the recovered or extracted biomolecules to commercially imperative deliverables. Lignin is a vital component which gives stability towards biodegradation to lignocellulose biomass; this property of lignin is exploited to design hydrogels with applications in the food packaging.

AWARDS

1. Invited Reviewer for Bioresource Technology Journal, Elsevier (Impact factor: 11.88), Microbial cell factories, Springer Nature (Impact factor: 6.352) and Journal of Environmental Management, Elsevier (Impact factor: 5.84).
2. Associate Fellow of TelanganaAcademy of Sciences (TAS), Telangana (2019)
3. CSIR-Nehru Science Postdoctoral Research Fellowship (2018-2021)
4. Moderator (Thematic session- Agriculture and Food Processing) & host (award ceremony) for SCO -1st Young Scientists Conclave, sponsored by Department of Science and Technology, Government of India and organized by CSIR-IICT, Hyderabad
5. Received two international travel grants for attending bioenergy conferences at Rome, Italy and Khan Kaen, Thailand sponsored by IIT Kharagpur.



PATENTS

1. Yellow laccase mediated delignificati on of lignocellulo sic biomass
Banerjee R, Ghangrekar MM, Rajak RC, Chintagunta AD, Althuri A, Srinivas GLK, Sherpa KC, and Kumar S 201631005954
20.02.2016

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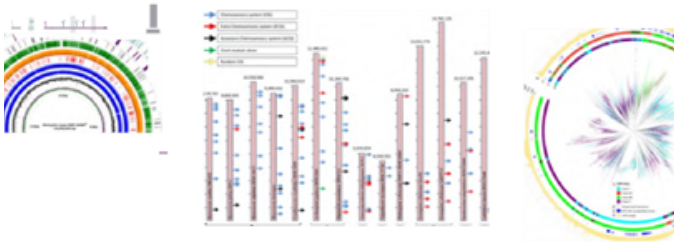
Dr Gaurav Sharma

- **Microbial genomics and evolution Plant-microbe interactions**
- **Genomic, Metagenomic, and Transcriptomics Computational biology to function**
- **Next-generation sequencing data analysis Database and webserver development**



AWARDS

1. Associationof Microbiologists of India (AMI) Young Scientist Award (2022)
2. DST-INSPIRE Faculty Fellowship from DST India (2019)
3. European Molecular Biology Organization (EMBO) Travel Award (2019)
4. American Society for Microbiology Postdoctoral Travel Award (2018)
5. Editor at Microbiology Spectrum (ASM Publication) and Associate Editor for Genomics journal

Our broad interest lies in exploring and understanding microbial diversity and genome evolution. With the development of remarkable sequencing technologies, an enormous amount of genome/ transcriptome/ metagenome data is being generated to infer interesting evolutionary theories physiological behavior, and putative lifestyles of ' diverse organisms. We attempt to utilize this open-source data along with generating high throughput data from various sequencing platforms to bridge the gap between computational data, biological function, and organism evolution. A few significant directions are as follows:

1) Understanding the genomic complexity in myxobacteria: Myxobacteria (Phylum Myxococcota) isa group of the largest genome size constituting microorganisms with diverse peculiar physiological characteristics. We are interested in understanding how these organisms gained this much genomic content, how these characteristics evolved, and how the signal transduction supports these unique functions.

2) Diversity and evolution of microbes: My lab is also involved in understanding and exploring the distribution, function, and evolution of diverse pathways across available bacterial genomes in a high-throughput manner. Answering such Talmudic questions allows us to get a bird's eye view of the Bacteria kingdom and its evolution.

3) Host-microbe interactions using computational microbiome studies: We use host genomics and community metagenomics to understand the medicinal plant-microbe interactions to comprehend the role of microbes in their secondary metabolite production.

4) Prediction webservers: We compile genomics/phylogeny-driven computational web-based tools to predict novel functions of proteins or their associated pathways that might help experimental biologists analyze and understand their input genomic and metagenomic sequences.

Assistant Professor

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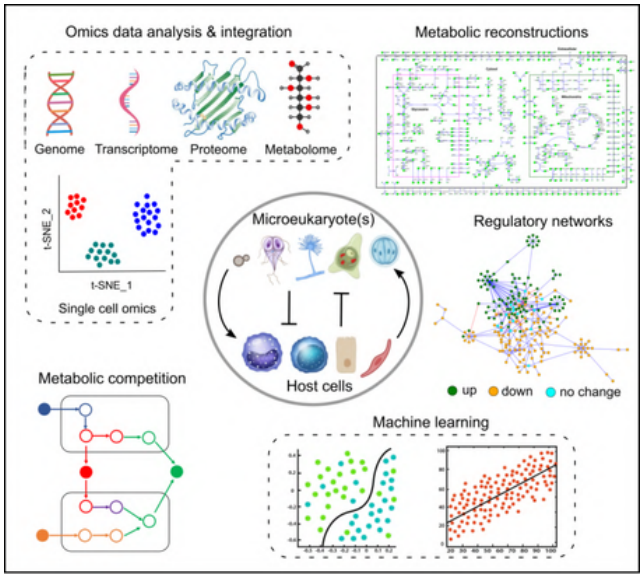
Dr Abhishek Subramanian

- **Computational Systems & Network Biology**
- **Omics data analysis & bioinformatics**
  Metabolism & gene regulation
- **Mathematical, statistical modelling and machine learning**
- **Parasitology and immunology**

Our group is specifically interested in understanding the “systems biology” of infections from both the host and parasite perspectives. Our tangible research outputs include the development of computational models, pipelines, software, web servers and databases in the above context
Our group employs various bioinformatics and computational techniques to develop in-silico models that can integrate multi-omics data for the inference, analysis and semi-automated development of networks for discovering novel biological mechanisms.



AWARDS

1. DBT - Ramalingaswamy Re-entry Fellowship 2021-22 from the Department of Biotechnology (DBT), Government of India
2. Keerthi Sangoram Memorial Endowment Award for Best Research Scholar in the area of Biological Sciences by CSIR-NCL Research Foundation, India
3. Award for the Best Posterat the 1st IBSE International Symposium held at Indian Institute of Technology (IIT), Madras, India
4. ISCB/lnCOB Travel Grant obtained for attending the 15th International Conference on Bioinformatics (lnCOB), Matrix Biopolis, Singapore

PATENTS

Ram Rup Sarkar, Rupa □howmick, Abhishek Subramanian, Method of Jdentification of Combinatorial EnÑymatic Reaction \argets in Glioblastoma Specific Metabolic Network, µS Patent App. 15/779,798, 2018 tPatent SubmittedÁ

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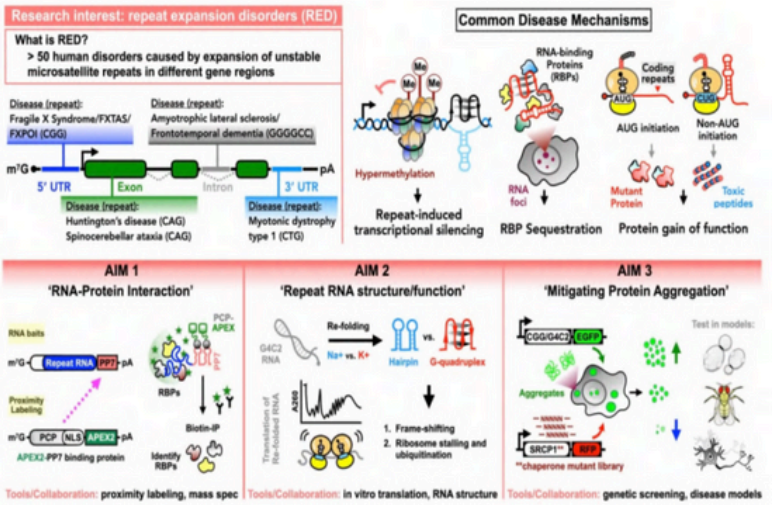
Dr Indranil Malik

- **Repeat Expansion Disorders**
- **Role of RNA binding proteins in neurological diseases**
- **Developing Drosophila models of human neurodegenerative diseases**

Our long-term goal is to study fundamental mechanisms of gene expression process in relation to human diseases and utilize this work to develop novel therapeutic strategies. In our lab, we are adapting novel tools to study the roles of repeat RNA- associated toxicity in a group of neurodegenerative disorders commonly known as 'Repeat expansion disorders'.

We seek to identify novel RNA-binding proteins (RBPs) that interact with expanded repeat RNAs, determine the in vivo structures of different RNA repeats, and then combine these two datasets to determine how specific RBPs facilitate the translation of these disease-causing 'toxic' RNAs.Additionally, we want to understand how alterations in fundamental aspects of RNA homeostasis may contribute to human diseases, which include but are not limited to neurodegenerative disorders. Our current disorders; Develop/utilize chemical, mutational, and sequencing-based techniques for the analysis of multiple disease-associated repeat RNA structures. Determine how RNA structure/ folding may contribute to translational regulations. Use the RNA structural information to develop/screen for chemical inhibitors of repeat-RNA associated toxicity; Ill. We are also interested in employing novel molecular chaperones (such as serine-rich chaperone protein 1 or, SRCP1 from Dictyostelium discoideum) to directly counter toxic aggregation-prone repeat peptides produced through translation of repeat RNAs.



AWARDS

1.Alzheimer's Association Research Fellowship (AARF-20-684648), 2020-23.
2.RNA Society 'poster recognition award' sponsored by National ScienceFoundation (NSF), USA. 2021
3. College of Agriculture and Life Sciences 'Excellence Fellowship', Texas A & M University
- College Station, Texas, USA. 2011-12

Professor

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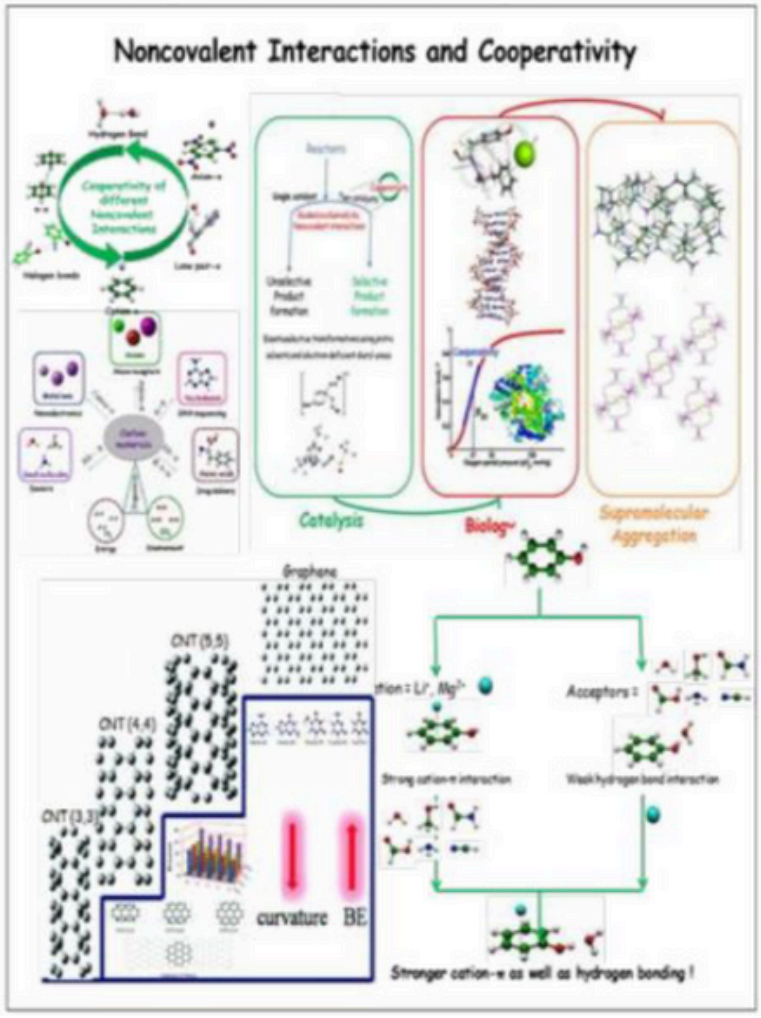
Dr G. Narahari Sastry

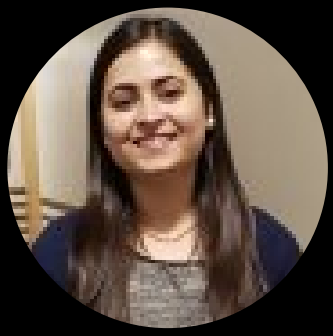
- **Non-covalent interactions**
- **Artificial intelligence and machine learning**
- **Computer aided drug design**
- **Software development Computational chemistry**
- **Molecular modeling &Bioinformatics**

With more than 330 publications across various disciplines reveal the highly interdisciplinary character of the group. A major area is developing indigenous software for drug design, Molecular Property Diagnostic Suite (MPDS). Several of the computational predictions from his group are verified experimentally and new experiments are carried out based on the computational methods. Employing the machine learning and Al along with the conventional computational and informatics based approaches to address fundamental problems in the area of biology, health, agriculture and material science.

AWARDS

- Shanti Swarup BhatnagarPrize 2011
- J.C. Bose NationalFellowship by DST, 2015
- National Bioscience Award of DBT, 2009
- Swarnajayanthi Fellowship of DST, 2005
- CRSI Medal for excellence in basic research, Silver Medal (2024), Bronze Medal (2009)
- B. C. Deb Memorial Award for Soil/ Physical Chemistry, Indian Science Congress, 2008
- B. M. Birla Scienceprize in Chemistry, 2001
- Alexander Von Humboldt Fellow,2006
- Fellow of Indian National Science Academy (FNA), Indian Academy of Sciences (FASc), National Academy of Sciences India (FNASc),Royal Society of Chemistry (FRSC), Biotech Research Society, India (FBRSI), Telangana Academy of Sciences (FTAS)





Assistant Professor

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Scholar: https://scholar.google.co.in/citations?user=MJMceCAAAAAJ&hl=en

Dr Savita Devi

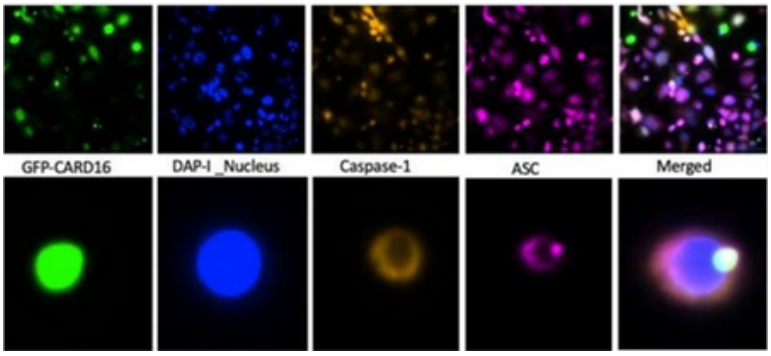
- **Molecular mechanisms of innateimmunity and inflammation regulation**
- **Human inflammasomes Nucleic acid sensors**
- **Innate immune sensors and Cancer Infection Immunology**

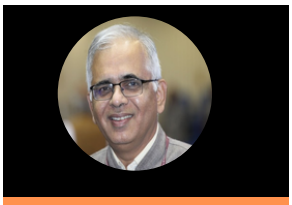
Our group employs various bioinformatics and computational techniques to develop in-silica models that can integrate multi-omics data for the inference, analysis and semi-automated development of networks for discovering novel biological mechanisms.

AWARDS

1. Associationof Microbiologists of India (AMI) Young Scientist Award (2022)
2. DST-INSPIRE Faculty Fellowship from DST India (2019)
3. European Molecular Biology Organization (EMBO) Travel Award (2019)
4. American Society for Microbiology Postdoctoral Travel Award (2018)
5. Editor at Microbiology Spectrum (ASM Publication) and Associate Editor for Genomics journal

My laboratory primarily studies the molecular mechanism of innate immunity and inflammation regulation in health and disease. We focused on the innate immune system and specifically on dissecting the molecular mechanisms of the hyper inflammatory host response during inflammatory and infectious disease, referred to as Cytokine Strom. Essentially, we work to define how our body senses and fights infections and how the same mechanisms can cause excessive inflammation and disease. Our goal is to provide the basis for the development of novel therapeutics to treat inflammatory and infectious diseases to ultimately benefit patients. To decipher the unique immune response to pathogens that eventually leads to multi organ failure: Sepsis, the body response to a life-threatening infection that causes damage to itself, is a leading cause of death around the globe, and failure of vital organs is one of the biggest contributors. Treatments of sepsis remain a serious concern and challenge in hospitals. Both Gram-positive and Gram-negative bacteria contributes towards the development of sepsis in clinical settings. However, all the drugs and treatments available so far is based on targeting the Gram-negative bacteria LPS or using broad spectrum antibiotics which further worsen the conditions.



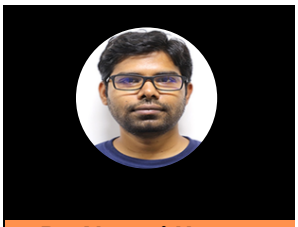


Dr. Shekhar C. Mande

Distinguished Professor

Area of Research:

- Structural and computational biology
- Genomics and bioinformatics



Dr. Neeraj Kumar

Affiliated Professor

Assistant Professor, Liberal Arts, IIT Hyderabad

Area of Research:

- Sensorimotor Learning, Motor Memory
- Non-invasive Brain Stimulation

Departmental Advisory Committee

Prof. Dulal Panda

Director, NIPER Mohali

Dr. Krishna Ella

Chairman and MD, Bharat Biotech

Prof. S Ramakrishna

Director, Center for Nanofibers and Nanotechnology,
Dept. of Mechanical Engineering, NUS
Singapore

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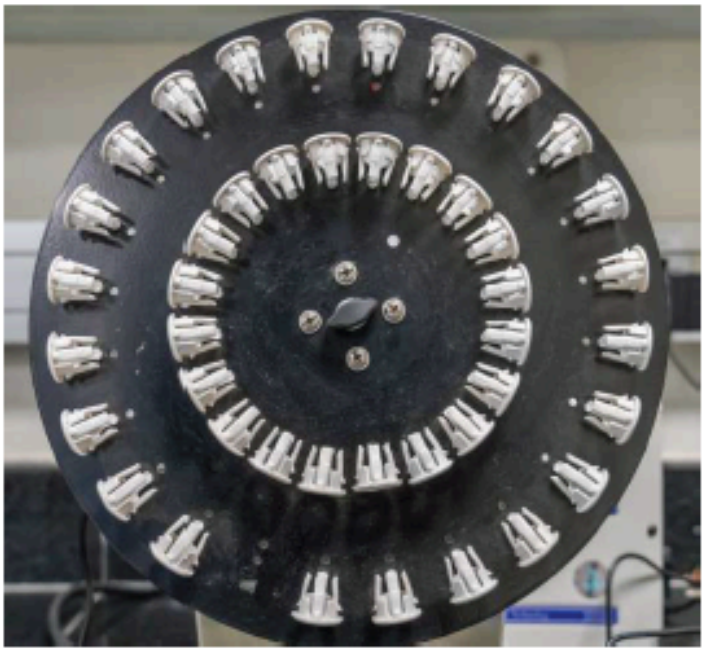
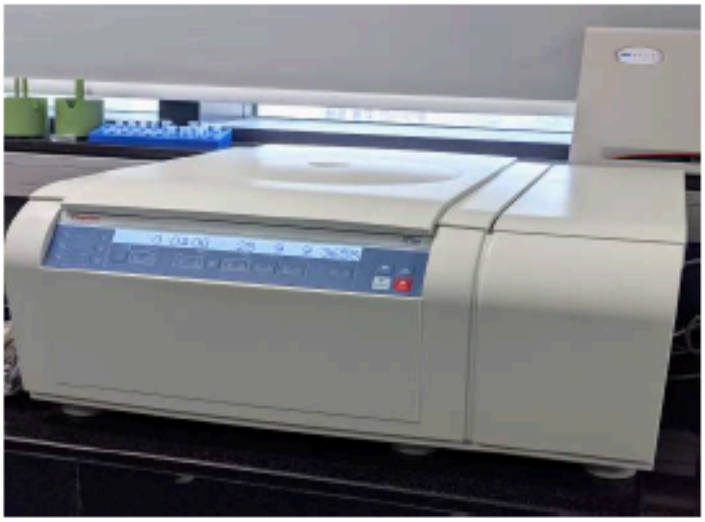
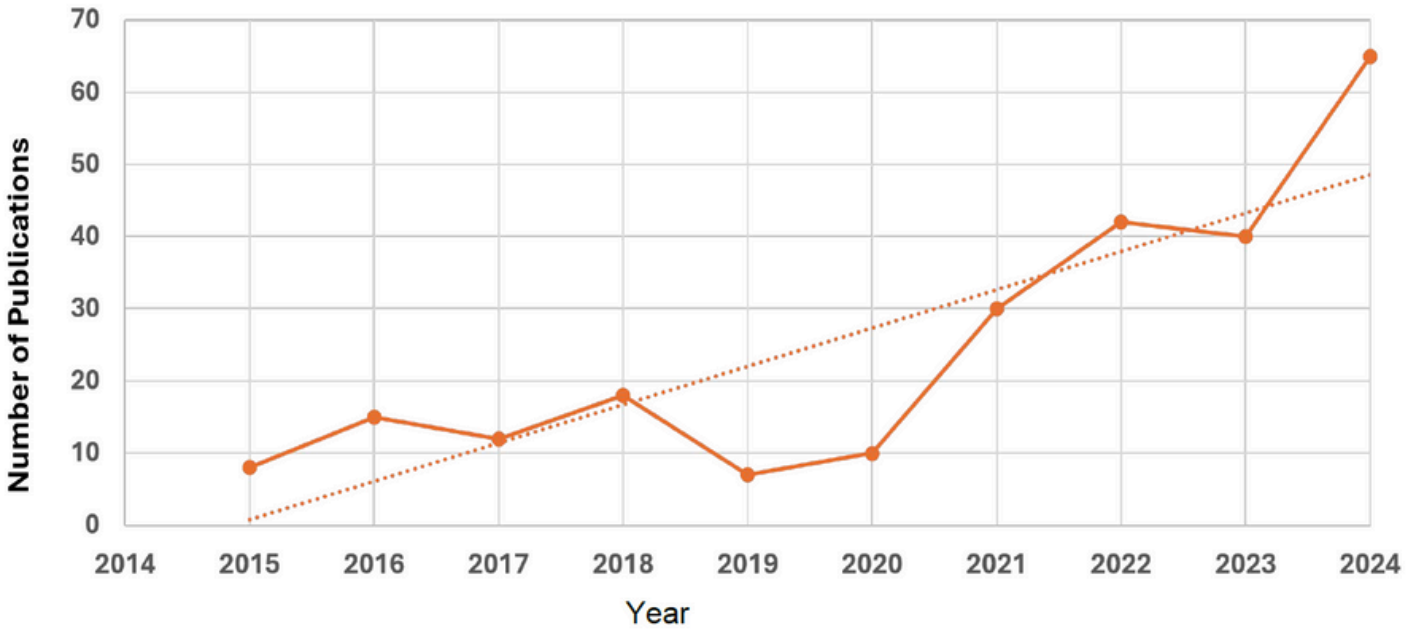
Research Facilities



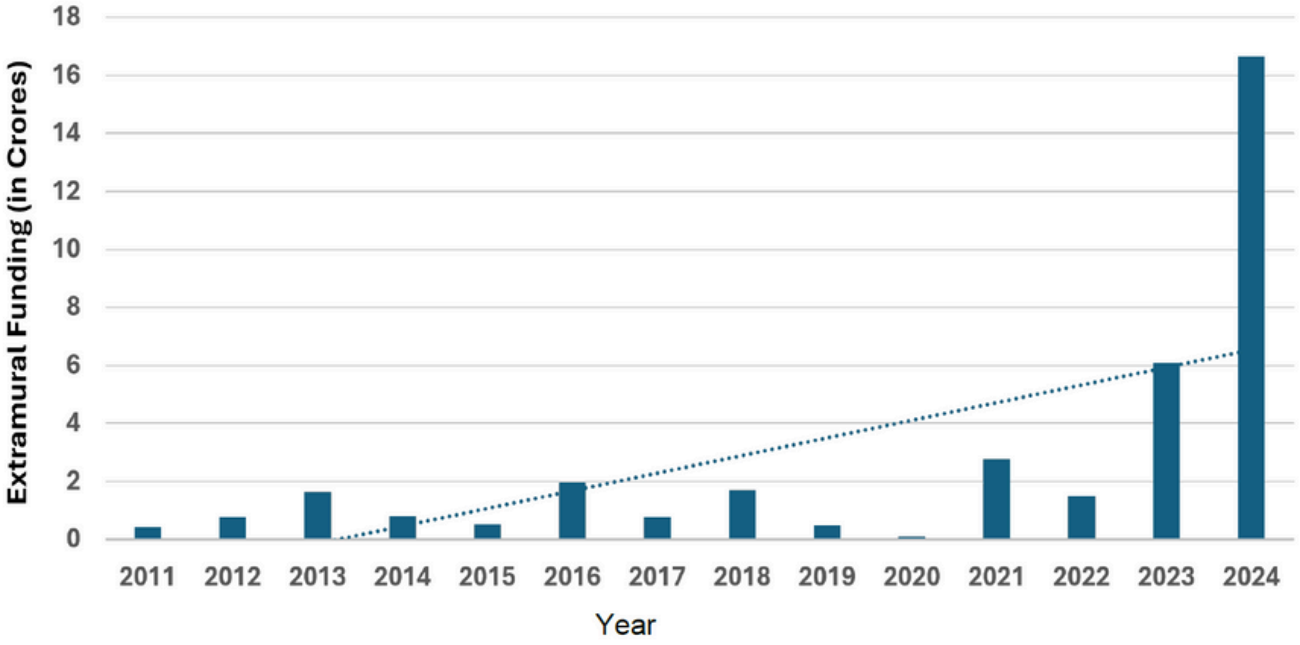


Research Publications and Fundings

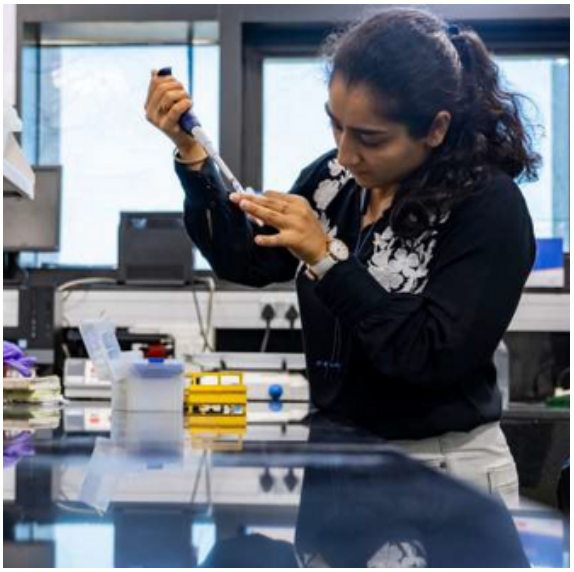
Publications



Sponsored Research



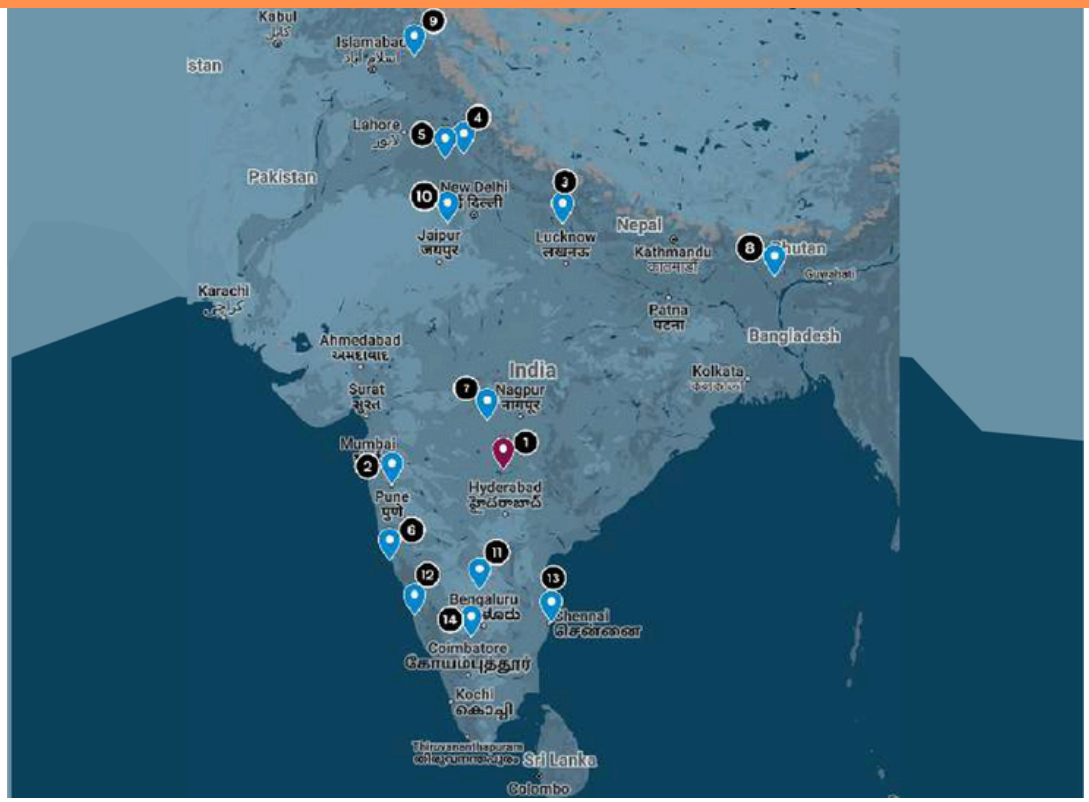
Life at Department of Biotechnology



International Collaboration

Point	S.N.	Collaborator Name	Institute Name	Institute Country
1	1	Prof. Peter Carmeliet	VIB-KU Leuven Center for Cancer Biology	Leuven, Belgium
2	2	Prof. Julia Gorelik	National Heart & Lung Institute, Imperial College	London, UK
	3	Prof. Jann Scott	Newcastle University	UK
3	4	Dr Andres Maturana	Nagoya University	Nagoya, Japan
4	5	Dr. Salim Timo Islam	INRS-Institut Armand-Frappier Center	Quebec, Canada
5	6	Prof. Mitchell Singer	Dept. of Microbiology and Molecular Genetics, University of California	Davis, USA
	7	Dr. Rebecca Parales		Davis, USA
6	8	Prof. Emina A. Stojković	College of Arts and Sciences, Northeastern Illinois University	Chicago, Illinois, USA
7	9	Dr. Pia H. Moisander	University of Massachusetts Dartmouth	Massachusetts, USA
8	10	Prof. Akira Shinohara	Osaka University	Osaka, Japan
9	11	Prof. Dr. Ulrich Schwaneberg	RWTH Aachen University	Aachen, Germany
10	12	Dr. Mehdi D. Davari	Leibniz Institute of Plant Biochemistry	Weinburg, Germany
11	13	Prof. Simon Moulton	Swinburne University of Technology	Australia
	14	Prof. Greg Murray		Australia
12	15	Prof. Richard Porter	University of Otago, Christchurch	New Zealand

National Collaborations



Point	S.N.	Collaborator Name	Institute Name
1	1	Dr. Nagarajan Ganapathy	IIT Hyderabad
	2	Dr Shishir Kumar	
	3	Dr. Rahul Kumar	
	4	Prof. T Shashidar	
	5	Dr. Suhanya Duraiswamy	
	6	Dr. Satyavrata Samavedi	
	7	Dr. Somnath Maji	
	8	Dr. Rajakumara Eerappa	
	9	Dr. Aravind Kumar Rengan	
	10	Dr. Krishna Guvvala	
	11	Prof. G. Satyanarayana	
	12	Prof. Sumohana Channappayya	
	13	Dr. Gunjan Mehta	
	14	Dr. Jyotsnendu Giri	
	15	Dr. Aravind Kumar Rengan,	
	16	Prof. Anindya Roy	
	17	Dr Swati Ghossh Acharyya	University of Hyderabad
	18	Dr. Vishal Rao	Indo-American Cancer Hospital, Hyderabad
	19	Dr. Shweta Tyagi	CDFD, Hyderabad
2	20	Dr. Ram Rup Sarkar	CSIR – NCL, Pune
3	21	Prof. Nishant Verma	KGMU Lucknow
4	22	Dr. Srikrishna Subramanian	CSIR-IMTECH, Chandigarh
5	23	Dr. Rachna Chaba	IISER Mohali, Punjab
6	24	Prof. Sanjeev C. Ghadi	Goa University, Goa
7	25	Dr. Sutharsan Govindarajan	SRM University, Amarawati, AP
8	26	Dr. Kapudeep Karmakar	UBKV, West Bengal
9	27	Dr. Qazi Parvaiz Hassan	CSIR – IIIM, J&K
10	28	Dr. Gunjan Goel	Central University of Haryana
11	29	Dr. Kaustuv Sanyal	JNCASR, Bengaluru, KA
12	30	Dr. Guruprasad Kalthur	Kasturba Medical College, Manipal, KA
13	31	Dr. Athi N. Naganathan	IIT Madras, Chennai, TN
14	32	Dr. P Ekambaram	Bharathiar University, Coimbatore, TN

Contact us

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Brochure Designed by
Ashwath Kumar B (MTech), Dr Gaurav Sharma and Prof. Anamika Bhargava, Dept of Biotechnology, IITH