DEPARTMENT OF BIOTECHNOLOGY

VOLUME - 3

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BIOPULSE

- THE PULSE OF PROGRESS IN BIOTECHNOLOGY

Department Vision and Mission

Department Vision

To excel in education, research, and entrepreneurship in various fields of Biotechnology for contribution to the evolving needs of the society

Department Mission

- To provide an excellent educational experience to the undergraduate students of Biotechnology through quality teaching and advanced curriculum with roots into the fundamentals, that enables students to become leaders in their chosen field of Biotechnology
- To provide vibrant learning and research environment that enables students to focus on lifelong learning to transform into entrepreneurs and renowned researchers
- To instill the spirit of innovation and creativity in young minds through participation in International and National level conferences/hackathons combined with a deep awareness of ethical responsibilities to profession and society

Programs Offered

B.Tech.
The program is designed to suit the needs of the young technology graduates looking to make a mark in a highly competitive market.

Placements
CBIT's Biotech students, riding on the back of the knowledge and skills acquired during the 4 years spent at the campus, have found placement in a number of big companies. These firms include IT giants like Wipro, Tech Mahindra, CTS, and Infosys along with major firms from other sectors, like Biological E. Limited, Deloitte, and Dr. Reddy's.

Students got placed in various companies like Dr. Reddy's Lab, Capgemini, Accenture, Generation Cognizant, Wipro, MuSigma, TCS, Winred Technologies etc.

Department Vision and Mission

B.Tech. (Biotechnology) Program Educational Objectives (PEOs)

The Biotechnology department is dedicated to graduating engineers who

- will demonstrate successful careers in the industry through scientific thinking, interpreting, analyzing experimental results, and pursue higher education, and research in reputed national and international institutes.
- will demonstrate leadership and initiative to advance professional and organizational goals with a commitment to ethical standards of profession, teamwork, and respect for the diverse cultural background.
- will be involved in lifelong /self-learning to keep abreast with the constantly evolving technologies for establishing start-ups and becoming successful entrepreneurs.
- will be committed to the creative practice of engineering and other professions in a responsible manner contributing to the socio-economic development of the society.

B.Tech. (Biotechnology) Program Outcomes (POs)

1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
2. Problem Analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.
6. The Engineer and Society: Apply to reason informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Principal's Message

Dr. C. V. Narasimhulu

Professor and Principal of CBIT

Dear All,

It is with immense pride and pleasure that I welcome you to **Chaitanya Bharathi Institute of Technology (CBIT)**, one of India's premier institutions and a beacon of excellence in technical education. Established in the year **1979**, CBIT has grown to become the pride of both Telugu states, fostering a rich legacy of academic distinction, research excellence, and holistic development.

As an autonomous institution, CBIT is dedicated to achieving its vision of becoming a "Centre of Excellence in Technical Education and Research." Our commitment to academic rigor and innovation is reflected in our consistent recognition, including **NBA accreditation (secured seven times since 1998) and NAAC A++ accreditation (Cycle 3, 2023)**. With a state-of-the-art campus, cutting-edge infrastructure, and a highly experienced faculty, CBIT ensures that students receive quality education that aligns seamlessly with the ever-evolving challenges of Industry 5.0.

Our meticulously designed curriculum integrates key educational frameworks, including AICTE guidelines, the National Education Policy (NEP-2020), and Outcome-Based Education (OBE). This robust academic structure encourages creativity, innovation, critical thinking, and problem-solving skills, ensuring that our students emerge as future-ready professionals.

At CBIT, we recognize that education extends beyond the classroom. We take immense pride in fostering an ecosystem that nurtures entrepreneurial aspirations and industry collaboration. Our **Entrepreneur Development Centre (EDC), start-up incubation initiatives, and strong industry linkages** empower students to translate ideas into impactful innovations. With abundant opportunities for top-tier placements, research endeavors, patent filings, and leadership development, CBIT provides a dynamic platform for students to explore and excel in their chosen fields.

Furthermore, with **56+ vibrant student activity clubs**, we promote holistic learning, ensuring that students not only thrive academically but also develop essential life skills, leadership qualities, and a strong sense of social responsibility.

As an institution committed to pragmatic and outcome-driven education, I emphasize the **"5Ps"—Placements, Publications, Projects, Patents, and Participatory Administration**. These guiding pillars serve as a foundation for our collective growth and success.

I encourage each of you to actively engage in the myriad opportunities available at CBIT, contribute to our rich legacy, and strive for excellence in all your endeavors. Together, let us shape a future of innovation, knowledge, and leadership.

Wishing you an enriching, fulfilling, and joyful learning experience at CBIT!

HOD's Message

Dr. Rajasri Yadavalli

Associate Professor and HOD,

Department of Biotechnology, CBIT

Welcome to the **Department of Biotechnology** at CBIT!

Established in the year 2005, the Department of Biotechnology at Chaitanya Bharathi Institute of Technology (CBIT) has been at the forefront of providing exceptional education, pioneering research, and hands-on training in diverse and evolving domains of biotechnology. With a strong commitment to academic excellence and innovation, we equip our students with cutting-edge knowledge and practical expertise in core disciplines such as **Plant, Animal, Industrial, Environmental, and Medical Biotechnology**, alongside specialized fields like **Computational Biology and Bioprocess Engineering**.

Recognizing the **interdisciplinary nature** of biotechnology and its far-reaching applications, our department has embraced modern, transformative domains that are shaping the future of the industry. These include **Biomaterials, Tissue Engineering, Biosimilars, Drug Design & Delivery, Nanobiotechnology, and Structural Biology**. Our focus on advanced analytical instrumentation and emerging technologies bridges the crucial gap between academic research and industrial application, ensuring that our students remain at the forefront of scientific advancements.

To foster experiential and participatory learning, our students gain firsthand exposure to the real-world biotechnology landscape through visits to prestigious research organizations and industry leaders such as **CSIR-CCMB, IICT, CDFD, NIAB, Dr. Reddy's Laboratories, and IISc Bangalore**. These immersive experiences enable students to engage with cutting-edge research, interact with industry professionals, and understand the latest technological innovations.

Beyond academics, our department places a strong emphasis on **career development and leadership growth**. Students benefit from a dynamic ecosystem of **industry internships, research collaborations, national and international seminars, technical workshops, club activities, and career fairs**. These opportunities not only enhance their technical competencies but also cultivate critical thinking, problem-solving, and entrepreneurial skills essential for thriving in the biotechnology industry.

Furthermore, we take immense pride in our faculty and students' active participation in societal and environmental initiatives. Through **sustainable research, community-driven projects, and entrepreneurial ventures**, our department remains steadfast in its mission to create a positive impact on the world. By nurturing a spirit of innovation, ethical responsibility, and scientific inquiry, we empower our students to become future leaders, researchers, and entrepreneurs who drive meaningful change in biotechnology and beyond.

At the Department of Biotechnology, CBIT, we are dedicated to fostering a **culture of excellence, curiosity, and transformative learning**. We invite you to embark on this exciting journey of discovery and innovation with us and become a part of a community that is shaping the future of biotechnology.

Wishing you a rewarding and enriching academic experience!

Importance of the Bioengineering and Biotechnology Club of CBIT (BBCC)

In an era where biotechnology is revolutionizing healthcare, sustainability, and industry, the Bioengineering and Biotechnology Club at CBIT stands as a beacon of innovation and excellence. This dynamic platform empowers students to push the boundaries of science, develop cutting-edge solutions, and shape the future of biotechnology. With a strong emphasis on skill development, the club provides hands-on exposure to advanced techniques such as CRISPR, bioinformatics, molecular biology, and bioprocessing. Through research projects, industry collaborations, and mentorship, students gain the expertise needed to excel in academia and the biotech sector. Practical training, workshops, and access to lab facilities help members bridge the gap between theoretical knowledge and real-world application. Beyond technical growth, the club fosters leadership, teamwork, and entrepreneurial thinking. Members engage in hackathons, innovation challenges, and startup incubation programs, transforming ideas into real-world solutions. The club also offers exposure to cutting-edge trends like biomaterials, synthetic biology, computational biology, and regenerative medicine, equipping students with the skills to tackle some of the world's most pressing challenges.

Networking opportunities with leading researchers, industry experts, and alumni ensure that students are well-prepared for careers in biotechnology, pharmaceuticals, healthcare, and environmental sciences. Whether aspiring to work in research, industry, or entrepreneurship, members gain invaluable insights into higher education prospects, placement opportunities, and startup mentorship. More than just a student organization, the Bioengineering and Biotechnology Club is a gateway to global opportunities. From participation in prestigious biotech competitions like iGEM to collaboration with international researchers and institutions, students have the chance to contribute to scientific advancements on a larger scale. Additionally, community-oriented projects such as biowaste management, water purification, and public health awareness campaigns allow members to make a meaningful social impact. At its core, the club is a hub for curiosity, innovation, and collaboration—a space where students not only learn but actively contribute to advancements that shape society. Whether you are passionate about pioneering new medical breakthroughs, solving global sustainability challenges, or leading the next wave of biotech startups, this club provides the resources, mentorship, and opportunities to help you succeed.

Faculty Coordinator's Message

Dr. B. Sumithra
Assistant Professor, Department of Biotechnology, CBIT

Dr. Sanjeeb Kumar Mandal
Assistant Professor, Department of Biotechnology, CBIT

It is with great enthusiasm that we introduce you to the **Bioengineering & Biotechnology Club** at Chaitanya Bharathi Institute of Technology (CBIT), a vibrant and dynamic platform dedicated to fostering innovation, research, and hands-on learning in the ever-evolving fields of biotechnology and bioengineering.

As the Faculty Coordinators, **Dr. B. Sumithra and Dr. Sanjeeb Kumar Mandal**, we take immense pride in guiding and mentoring students as they explore groundbreaking domains such as **Biomaterials, Tissue Engineering, and Nano-biotechnology**. Our club serves as an intellectual hub where curiosity meets creativity, allowing students to bridge the gap between **theoretical knowledge and practical applications**.

Through **interactive workshops, insightful seminars, industrial visits, and research-driven internships**, we provide students with unparalleled exposure to cutting-edge technologies and real-world challenges. These initiatives not only enhance academic learning but also equip students with essential problem-solving skills, technical expertise, and industry-relevant experience, ensuring they are well-prepared to thrive in their careers.

Beyond academics, our club strongly emphasizes **leadership, teamwork, and entrepreneurial spirit**. We encourage students to take the initiative in driving research projects, collaborative innovations, and socially impactful solutions. Whether you are passionate about scientific discovery, technological advancements, or pioneering your own biotech startup, this club is the ideal environment to learn, explore, and grow.

By joining the Bioengineering & Biotechnology Club, you will become part of a **forward-thinking community dedicated to shaping the future of biotechnology**. Together, we will embark on an inspiring journey of knowledge, exploration, and innovation, working towards breakthroughs that positively impact society and the global scientific community.

We invite you to be a part of this exciting venture—connect, collaborate, and contribute to the ever-expanding world of biotechnology!

Let's learn, innovate, and make a difference!

Student Presidents' Message

Hey everyone!

We are **Kirthika Sundar** and **Srikanth Muthyala**, the proud presidents of the Bioengineering & Biotechnology Club at CBIT! If you have a passion for biotechnology, research, and innovation—or even if you're just curious about cutting-edge fields like Tissue Engineering, Nano-biotechnology, and Drug Design—then you've found the perfect place to explore, experiment, and grow!

Our club is a **hub of creativity, learning,** and **real-world application**. We don't just talk about science—we bring it to life through hands-on workshops, industry visits, and interactive projects that bridge the gap between classroom knowledge and practical experience. Whether you want to work with advanced biotech tools, explore futuristic research topics, or connect with industry professionals, we create the right opportunities for you to gain invaluable exposure and hands-on expertise.

But biotech isn't just about science—it's about impact. That's why we emphasize not only technical skills but also **leadership, problem-solving, and entrepreneurship**. The world of biotechnology is evolving rapidly, and we believe in empowering our members to become **innovators, thinkers, and changemakers** who can drive meaningful progress in healthcare, environmental sustainability, and beyond.

At the heart of our club is a passionate team of creative minds who love pushing the boundaries of what's possible in bioengineering. From organizing engaging events and competitions to collaborating on groundbreaking research projects, we work together to make this club a vibrant and inspiring learning space for all.

So, whether you're here to **learn something new, experiment with exciting ideas, collaborate on research, or simply geek out with like-minded individuals**, we invite you to join us on this thrilling journey. Let's innovate, explore, and build something amazing—together!

Welcome to the future of bioengineering at CBIT!

Kirthika Shanmuga Sundar

4th Year, Department of Biotechnology, CBIT

Srikanth Muthyala

3rd Year, Department of Biotechnology, CBIT

BRSI: Biotechnology Popularization and Skill Development Program

01 *BRSI*

Ms. Yamini Arlibandi from Dr. Reddy's and Mr. Finny Thomas from Granules India

On **August 30-31, 2024**, Chaitanya Bharathi Institute of Technology (CBIT) successfully conducted the **"BRSI Biotechnology Popularization and Skill Development Program"**—a transformative initiative aimed at educating and inspiring young minds about the vast potential of biotechnology. Sponsored by the prestigious Biotech Research Society of India (BRSI), this program was designed to enhance awareness and cultivate interest in biotechnology among students from classes 9 to 12.

The event saw enthusiastic participation from various schools across the region, including international representation from Dubai, making it a truly global learning experience. Through a combination of engaging theoretical sessions and hands-on practical workshops, students explored the fascinating world of genetic engineering, micropropagation, and DNA extraction. These interactive activities provided them with a solid foundation in essential biotechnological concepts and laboratory techniques, bridging the gap between textbook knowledge and real-world application.

Adding immense value to the program were distinguished guest speakers Ms. Yamini Arlibandi, Research Associate, Dr. Reddy's Laboratories, Hyderabad, and Mr. Finny Thomas, General Manager & Head, Fermentation, Granules India Limited, Hyderabad. Their insightful sessions on career opportunities in biotechnology offered students a clearer understanding of the diverse professional pathways available in this rapidly evolving field, from pharmaceutical innovations to biomedical research and industrial applications.

The program was conducted under the visionary leadership of Dr. Rajasri Yadavalli, Dr. Bishwambhar Mishra, and Dr. C. Nagendranath Reddy, faculty of the biotechnology department, whose guidance and expertise ensured the event's success and impact. Their dedication to fostering scientific curiosity and skill development was widely appreciated, and the program was commended for igniting a passion for biotechnology among the next generation of aspiring scientists and innovators.

CBIT remains committed to nurturing young talent and advancing scientific literacy, and this initiative marks another significant step in its mission to empower students with the knowledge, skills, and inspiration to excel in the field of biotechnology.

PLANTATION DRIVE

02 *PLANTATION DRIVE: "One a Week, Let Nature Speak"*

The Department of Biotechnology at Chaitanya Bharathi Institute of Technology (CBIT), in collaboration with the Bioengineering and Biotechnology Club (BBCC), successfully conducted a Plantation Drive titled **"One a Week, Let Nature Speak"** from **September 1 to October 6, 2024**. This initiative was designed to promote sustainability, foster environmental consciousness, and actively engage the community in conservation efforts.

Under the expert guidance of distinguished faculty members, the initiative saw remarkable participation and enthusiasm. Leading the charge was Dr. Ashoutosh Panday, Head of the Department, alongside dedicated faculty mentors, including Dr. G. Vijaya Lakshmi, Dr. Yadavalli Rajasri, Dr. C. Nagendranatha Reddy, Dr. Dharmalingam K, Dr. Kiran Yellappa Vajanthri, and Dr. Sanjeeb Kumar Mandal. Their unwavering support and expertise played a pivotal role in shaping the event's success.

Additionally, Dr. Bishwambhar Mishra provided invaluable support, contributing significantly to the execution and impact of the initiative. The club members, along with faculty, students, and volunteers, worked collectively to plant numerous trees, thereby reinforcing the importance of environmental stewardship and sustainable living.

Beyond just planting trees, this initiative sought to instill a sense of responsibility toward nature among participants, fostering an understanding of how small, consistent efforts can lead to long-term ecological benefits. The enthusiastic involvement of students, faculty, and staff has laid the foundation for a culture of sustainability that CBIT hopes will continue to flourish in the years to come.

The BBCC Club extends its heartfelt gratitude to everyone who contributed to this cause, from dedicated participants and faculty mentors to the supporters who championed this initiative. Their combined efforts are helping create a greener, healthier environment and inspiring future generations to prioritize sustainability and community-driven environmental action.

CBIT remains committed to environmental responsibility, innovation, and community engagement. The success of "One a Week, Let Nature Speak" serves as a catalyst for continued efforts toward ecological preservation, sustainable development, and climate-conscious action.

GUEST LECTURE

03 *Alzheimer's Day*

Alzheimer's and Related Disorders Society of India (ARDSI)

The Department of Biotechnology, in collaboration with the Bioengineering and Biotechnology Club of CBIT (BBCC) and The Alzheimer's and Related Disorders Society of India (ARDSI), held an important event "**Alzheimer's Day,"** on **September 26, 2024**, to raise awareness about Alzheimer's disease and dementia. The event was led by Dr. C. V. Narasimhulu, Principal of CBIT, alongside esteemed faculty members, including Dr. P. V. R. Ravindar Reddy, Director of Student Affairs, and Dr. Ashoutosh Panday, with immense support of faculty coordinator of BBCC- CBIT, Dr. G. Vijaya Laxmi. Keynote speakers Dr. Mani Toley and Saadiya Hurzuk members of the Alzheimer's and Related Disorders Society of India (ARDSI) shared valuable insights into dementia, a condition currently affecting approximately 8.8 million individuals in India. The event emphasized the significant lack of adequate care services and the social stigma that often accompanies dementia, which weighs heavily on families and caregivers. It was highlighted that biotechnology students play a crucial role in developing innovative solutions to improve the quality of life for those affected. Collaborative efforts involving healthcare professionals, researchers, and caregivers are essential to effectively address this issue. The event concluded with a call to action for young individuals to engage in research initiatives and a proposed outreach program to raise awareness in local communities.

GUEST LECTURE

04 *Apoptosis*

Mr. Meduri Ruthwick, M.Tech. Biol. Eng.
IIT Gandhinagar

On **October 21, 2024**, Mr. Meduri Ruthwick, an M. Tech student in Biological Engineering at IIT, Gandhinagar and a distinguished alumnus of CBIT, delivered an insightful talk titled **"Apoptosis - A Tale to Tell"**. Known for his academic and extracurricular achievements, Ruthwick shared his expertise with students and faculty of the Biotechnology department. In his presentation, Ruthwick delved into the process of apoptosis, covering essential cell biology concepts. He discussed the cell cycle phases (G1, S, G2, and M), emphasizing the importance of checkpoints in cell division. He then highlighted the role of the Retinoblastoma (RB) gene in determining cell fate, explaining how its phosphorylation affects cellular outcomes. Moving to the p53 gene, Ruthwick described it as the "master guardian" of the cell, essential in preventing tumor growth and a major factor in both healthy and cancerous cells. Through his narrative of the "Tale of Apoptosis," Ruthwick brought clarity and fascination to these intricate cellular processes, illustrating the beauty of biology.

In addition to the technical insights, Ruthwick offered students valuable advice drawn from his own academic journey. He stressed the importance of curiosity, building strong foundations in the subject, and cherishing the learning process. Encouraging students to seek close mentorship, he shared his experiences of active learning, resilience, and persistence, underscoring that failures are a natural part of growth. The session left students inspired to pursue their studies with enthusiasm, overcome challenges with determination, and make the most of their educational journey.

iCBIT 2024

05 2nd International Conference of Biotechnology and it's Interdisciplinary Technologies 2024

On **December 13-14, 2024**, **"Second International Conference on Biotechnology and it`s Interdisciplinary Technologies,"**, hosted by the Department of Biotechnology at Chaitanya Bharathi Institute of Technology (CBIT), commenced with an inaugural ceremony graced by esteemed academicians, industry experts, and researchers. Anchors Ms. Pranavi and Mr. Srikanth set the tone for the event by emphasizing the significance of interdisciplinary collaboration in biotechnology. The session featured insightful addresses, with Dr. Rajasri Yadavalli, HoD, Biotechnology, highlighting the need for sustainability in biotechnological advancements, while Dr. K. Ramesh, HoD, Chemistry, and Dr. B. Sreenivasa Reddy, HoD, Physics, discussed innovations in chemistry and physics that contribute to the field. As a symbolic gesture of commitment to growth and sustainability, dignitaries were presented with potted plants. The keynote address, delivered by Prof. Senthilkumar Sivaprakasam from IIT Guwahati, provided an in-depth exploration of Bioprocess Analytical Technology, the One Health Approach, and emerging technologies such as AI, CRISPR, and Synthetic Biology. The session concluded with an engaging Q&A, fostering academic collaboration and intellectual exchange.

On the second day, the conference continued with thought-provoking keynote addresses by Dr. M. Venkateswara Reddy from the University of Cincinnati, USA, and Dr. S. Venkata Mohan, Chief Scientist at CSIR-IICT, Hyderabad, who shared groundbreaking insights into biotechnology applications. The event saw participation from over 200 researchers worldwide, who presented their work across various domains of biotechnology, making it a truly enriching experience. The Department of Biotechnology extended its heartfelt gratitude to the CBIT leadership, faculty members, sponsors, and student volunteers for their invaluable contributions, ensuring the success of the conference. Participants were encouraged to engage actively in discussions and collaborations that would drive future advancements in the field. As the event concluded, the spirit of innovation, research, and interdisciplinary learning remained at the heart of CBIT's commitment to shaping the future of biotechnology.

WORLD CANCER DAY

06

Guest lecture by

Dr. Banda Ravi Teja, Consultant Medical & Hemato Oncologist at Continental Hospitals, Hyderabad

In observance of World Cancer Day, on **February 4, 2025**, the Department of Biotechnology at Chaitanya Bharathi Institute of Technology (CBIT), in collaboration with the Biotechnology and Bioengineering Club (BBCC), successfully hosted a guest lecture on "Redefining Cancer Care: The Future of Research and Innovation". The event aimed to enhance awareness about cancer care, emphasizing early detection, cutting-edge treatment strategies, and the role of scientific research in shaping the future of oncology. Through engaging discussions and expert insights, the session encouraged proactive cancer prevention and care in the community.

The session featured a keynote address by Dr. Banda Ravi Teja, MD-General Medicine, DM-Oncology, Consultant Medical and Hemato-Oncologist at Continental Hospitals, Hyderabad, who provided deep insights into breakthroughs in cancer research, the importance of genetics and lifestyle in reducing cancer risk, and the crucial role of early diagnosis in improving treatment outcomes. The lecture was highly engaging, with an interactive Q&A session where students and faculty actively participated.

Following the lecture, a cancer awareness walk was conducted to reinforce the message of collective action against cancer. Participants walked in solidarity, carrying banners and chanting the slogan: "Step by step, mile by mile, let's beat cancer with a smile." This initiative symbolized the commitment of CBIT students and faculty towards raising awareness and advocating for early detection and prevention.

A special mention goes to C. V. Narasimhulu, Professor and Principal of CBIT; Dr. M. Ganeshwar Reddy, Professor, Department of Mathematics; Dr. P. Radha Krishna Prasad, Assistant Professor, Department of Mechanical Engineering; and Dr. Linga Reddy, Professor and Director of Student Affairs, for their invaluable support in making the event a success. The event was organized under the guidance of Dr. Y. Rajasri, Head of the Department of Biotechnology; Dr. C. Obula Reddy; and the Faculty Coordinators Dr. B. Sumithra and Dr. Sanjeeb Kumar Mandal from the Department of Biotechnology.

Partners in Progress: Visit to Prathista Industries Inspire CBIT's Next-Gen Innovators

The Department of Biotechnology at CBIT, Hyderabad, recently connected classroom learning with real-world industry through two exciting events. Fourth-semester students visited Prathista Fermentation Industries on **March 27, 2025**, where they saw firsthand how large-scale fermentation works—like operating bioreactors and producing enzymes used in medicines, food, and eco-friendly chemicals. This hands-on tour helped students grasp how textbook concepts translate to real industries. A big thanks to Prathista Industries and Mr. Mishra for sharing their knowledge and inspiring the next generation of biotech leaders!

Visit to The Telangana State Medicinal Plant Board at Aziz Nagar, Moinabad

The field visit to the Telangana State Medicinal Plant Board at Aziz Nagar, Moinabad, on **October 23, 2024**, was informative and enriching for the students of 3rd Year, B.Tech Biotechnology. The students learned about the importance of medicinal plants in both modern and traditional medicine. The visit showcased a variety of plants with therapeutic benefits, from common ones like Tulsi and Neem to rare species like Sinduram Chettu, highlighting biodiversity and conservation efforts. The Board's initiative **"Maa Ke Naam Pe Ek Paudha"** encouraged tree planting in mothers' names for environmental conservation. The students were given saplings to plant on our college campus as part of this initiative.

The visit emphasized the crucial role of medicinal plants in research and health practices, showcasing how biotechnology can enhance cultivation and conservation. The students gained a deeper understanding of the connection between plant science and human health, inspiring us to contribute to plant biotechnology research and the development of herbal medicines. The experience deepened our appreciation for the Board's work and our responsibility towards environmental conservation and sustainable plant resource utilization.

Special Mention: Dr. Sandhya Kumaraswamy

With close to a decade of dedicated research experience and over 15 years of impactful work within the biopharmaceutical industry, Dr. Sandhya Kumaraswamy has been a driving force in the advancement of R&D, Quality Control, and Regulatory Affairs. Her career is marked by substantial contributions, particularly in areas that require a meticulous balance of scientific rigor and regulatory insight. In her current role as the Head of Learning Services at CRAMbridge, Dr. Kumaraswamy spearheads the creation and implementation of innovative training programs designed to enhance GMP (Good Manufacturing Practices) compliance.

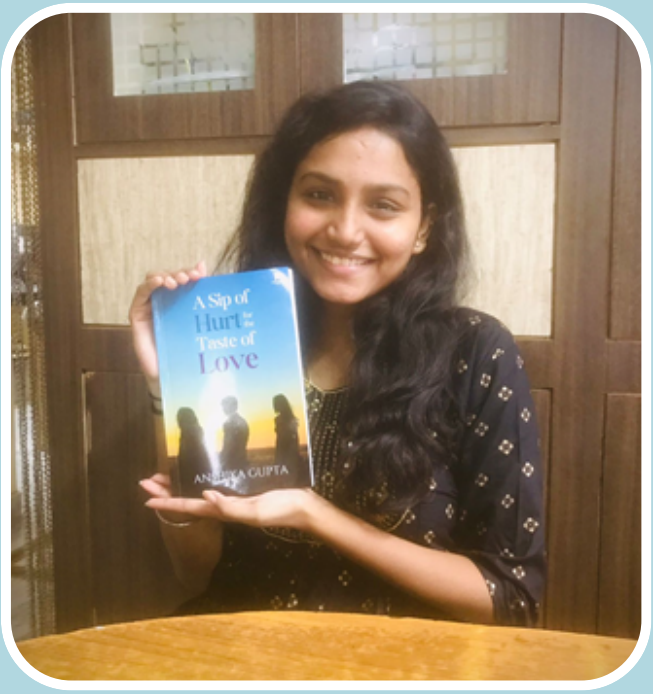
Dr. Sandhya Kumaraswamy

Adjunct Professor, Department of Biotechnology, CBIT

Her efforts ensure that teams are thoroughly equipped with the critical skills and knowledge needed to uphold the highest standards in the field. By emphasizing hands-on techniques and compliance-oriented approaches, her training modules empower professionals to meet stringent industry demands with confidence.

Before her current role, Dr. Kumaraswami made significant contributions at Dr. Reddy's Laboratories, Hyderabad, where she led Chemistry, Manufacturing, and Controls (CMC) regulatory strategies. Her leadership was instrumental in navigating complex regulatory landscapes, contributing to the successful approval and market entry of numerous biotherapeutic products across global regions. Renowned for her technical acumen and strategic insight, Dr. Kumarswami is also celebrated as a natural leader and mentor. She has a deep commitment to nurturing talent, promoting collaboration, and fostering a culture of excellence within the biopharmaceutical sector. Her passion for innovation and knowledge-sharing continues to inspire those she leads, making her a respected figure in the field.

STUDENT ACHIEVEMENTS



Anshika Gupta

Ms. Anshika Gupta is the author of **"A Sip of Hurt for the Taste of Love,"** a book compelling enough to unravel the mysteries and complexities of love, loss, and emotional growth. Blending aspects of vulnerability with hope, a book like this opens a wide scope of studying pain and heartbreak that might mould one's pursuit of love. Ms. Gupta, through poetic prose and reflective storytelling, brings out the human experience, that readers will learn to love their happiness and sorrow that comes along with relationships. This heartwarming narrative touches any individual who may have gone through the complexities of loving and self-realisation, making for one of the most touching explorations on emotional healing.

Ms. Kirthika Shanmuga Sunder received a prize at the Institute of Engineers competition for the essay **"Artificial Intelligence and Sustainability—The Role It Plays"**. This competition offered her the initial platform with which to pursue the solving capability of AI concerning environmentally irritating issues and on returning to live sustainably. The essay explained innovative ways in which AI can be used to improve the usage of resources, waste elimination, and contribute to grand goals sustainability by the world: this has shown how technology is increasingly becoming relevant in solving major environmental issues.

Kirthika Shanmuga Sunder

STUDENT ACHIEVEMENTS

Mr. Tanmay Dacha's remarkable achievement at the state-level athletics competition on November 9, 2024, is a testament to his unwavering dedication and exceptional skill in the sport of discus throw. His gold medal win not only highlights his physical strength and precision but also his disciplined approach to training and preparation. Throughout his athletic journey, Tanmay has consistently pushed himself to new limits, working tirelessly to improve his technique and endurance. His performance at this event serves as a clear indicator of his growing dominance in the field of athletics, positioning him as a rising star in the discipline. Tanmay's success is a reflection of the hard work and commitment he puts into his craft, making him a role model for aspiring athletes and reinforcing his status as a key figure in his sport.

Tanmay Dacha

Gadde Padma Priyasha and Rishika Malyala

Ms. Gadde Padma Priyasha and Ms. Rishika Malyala, third-semester students of Biotechnology, represented our college as part of a delegation at VASAVI-MUN. In combination with peers from other branches, they competed against 300 students from the Indian institutions, where their team won the Best Delegation Award. It showcases that these students possess high levels of diplomatic skills, teamwork, and a sense of excellence to achieve at the Model United Nations conferences. The competition, designed as real United Nations procedures, would allow them to seriously discuss issues in the world. Ms. Rishika Malyala won "Special Mention" at the Inter-Collegiate Conference (ICC) 2024 organized by CBIT-MUN for her outstanding debate and committee performances.

STUDENT ACHIEVEMENTS

Ms. Gadde Padma Priyasha achieved a remarkable feat by winning the “Best Reporter Award” in the Research and Analysis Wing (RAW) Committee at the Concordia Youth Parliament 2024. This prestigious event, organized by the Rotary Club of Hyderabad East on December 28–29, 2024, was a simulation of the Indian Parliament, where young delegates engaged in debates and discussions on national issues. Competing against 200 delegates, Padma Priyasha stood out for her exceptional reporting skills, earning the coveted award and a cash prize of ₹8,000. Her ability to analyze, report, and present complex political matters with clarity and precision demonstrated her keen understanding of parliamentary procedures and the intricacies of governance. This achievement not only highlights her aptitude in research and analysis but also showcases her potential as a future leader and policy analyst, contributing to her growing reputation in academic and professional circles.

Gadde Padma Priyasha

At various prestigious conferences, the achievements of Ms. Rishika Malyala have been truly remarkable. With consistent performance, they were awarded Special Mention-II at CBIT ICC'24, Special Mention-I at WIE Conferencia 6.0, and Special Mention-I at the Concordia Youth Parliament 2024, showcasing her strong debating and diplomatic skills across multiple platforms. Additionally, her dedication and exceptional performance were recognized with the Best Delegate award at GNITSMUN'25, where she demonstrated remarkable leadership and negotiation abilities. These accolades underline her exceptional aptitude in Model United Nations conferences, demonstrating her commitment to excellence in public speaking, diplomacy, and global problem-solving.

Rishika Malyala

STUDENT ACHIEVEMENTS

Ms. Sreya Palakodeti and her team demonstrated exceptional entrepreneurial skills by reaching the finals of TiE Grad 2024, a prestigious and highly competitive platform for student startups and innovations. Their journey was marked by multiple rigorous rounds, each requiring sharp business acumen, creative problem-solving, and adaptability to market needs. Sreya and her team's innovative ideas and strategic approach caught the attention of industry experts, earning them a spot among the top finalists. Their success at TiE Grad 2024 highlights their potential to turn entrepreneurial ideas into successful ventures, marking a significant milestone in their careers as aspiring entrepreneurs.

Sreya Palakodeti

Advaith Roy

Mr. Advaith Roy captivated the audience and judges with his extraordinary musical talent, clinching 1st Prize in the classical singing competition "Surshringar" at Mood Indigo, Asia's Largest College Fest, on December 25, 2024. Organized by IIT Bombay, this prestigious event gathers some of the best musical talents from across the country. Advaith's victory not only showcases his exceptional skills in Indian classical music but also his deep commitment to honing his craft. His performance demonstrated remarkable vocal control, emotional depth, and technical proficiency, making his win a testament to his dedication and passion for the art form, as well as his ability to perform at the highest level in a competitive environment.

ALUMNI ACHIEVEMENTS

From the classrooms of Chaitanya Bharathi Institute of Technology to the prestigious halls of Stanford University, alumna Dr. Vidhyani Suryadevara has transformed her aspirations into remarkable accomplishments. As a Lead Investigator, TEDx speaker, and Instructor in the Department of Radiology at Stanford University, she's making strides in global health and radiology innovation. Her role as a Faculty Fellow at the Centre for Innovation in Global Health further underscores her dedication to advancing healthcare on a global scale, making her a true inspiration for students and faculty alike.

Vidhyani Suryadevara

Her recent works, supported by an International Skeletal Society seed grant, conducted innovative research with significant impact. She expressed gratitude and presented her findings to radiologists and pathologists worldwide, marking a proud moment in her career.

Dr. Vidhyani presented research on osteoarthritis MRI method, moderated a session on radiotheranostics at the 2024 World Molecular Imaging Congress, and received recognition as U.S. ambassador in the 2023 congress. Dr. Suryadevara has authored numerous publications in the domains of biomedical research and radiology.

Dr. Vidhyani Suryadevara has received multiple honors for her exceptional work and brilliance in her field. Her accomplishments are a tremendous source of motivation for the upcoming generation of professionals. She is an inspiration to young people who aspire to be like her because of her commitment, creativity, and leadership, which perfectly capture what it means to aim for greatness. Dr. Vidhyani's success is a tribute to her vision and hard work, inspiring people to follow their own passions with purpose and tenacity.

ALUMNI ACHIEVEMENTS

We are incredibly proud to celebrate Mr. Mohith Arikatla, an outstanding alumnus of Chaitanya Bharathi Institute of Technology (CBIT), whose academic and professional journey exemplifies excellence and dedication. Mohith's academic background is nothing short of impressive. He completed his Master's degree in Computational Biology at the prestigious Weill Cornell Graduate School of Medical Sciences, where he continues to contribute to groundbreaking research.

Prior to this, he earned his Bachelor of Technology in Biotechnology from CBIT, where he laid the strong foundation that has propelled him into a successful career. His time at CBIT not only shaped his academic skills but also nurtured his leadership qualities, as evidenced by his active involvement in multiple student organizations, including as the President of the Music Club and the Organization Head of the Bioengineering and Biotechnology Club.

Throughout his journey, Mohith has continuously expanded his knowledge and expertise, earning certifications in advanced fields like proteogenomics, data science, and structural biology from leading institutions such as NPTEL, IBM, and Kaggle. His technical prowess is reflected in his work as a Bioinformatics Developer at Adept Pharma, where he led efforts in genomic analysis and data interpretation. He has also worked on significant research projects at Weill Cornell Medicine, including training models to analyze ONT sequencing data and assessing translational differences in genomic analysis, particularly with data from mice flown on the International Space Station.

Mohith Arikatla

Beyond his academic and professional achievements, Mohith has demonstrated a deep commitment to social causes, volunteering with organizations like The Beautiful World Movement and the Hyderabad Flood Relief Coalition. His leadership in organizing fundraising events and providing disaster relief is a testament to his character and sense of responsibility.

With expertise in cutting-edge fields like next-generation sequencing, RNAseq analysis, high-performance computing, and machine learning, Mohith stands at the forefront of innovation in bioinformatics and computational biology. His journey is a true inspiration, and as a student of CBIT, he has brought great pride to our institution. We look forward to his continued success and groundbreaking contributions to the world of science and technology.

ALUMNI ACHIEVEMENTS

Chaitanya Bharathi Institute of Technology (CBIT) takes great pride in the accomplishments of Ms. Rithika Gorrepati, an esteemed alumna whose journey from biotechnology to bioinformatics showcases both her commitment and innovation. Rithika began her academic path at CBIT, earning a Bachelor's degree in Biotechnology with an impressive 84.3%. Her passion for scientific research then led her to the prestigious Georgia Institute of Technology, where she is currently advancing her studies with a Master's degree in Bioinformatics.

Her commitment to research is evident in her numerous publications. Among her significant contributions is a book chapter discussing bioremediation processes for textile industry effluents, reflecting her dedication to sustainable solutions. Rithika has also published insightful reviews on nutritional profiling and detection mechanisms in food science and on microbial bioactive compounds for food preservation. These works showcase her dedication to addressing critical global challenges in environmental sustainability and food security through biotechnological innovation.

Rithika's technical skill set is both broad and deep. With expertise in techniques such as UV/Vis spectroscopy, cell culture, genetic engineering, and bioinformatics, she has a robust foundation that enhances her work in computational biology. Her skills also include programming in C and R, equipping her for complex data analysis and project management.

Rithika's journey from CBIT to the advanced labs of Georgia Tech is a testament to her determination and vision, and she serves as a source of inspiration for CBIT students pursuing careers in science and technology. Her achievements exemplify the values that CBIT strives to instill in its students, and we look forward to her future contributions as she continues to innovate in bioinformatics and biotechnology.

Rithika Gorrepati

During her time at CBIT, Rithika not only excelled academically but also demonstrated remarkable leadership, engaging actively in initiatives that enriched her learning experience and helped shape her career path. This foundation enabled her to pursue impactful work in both scientific research and community development within the biotechnology and startup ecosystems.

Rithika's professional journey is marked by diverse experiences that showcase her commitment to bridging science and innovation. In her role at T-Works, India's largest prototyping center, she led community development and built partnerships that fostered collaboration. At the Apple Experience Zone within Hyderabad's T-Hub, she contributed to establishing a space that strengthens ties within the local startup ecosystem, fostering innovation and growth. Her work at T-Hub in corporate innovation further deepened her expertise, as she supported groundbreaking solutions that aligned with the organization's mission to drive impactful projects. Rithika also gained valuable experience working at renowned pharmaceutical companies like Laurus Labs Limited and Dr. Reddy's Laboratories, where she developed her skills in business development and analytical science.

STUDENT SPOTLIGHT

Lost in Thought: The Hidden World of Maladaptive Daydreaming

Daydreaming is usually harmless — a soft place the mind wanders to when reality feels a bit too loud. But for some people, imagination doesn't stay in the background. It becomes a parallel world they slip into for hours, with storylines, characters, plots, and emotions so vivid that real life starts feeling secondary. This is known as Maladaptive Daydreaming (MD), a behavioural condition where daydreaming becomes intense, compulsive, and disruptive to daily life.

MD isn't officially recognized as a mental disorder yet, but it is increasingly being studied through neuroscience, clinical psychology, and cognitive biology. It gives us a fascinating look at how the brain builds alternate realities and why some people get stuck in them. People with MD often describe it as a "portal-an escape from real world", they can't fully close.

Triggers like music, boredom, stress, or loneliness can push them into elaborate fantasies. These inner worlds provide comfort, creativity, and escape, but over time they can interfere with studies, concentration, sleep cycles, and real-life relationships.

From a neurological point of view, MD sits at the intersection of brain networks that control imagination, reward, and self-referential thinking.

The Default Mode Network (DMN), the brain system active during imagination and internal storytelling, becomes highly engaged. Meanwhile, disruptions in dopamine and serotonin pathways may increase the "reward" feeling of escaping into daydreams. This makes the cycle harder to break and can even resemble behavioural addictions. Technology is now stepping in as well. fMRI scans are helping researchers understand where MD sits on the spectrum of attention disorders.

AI-supported mental health tools are being tested to track compulsive thought patterns. Wearable neurotech and mindfulness-based digital therapeutics may eventually help individuals ground themselves when they get "lost in their heads". Maladaptive Daydreaming doesn't mean someone is "broken" or "too dramatic". It means the brain is using its creativity as a coping mechanism. The challenge is balancing imagination with presence — being able to enjoy that inner universe without losing touch with the real one. As research grows, MD could become a formal diagnosis. But more importantly, awareness offers validation. For many people, finally having a name for this experience is the first step toward understanding it.

~Madikunta Divyasree, IVth Year,
B.Tech. Biotechnology

STUDENT SPOTLIGHT

AI-Augmented Precision Medicine: The Startup Advantage

An increasingly large number of patients today—whether individuals tackling complex cancers, chronic metabolic disorders, or rare genetic conditions—face the reality that standard treatments do not always work. These variable outcomes have intensified the global push toward precision medicine. Precision medicine seeks to tailor care to each patient's unique genomic, phenotypic, and environmental profile. The convergence of AI and medicines reflects an urgent need to transform real patient experiences into data-driven, actionable, and personalized care strategies.

National Academy of Medicine reports indicate that contemporary healthcare is informed by the "5 Vs" of big data—volume, velocity, variety, veracity, and value. AI holds a unique position in catering to these demands along the "5 Ps" of healthcare: predictive, preventive, personalized, participatory, and precision. Indeed, this collaboration is increasingly reflected in clinical research, population health analytics, and translational medicine.

AI helps by providing insight, reasoning, learning, and by enhancing clinicians through augmented intelligence. Precision medicine extends this core through the integration of electronic health records, image analytics, and real-world phenotypic data to facilitate individualized treatment recommendations.

Real-world applications are rapidly expanding. AI-driven oncology models are informing the prediction of treatment responses; radio-genomic pipelines are linking imaging with molecular signatures; Predictive analytics facilitated early intervention in high-risk populations. These domains represent fertile grounds for breakthroughs driven by startups. Despite progress, a suite of serious barriers remains: algorithmic fairness, workflow interoperability, privacy, security, and the need for transparent model development. Tackling these would be important in building clinical trust and regulatory readiness. AI will increasingly be seen as augmented intelligence, enhancing rather than replacing clinical expertise.

Startups are in the best position to lead this transformation with their agility and innovative capacity. AI augmented precision medicine offers an extraordinary opportunity to students, faculty, and emerging innovators to translate computational advances into improvements in the lives of patients. This constantly emerging landscape not only moves science ahead but also empowers the next generation toward creating solutions that will directly impact the health of people globally.

~Anshika Gupta, IVth Year,
B.Tech. Biotechnology

Biotech Investment Trends and Industry Structure in 2025

The biotech field is hitting a key turning point in 2025. Investments slowed down a lot back in 2023 to 2024, but now money is easing back into the mix. It is happening in a much pickier way, with more structure overall. Things in the industry point to a real change, where cash flows toward treatments that pack a big punch.

Advanced tools are blending in deeper, too, and artificial intelligence leads that charge.

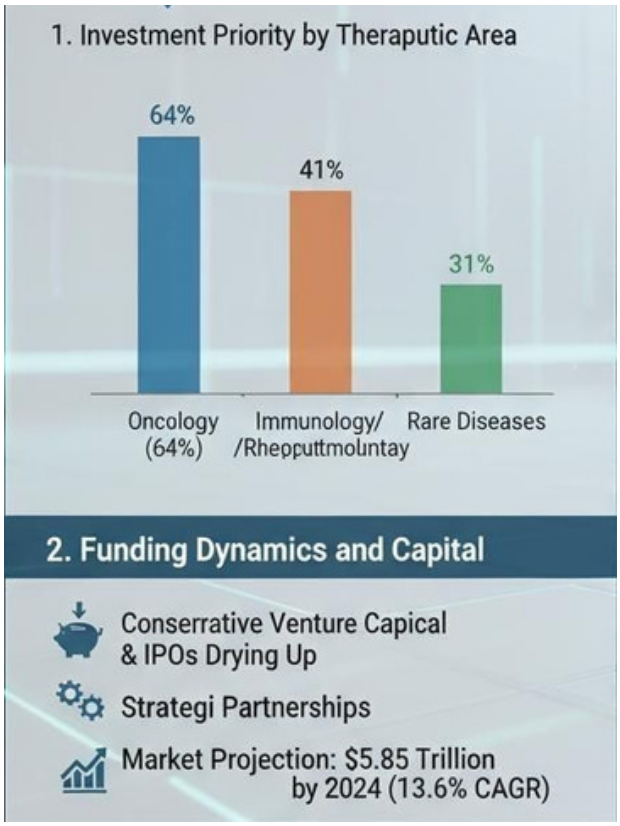
Venture capitalists in biotech are going for fewer deals these days. When they do invest, those rounds turn huge, like mega rounds. They zero in on firms with solid science behind them and pipelines that have real proof.

STUDENT SPOTLIGHT

That approach cuts down on risks and funnels money to programs that are already pretty far along. Equity raises picked up some steam, but IPOs stayed pretty quiet. A lot of public biotech companies keep burning through cash fast. Private money ends up driving most of the growth here. By the middle of 2025, venture funding shows a solid bounce back. Confidence in new biotech ideas is building again. Investors lean toward companies centered on just one or a couple of clinical assets that carry less risk. They steer clear of wide-ranging platform tech. This setup brings more predictability and quicker payoffs. Non-dilutive options keep growing in reach, things like royalty funds, credit setups, and payments tied to milestones. Those help stretch out cash without losing ownership stakes. North America still leads the pack on biotech investments. Europe and Asia trail close, not far off at all. Artificial intelligence is powering up protein design in biotech and predictions for clinical trials. That pulls in heavy funding right now. Cell and gene therapies draw big interest too, with CRISPR tools, mRNA setups, and gene-editing outfits in the spotlight. Longevity work is gaining ground, especially around aging and regenerative medicine. Those areas feel more ready for investment these days. The bioeconomy and sustainability side is shaping up as a hot spot soon. Industrial biotech fits there, covering bio-materials and biofuels.

Oncology holds the top spot for investments still. The patient numbers are massive, unmet needs run deep, and innovations move fast in targeted treatments plus cell-based ones. Immunology and rheumatology keep pushing strong too. New targets pop up in inflammatory conditions, and immunotherapies get more advanced all the time.

The worldwide biotechnology market looks set for solid long-term expansion. It should grow at a compound annual rate of 13.6 percent from 2025 to 2034. By 2034, that puts the value at 5.85 trillion dollars.



Conclusion:

The biotech industry in 2025 is marked by a highly selective investment climate favoring high-return areas like Oncology and Gene Therapy. The industry's structure is fundamentally changing through the integration of AI and CRISPR technology, with all efforts concentrated on capital efficiency and strategic partnerships.

~Dhruv Tadikonda IVth Year,
B.Tech. Biotechnology.

STUDENT SPOTLIGHT

Revolutionizing Clinical Testing: 3D Models over Animal Experiments

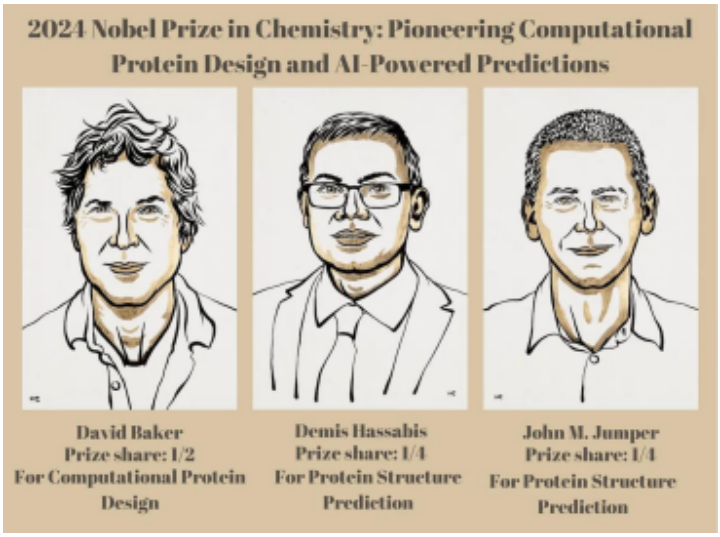
The landscape of clinical testing is undergoing a transformative shift as advanced 3D models emerge as powerful alternatives to traditional animal experiments. These innovative, lab-grown systems, ranging from organoids and tissue-engineered constructs to microfluidic "organ-on-chip" devices are redefining how researchers study human biology and disease.

One of the major limitations of animal testing is the biological gap between humans and model organisms. Even well-established species such as mice cannot fully replicate human physiology, often leading to inaccurate predictions of drug behavior. 3D models, however, use human cells, allowing scientists to observe responses that are more precise and clinically relevant. This not only improves the reliability of preclinical outcomes but also accelerates the drug-development pipeline by reducing failures in later clinical trial phases. In addition to scientific accuracy, 3D models uphold a strong ethical advantage. As global conversations around humane research intensify, many regulatory bodies and industries are seeking ways to reduce or replace animal use. These models offer a viable, scalable, and ethically responsible solution. Furthermore, 3D systems enable real-time monitoring of cellular interactions, disease progression, and therapeutic responses, making them invaluable for personalized medicine. They help researchers test treatments on patient-derived cells, predicting individual outcomes with unprecedented precision. While challenges remain- such as standardization, cost, and integration into regulatory frameworks- the momentum behind 3D technologies continues to grow rapidly. In essence, 3D models are revolutionizing clinical testing, offering a future where research is not only more humane but also more scientifically accurate and patient-centric.

~Alekhya Pasumarthy, IVth Year,
B.Tech. Biotechnology

Nobel Recognition for Protein Design: How AI and Biochemistry United to Shape a New Scientific Era

In a landmark moment for science, the 2024 Nobel Prize in Chemistry was awarded for breakthroughs in AI-driven protein design, marking a turning point in how humanity understands and engineers' life at the molecular level. The decision, announced last October, officially acknowledged the profound impact of artificial intelligence on biochemistry a merger that has rapidly transformed research, medicine, and industry. The winning contributions centered around the development of deep learning systems such as AlphaFold and RoseTTAFold, which solved the long-standing protein-folding problem by predicting structures with near-atomic accuracy.



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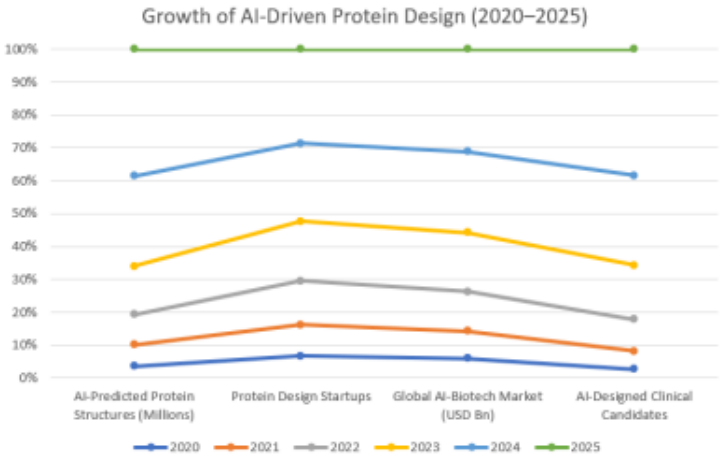
These tools opened the door to designing brand-new proteins with functions not found in nature, enabling advancements in therapeutics, diagnostics, materials science, and climate-related innovations. throughout 2024 and into 2025, the Nobel announcement triggered a surge of investment and global interest in protein engineering. Startups specializing in enzyme design, antibody modelling, and computational drug discovery saw record growth. Pharmaceutical giants quickly adopted AI-powered protein modelling pipelines, significantly shortening drug-development timelines. Scientists report that AI-designed proteins are now entering clinical trials at an unprecedented pace. These include synthetic enzymes for metabolic disorders, novel scaffolds for targeted cancer therapies, and climate-resilient proteins capable of degrading pollutants or capturing carbon dioxide. Regulatory bodies in the U.S. and Europe have begun drafting safety and validation frameworks for AI-generated biomolecules an essential step as the line between



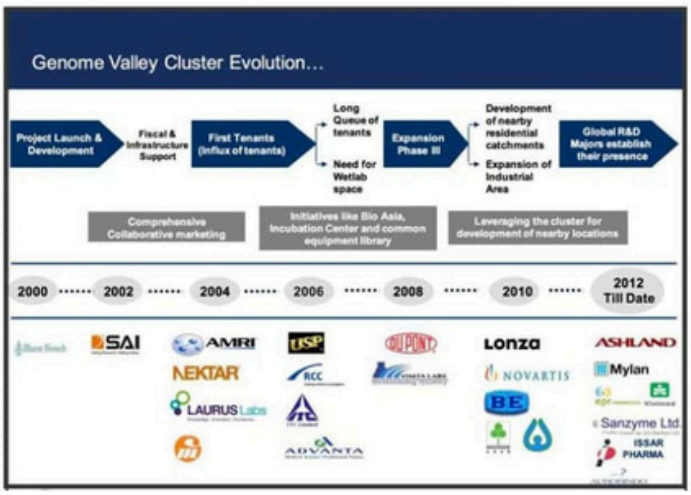
biological discovery and computer-driven creation becomes increasingly blurred. While ethical debates continue regarding AI autonomy in molecular design, the consensus among researchers is clear: the Nobel Prize represents not just recognition, but a declaration that a new era of intelligent biochemistry has begun.

~Srikanth Muthyala, III[rd] Year,
B.Tech. Biotechnology

The Genome Valley of India

The concept of Genome Valley was envisioned by Dr. Krishna Ella, the founder of Bharat Biotech. He proposed the idea of creating a dedicated biotech hub that would bring together research, development, and manufacturing facilities in the life sciences sector.

The realization of Genome Valley as a world-class biotech hub was driven by the efforts of Mr. N. Chandrababu Naidu, the then Chief Minister of Andhra Pradesh (before the bifurcation of the state into Andhra Pradesh and Telangana).



STUDENT SPOTLIGHT

Genome Valley, located on the outskirts of Hyderabad, India, is one of the country's most prominent life-sciences research and innovation hubs. Established to promote biotechnology, pharmaceuticals, and biomedical research, the region has evolved into a hub that houses worldwide enterprises, cutting edge research institutions, and a plethora of biotech startups. Its collaborative environment promotes collaboration among industry, academia, and government, hastening advances in drug research, vaccine development, and agricultural biotechnology. Genome Valley is home to over 200 companies from various sectors within the life sciences, including biotechnology, biopharma, and vaccine manufacturing. This cluster hosts many global names such as Novartis, GlaxoSmithKline, and DuPont, alongside numerous domestic and contract research organizations. Over time, the cluster has drawn significant foreign investment and has established itself as a crucial center for top international corporations R&D operations. Genome Valley contributes significantly to India's standing in the global bio sciences landscape by supporting both established enterprises and developing ventures. Its continuing expansion demonstrates the country's commitment to innovation and scientific advancement.

~Amogh Anil Bellurkar, III[rd] Year,
B.Tech. Biotechnology

India's Biotech Revolution: From Underdog to Global Powerhouse

Indian biotechnology was an underdog a decade ago. It had plenty of potential, but a combination of low funding, weak industrial linkages, and lack of public awareness put a lid on it. The value of India's bioeconomy in 2014 was only $10 billion, and its growth was hindered by poor infrastructure and quite a low level of international recognition. However, India has fairly rewritten the story with the help of government interventions, scientific innovation, and the biotech startup revolution. The country's bioeconomy has expanded from $10 billion in 2014 to $165.7 billion in 2024, which accounts for 4.25% of the GDP and has an annual growth rate of 17.9%.

The Indian dream of harnessing biotechnology for economic growth, while ensuring process sustainability and inclusivity, is basically what led to this change circle. The BioE3 (Biotechnology for Economy, Environment and Employment) Policy 2024 is a landmark, which means the use of clean and regenerative biomanufacturing practices in biologically based industries that are consistent with India's net-zero carbon targets. Additionally, the National Biopharma Mission and Biotech-KISAN programs have linked lab research with the real world, resulting in vaccine innovation, agricultural productivity increase, and rural farmer empowerment. The triumph of the country's biotechnology is very much the story of its innovations in bioenergy. The rate of ethanol blending has been raised from 1.5% in 2014 to 15% in 2024 which has led to a cutting down of oil imports as well as carbon emissions whereas at the same time, rural economies are going on a growth spree. In the same way, BIRAC has played a lead role in the evolution of the biotech startup scene by providing financial and incubation support to almost 1,000 biotech startups.

By volume, India is currently the third-largest producer of pharmaceuticals. Besides, India is the global vaccine manufacturing center and the next leader in gene editing, biomanufacturing, and bio-agriculture It started as an underestimated sector and is now a global biotechnology powerhouse that reflects the innovative, sustainable, and self-reliant nature of the country. The sector is on track to achieve a $300 billion bioeconomy by 2030 and change the global biotech landscape.

~Shruti Das Mohapatra, III[rd] Year,
B.Tech. Biotechnology

STUDENT SPOTLIGHT

One Formula, Two Markets: How AI is Creating Vegan Products for Both Pets and Humans

In recent years, the vegan product revolution hasn't just been limited to human dinner plates; it has reached the bowls of our furry companions as well. As AI helps reshape food formulations, various biotech companies have made an unexpected discovery: the same AI that perfects vegan meals for humans can also be adapted to create nutritionally complete plant-based foods for pets. This represents more than just a cost-saving measure, it's a fundamental reimagining of how we approach nutrition across species.

At the heart of this innovation lies machine learning models capable of analysing vast datasets of plant ingredients. These models don't just predict the texture and taste of food, but also design precise nutritional profiles that meet the metabolic needs of both humans and animals. Companies like Climax Foods and NotCo have already demonstrated how AI can replicate the sensory experience of animal-derived foods for human consumers. Now, the same approach is being applied to pet nutrition, where the stakes are equally high, but the flavor preferences differ drastically. This dual-market strategy offers compelling advantages. By efficiently leveraging shared ingredient databases, process parameters, and formulation algorithms, scientists can accelerate production cycles while reducing R&D costs in both sectors.

AI backed plant based cheese

A single AI platform can simultaneously help optimize protein content for human athletes, adjust amino acid profiles for canine digestion, identify potential allergens for any species with a sensitive stomach, and source high-quality, sustainable plant materials at scales suitable for both markets.

Yet, this new approach raises important questions about nutritional adequacy, regulatory pathways, and consumer acceptance. Can the same base formulation truly satisfy both a vegan bodybuilder and a lactose-intolerant Labrador? As AI continues to unlock the potential of plant-based foods, the answer increasingly appears to be yes, with the right algorithmic adjustments, of course

Representative Image of an AI backed vegan product

~D Bhoomika, III[rd] Year,
B.Tech. Biotechnology

STUDENT SPOTLIGHT

Inside the Enemy within: Cancer Stem Cells and their Role in Tumor Resilience

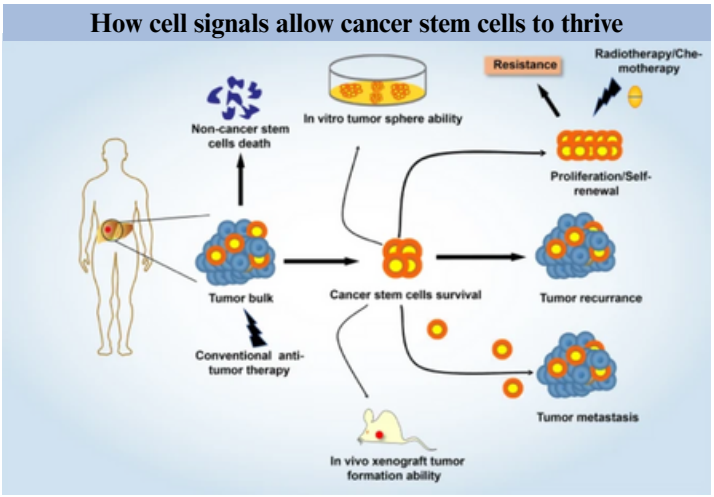
Cancer stem cells (CSCs) are a very small but powerful group of cells found inside tumors. They make up less than 1% of a tumor, yet have an outsized impact on how cancer behaves. These cells can self-renew and differentiate into different types of tumor cells. Because of this, even if most cancer cells are killed during treatment, CSCs can survive, hide, and later restart tumor growth. In some cancers like brain tumors and colorectal cancer, CSCs may make up as much as 20% of the tumor, while in cancers like lung cancer, the proportion ranges from only 0.4% to 1.5%. The frequency of CSCs may even rise as cancer progresses, making the disease harder to treat over time.

The danger posed by CSCs is not just their ability to restart tumors but also their strong resistance to standard treatments like chemotherapy and radiation. CSCs can repair DNA quickly, pump out drugs before they take effect, and often remain in a "sleeping" state where treatments cannot detect them. This explains why some cancers return even after appearing cured and why the global cancer stem-cell therapy market continues to grow, reaching over $3.5 billion in 2025.

To fight CSCs, scientists are developing innovative strategies, including:

- Medicines that block survival or growth signals used by CSCs.
- Immunotherapies that help the body's immune system target CSCs.
- Therapies that force CSCs to differentiate into non-cancerous cells.
- Combination approaches that pair CSC-targeted drugs with traditional treatments.

These approaches have already improved success rates in several stem-cell-based and targeted therapies, reaching 60–70% for certain blood cancers, with even higher numbers for some transplant procedures. By targeting the "enemy within," the chances of cancer recurrence can be reduced, giving more patients a chance at long-lasting recovery. The future of cancer treatment lies in understanding and defeating CSCs, and progress in this field brings hope that we may one day win the fight against cancer for good.



~Disha Penchala, III[rd] Year, B.Tech. Biotechnology

STUDENT SPOTLIGHT

AI-Driven Drug Discovery: From Molecule Prediction to Clinical Trials

Artificial intelligence is reshaping the drug discovery landscape, enabling not only much faster results but also data-driven identification and optimization of therapeutic candidates. Traditional drug discovery can take over a decade of research and billions of dollars in investment, but AI-integrated pipelines reduce the time and cost by significantly improving target identification, molecular design, and preclinical decision-making.

AI systems are improving target selection by using machine learning on genomic, proteomic, and clinical datasets to enhance the prediction of disease-relevant biological pathways. Once a target is defined, deep learning models (such as graph neural networks and transformer architectures) underpin de novo molecular generation, predicting molecules that will have high binding affinity and favorable biochemical properties. Reinforcement learning and diffusion-based generative models further optimize these molecules for maximum therapeutic potential with minimum toxicity.

Early pharmacological assessment through the use of AI-based ADMET prediction provides a computational screen of candidate molecules and significantly reduces experimental failures. These capabilities have accelerated the emergence of AI-designed therapeutics in clinical development.

Notable examples include Insilico Medicine's fibrosis drug ISM001-055, one of the first AI-generated molecules to reach Phase I trials, and Exscientia's immuno-oncology candidate EXS-21546, also advancing through human studies. The integration of AlphaFold-driven protein structure prediction, originating from DeepMind, further strengthens rational drug design by providing high-accuracy structural insights for previously unresolved targets. AI has an increasing role in preclinical modeling, the design of clinical trials, and patient stratification, which will enable much more precise therapeutic evaluation and enhance the chance of regulatory success. Despite significant progress, critical challenges persist and include data standardization, model interpretability, regulatory validation, and ethical considerations in algorithmic decision-making. With the continued maturation of AI methods, they stand poised to transform drug discovery into a more efficient, predictive, and patient-specific discipline, reinforcing their place as a critical technological driver in modern pharmaceutical innovation.

~Venkata Sai Nikitha Teku, IIIrd Year,
B.Tech. Biotechnology

Self-reproduction as an Autonomous Process of Growth and Reorganization in Fully Abiotic, Artificial and Synthetic Cells

I think we have all heard the phrase all cells arise from pre-existing cell, but what if a cell-like system could arise and multiply from scratch? Recent work by Pérez-Mercader and colleagues suggests it can. Continuing the famous 1953's Miller-Urey experiment, They took four carbon-based molecules and water, and surrounded the mix with green LED lights. When illuminated, these inert molecules formed new amphiphiles that self-assembled into tiny vesicles (microscopic bubbles). In effect, the experiment turned a homogenous mixture into a population of

STUDENT SPOTLIGHT

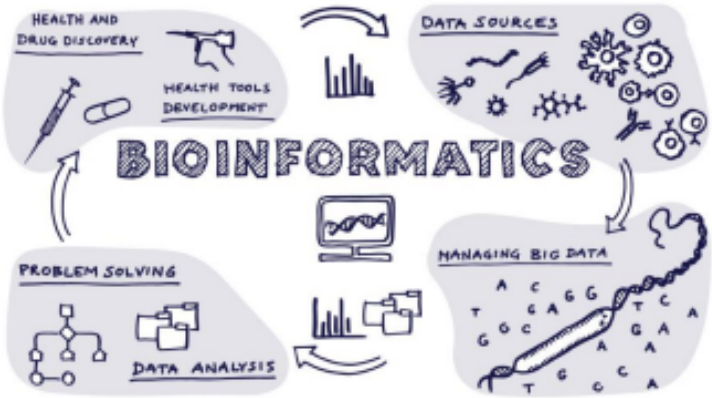
polymer “cells” with very little biology involved.
Once formed, these polymer vesicles behave in lifelike ways. They grow as more monomers convert into polymers inside them, then “bud off” part of their contents. This happens when internal polymer chains crowd the membrane: bits are squeezed out as globules or “spores,” which then become new vesicles. Intriguingly, each released seed carries slightly different polymer lengths. This means offspring vesicles are not identical to their parents, a primitive kind of heredity. The researchers observed Darwinian evolution in action when they saw that some released spores formed vesicles more readily than others, creating a form of heritable variation comparable to the raw material for natural selection.
Why does this matter? It shows that lifelike behavior can emerge from simple chemistry and light.

As Oxford chemist Stephen Fletcher notes, this system exhibits “lifelike behavior” from nonbiological chemicals given a light source. After all "lifelike behavior" is nothing but metabolism, reproduction and evolution, which are all observed in these "cells" created in a lab. For students, it’s a vivid example of how principles like reproduction and variation are not limited to DNA-based life. It hints that the origin of life might not require modern biochemistry at all. Instead, under the right energy and chemistry, self-replicating compartments and even a form of Darwinian selection can spring to life in a test tube. This challenges our definition of life and officially puts a dark, round full stop on the argument of divine creation.

~H. Kunal Kumar, III[rd] Year,
B.Tech. Biotechnology

The Code Behind Life: Bioinformatics

Bioinformatics is the powerful intersection of biology, computer science, and data analytics—an essential field that decodes the complexity of life at the molecular level. As modern biological research generates massive amounts of data, from genome sequences to protein structures, traditional laboratory methods alone are no longer sufficient. Bioinformatics steps in as the digital engine that processes, analyzes, and interprets this information with precision.
At its core, bioinformatics transforms raw biological data into meaningful insights. Using algorithms, statistical models, and computational tools, scientists can identify genes, predict protein functions, model biological pathways, and even trace evolutionary relationships. This makes bioinformatics indispensable in fields like genomics, precision medicine, agriculture, and drug discovery.



One of its most impactful applications lies in personalized medicine.
By analyzing an individual’s genetic information, bioinformatics helps identify disease risks, suggest targeted treatments, and improve diagnostic accuracy. In agriculture, it supports the development of high- yield, stress-resistant crops by decoding plant genomes.

STUDENT SPOTLIGHT

During global health crises, such as viral outbreaks, bioinformatics enables rapid sequencing and tracking of infectious agents, guiding timely public-health decisions. Beyond its technical power, bioinformatics symbolizes a shift in how science is conducted moving from experiment-driven to data-driven exploration. It empowers researchers to ask deeper questions and uncover patterns invisible to the naked eye.

In essence, bioinformatics is the language that reads, interprets, and translates the code of life. As biology becomes increasingly digital, this field will continue to shape discoveries that transform medicine, industry, and our understanding of living systems.

~Malyala Rishika, II[nd] Year,
B. Tech. Biotechnology

Gut–Brain Harmony: How Microbes Shape Mood, Memory, and Mental Health

The gut–brain axis has emerged as a critical focus in neurobiology and biotechnology, revealing how intestinal microbes regulate psychological and cognitive functions. Recent research suggests that the human gut microbiome is not merely involved in digestion but also plays a central role in modulating neurotransmitters, immune responses, and neural signaling pathways. As a second-year biotechnology student, exploring this field shows how intricately microbial ecology intersects with mental health.

The gut microbiota communicates with the central nervous system (CNS) through multiple mechanisms, including the vagus nerve, microbial metabolites, and immune modulation. Short-chain fatty acids (SCFAs), produced by microbial fermentation of dietary fibers, influence neuroinflammation and synaptic plasticity—key determinants of memory formation.

Certain microbial species such as Lactobacillus and Bifidobacterium have been shown to produce gamma-aminobutyric acid (GABA) and serotonin precursors, linking microbial composition to mood regulation (Clapp et al., 2017). Dysbiosis, or microbial imbalance, has been correlated with conditions like anxiety, depression, and neurodevelopmental disorders.

The concept of "psychobiotics", probiotic strains that positively affect mental health definitely highlights their therapeutic potential. Clinical studies indicate that targeted modulation of gut microbes may alleviate stress, improve cognitive flexibility, and reduce symptoms of depression (Sarkar et al., 2016). This underscores the microbiome's potential as a non-invasive biomarker and intervention point in mental health research.

As understanding deepens, the gut–brain axis represents a promising frontier for developing microbial-based therapies. Its interdisciplinary nature bridges biotechnology, neuroscience, and clinical psychology, offering innovative approaches to enhance mental well-being.

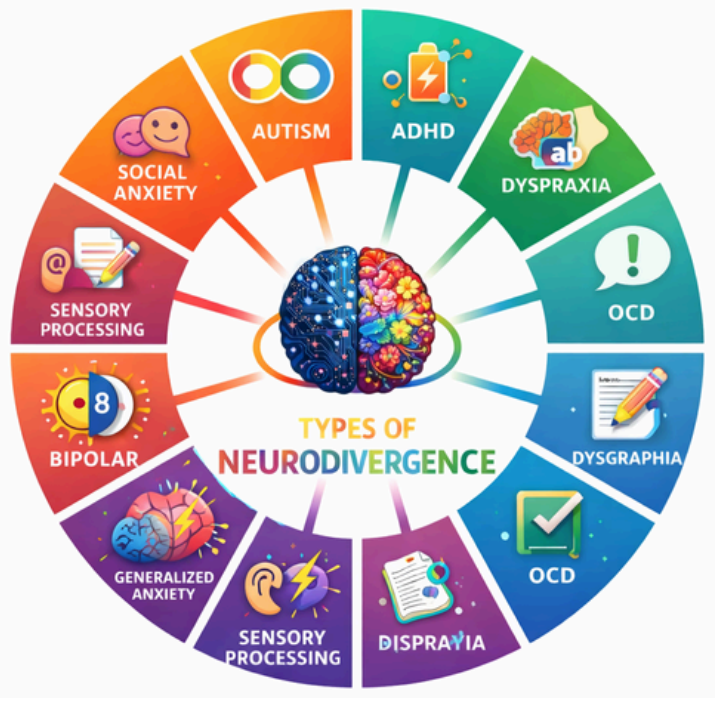
~Manasvi Kurri, II[nd] Year,
B. Tech. Biotechnology

STUDENT SPOTLIGHT

The Study of Emerging Neurodivergence: Dyslexia, Autism & ADHD

Neurodivergence is a broad term referring to natural variations in brain functioning, including conditions such as dyslexia, autism spectrum disorder (ASD), and attention deficit hyperactivity disorder (ADHD). Unlike traditional medical models which focus on deficits, the neurodiversity paradigm views these differences as part of human diversity with unique strengths and challenges. This approach is increasingly influencing educational, clinical, and workplace support structures to foster inclusivity. Recent advances in genetics illustrate overlapping yet distinct neurodevelopmental bases among dyslexia, ADHD, and autism. Dyslexia and ADHD share substantial genetic correlations, particularly linked to attention and learning difficulties. This overlap suggests common underlying mechanisms affecting executive functions such as working memory and response inhibition. Autism, by contrast, involves a wider constellation of genetic and phenotypic traits often associated with social communication differences and behavioral patterns distinctive from those of dyslexia and ADHD. Cognitively, dyslexia is characterized primarily by difficulties in phonological processing, impacting reading fluency and spelling accuracy. ADHD manifests in symptoms related to inattention, impulsivity, and hyperactivity, frequently accompanied by executive function deficits. Autism displays a wider profile including focused interests, repetitive behaviors, and social reciprocity challenges, with often typical or even enhanced verbal and nonverbal reasoning skills, but with slower processing speeds. These conditions often co-occur, with dyslexia and ADHD frequently appearing together in individuals—studies estimate co-occurrence rates between 25-40%. Autism's overlap with dyslexia is less common but does occur, emphasizing the complexity and individuality of neurodivergent profiles. They share common challenges such as executive function impairments and cognitive flexibility difficulties, but express them differently behaviorally and neurologically. Understanding these nuanced overlaps guides tailored support strategies, moving beyond single-diagnosis frameworks toward integrated behavioral and educational interventions. This approach acknowledges the distinct needs and personal strengths of neurodivergent individuals, supporting holistic development.

The neurodiversity movement advocates acceptance and accommodation rather than pathologizing neurological differences. Viewing dyslexia, autism, and ADHD as natural cognitive variations promotes dignity, reduces stigma, and encourages leveraging unique talents. In academic and professional settings, this translates into modified teaching methods, sensory-friendly environments, executive function supports, and flexible workflows.



STUDENT SPOTLIGHT

Famous scientists and inventors, including Albert Einstein and Marie Curie, have exhibited traits consistent with neurodivergence, underscoring the potent contributions neurodivergent individuals make to society when supported effectively. Contemporary research also highlights how workplaces and educational settings can be enriched by embracing diverse neurocognitive styles.

The study of emerging neurodivergence involving dyslexia, autism, and ADHD reflects an evolving landscape marked by scientific integration and social awareness. Genetic and cognitive research deepens understanding of overlaps and differences, while the neurodiversity framework fosters inclusion and empowerment. Moving forward, inclusive policies and adaptive practices informed by this knowledge can unleash the potential of neurodivergent populations across all spheres of life.

~Yamini Khasholka Iytha, II[nd] Year,
B. Tech. Biotechnology

The Longevity Blueprint: Biotechnology's Quest to Redefine Aging

Biotechnology is reshaping how we view aging, shifting it from an unavoidable decline to a biological process that can be studied, modified, and potentially reversed. The "longevity blueprint" represents a scientific roadmap that combines genetics, cellular biology, regenerative medicine, and data-driven insights to extend human health span the number of years we live in good health. A major focus is the removal of senescent cells through senolytic drugs, which reduces inflammation and tissue damage. Gene-editing tools like CRISPR allow correction of age-accelerating mutations, while stem-cell and tissue-engineering approaches aim to replace or repair damaged organs. Epigenetic reprogramming, inspired by Yamanaka factors, shows promise for resetting cellular age without losing cell identity.

AI and multi-omics technologies help identify individual aging signatures, enabling personalized therapies and early interventions. Together, these innovations aim not just to add years to life but to add life to years, redefining aging as a treatable and optimizable biological state.

~Dutta Yashmitha, II[nd] Year,
B. Tech. Biotechnology

STUDENT SPOTLIGHT

Space Biotech: Can Life Thrive Beyond Earth

Space biotechnology is a cutting-edge field that explores how biological systems can survive, adapt, and be engineered for life beyond Earth's surface. Space presents extreme conditions including microgravity, high radiation, limited resources, and isolation, all of which severely challenge life and human sustainability. Understanding these effects at the molecular and cellular level is crucial for long-term space missions and future colonization efforts.

One major focus is the development of closed ecological life-support systems, where plants, microbes, and engineered organisms fulfill critical roles—producing oxygen, recycling waste, and providing food—to create a sustainable habitat for astronauts. Space biotech innovations also include using synthetic biology approaches to engineer microbes capable of producing medicines or biofuels directly on spacecraft, reducing the need for resupply missions.

Research has demonstrated surprising adaptability of microbes and plants in space, with altered growth patterns and stress responses that inspire potential biotechnological applications back on Earth in agriculture and medicine.

Advances in 3D bioprinting and tissue engineering in microgravity open pathways for creating human tissues and organs off planet, which could revolutionize medical care for astronauts.

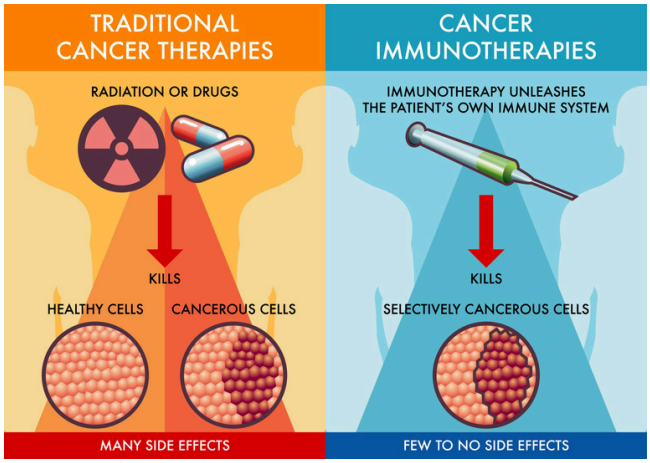
~Lingamdinne Trishika Reddy, IInd Year,
B. Tech. Biotechnology

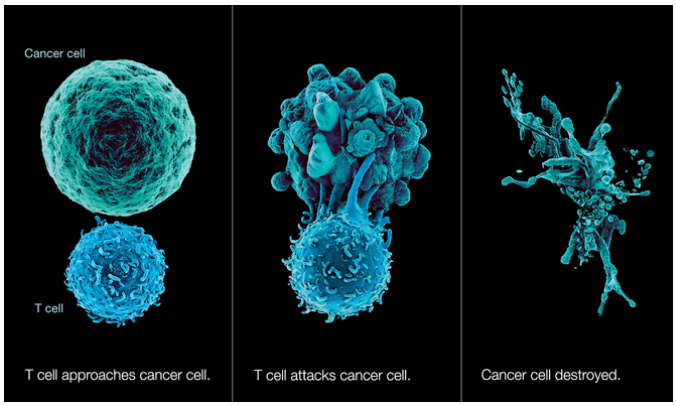
STUDENT SPOTLIGHT

Immunotherapy and Beyond: How We will Treat Cancer Next?

The oncology landscape is moving past conventional chemotherapy and redefining the battle against cancer through active immune modulation. Checkpoint blockade (like PD-1 inhibitors) manages disease under control, yet its objective response rate remains limited, often ineffective in "cold" tumors due to few infiltrated immune cells. The future lies in strategically engineering the immune system to defeat the hostile tumor microenvironment (TME). The necessary cytotoxic firepower is by Adoptive Cell Therapy (ACT). While CAR-T is effective in blood cancer, the next generation will target solid tumors. Here, TCR-T cell therapy is the main focus, as it recognizes intracellular proteins present on MHC, drastically increasing the target area as compared to the surface-targeting CAR-T. Also, to allow that T-cells remain in TME, armored CAR T-cells (TRUCKs) are designed to secrete therapeutic payloads, such as pro-inflammatory cytokines. These living drug dispensers reprogram the immunosuppressive TME, a necessary step to achieve a prolonged therapeutic effect. The precision frontier is being revolutionized by personalized neoantigen mRNA vaccines. They contain instructions to produce unique mutated cancer proteins and rely on Lipid Nanoparticles (LNP) for efficient delivery. The LNP composition contains ionizable lipids directs the in vivo delivery to antigen-presenting cells like dendritic cells, ensuring the effective T-cell priming and activation.

Finally, Oncolytic Viruses (OVs) are TME modulators with a dual-action feature. They induce immunogenic cell death and are no warmed Bi-specific T cell Engagers as their "weapons". The OV locally produces the BiTE/TriTE, which acts a molecular bridge, redirecting endogenous T cells to tumor-associated antigens. This localized expression overcome the systemic toxicity and short half-life of soluble Bi TEs, leading to a powerful, targeted cytotoxic force. The next era of cancer treatment will be defined by the synergistic integration of these engineered platforms: Priming (Vaccines), Delivery/Reprogramming (ACT/OVs), and Sustained Activation (CIs).





~Hajra Saba, II[nd] Year,
B. Tech. Biotechnology

STUDENT SPOTLIGHT

Nanoparticle Delivery Systems in Gene Therapy

Gene therapy is a revolutionary strategy in modern medicine that seeks to correct or replace malfunctioning genes responsible for different genetic diseases. One of the major challenges for gene therapy involves safe and efficient delivery of genetic materials into target cells. Traditional viral vectors, while being highly effective, commonly raise concerns about immunogenicity, limited cargo capacity, and insertional mutagenesis. To overcome these hurdles, nanoparticle-based delivery systems have emerged as a powerful non-viral alternative. Nanoparticles are engineered materials, usually ranging between 1 and 100 nanometers in size. They encapsulate and protect therapeutic DNA, RNA, or CRISPR-Cas components from enzymatic degradation while enabling their cellular intake. Lipid nanoparticles, popularized through mRNA vaccine technologies, are being optimized for gene therapy toward targeting the liver, lungs, and tumors. In addition, polymeric nanoparticles constructed from biocompatible materials like polyethyleneimine or PLGA create opportunities for controlled release and tunable surface properties that enhance targeting. Inorganic nanoparticles, like those based on gold or silica systems, further expand options for delivery by conferring high structural stability and ease of functionalization. Recent research is focused on hybrid nanoparticles that can cross physiological barriers, such as the blood-brain barrier, for neurodegenerative disease treatment. Artificial intelligence is also being integrated into nanoparticle design to predict biological interactions and improve efficiency. Understanding of nanoparticle systems by biotechnology students merges knowledge in molecular biology, material sciences, and pharmacokinetics—essential components for future innovations in gene-based therapeutics. These advances bring the long-standing goal of precise, safe, personalized gene therapy one step closer to reality.

~Syeda Sidra, IInd Year, B. Tech. Biotechnology

The Direwolf De-extinction: Resurrection or a new creation?

Colossal Biosciences' dire wolf project is a flagship for "de-extinction," an effort to resurrect an Ice Age predator. The stated goal is "rewilding", an ambitious plan to restore lost ecological functions. However, this high-profile endeavor serves as a perfect case study for the groundbreaking technology, the complex scientific hurdles, and the profound controversies of the field.

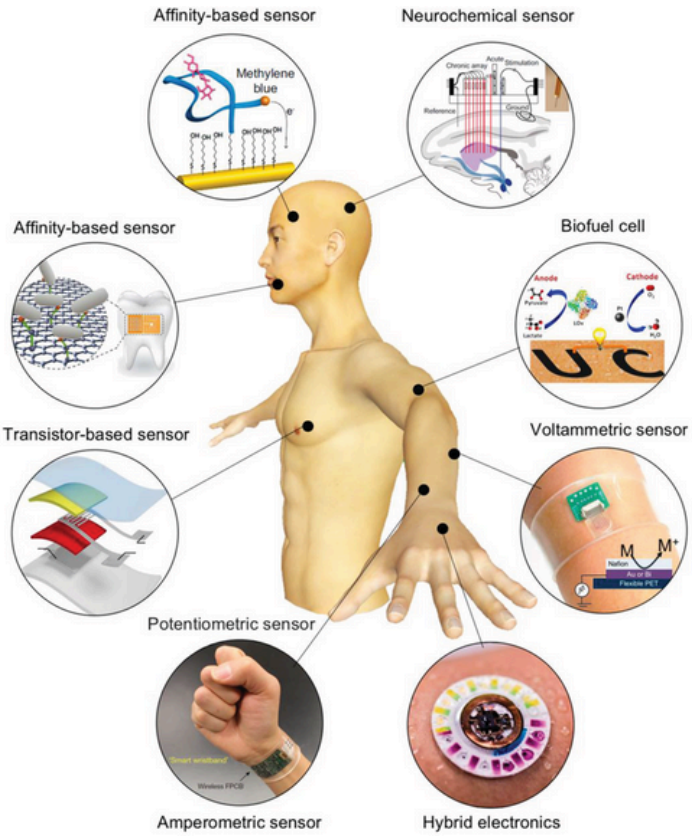
The process is a multi-step feat of synthetic biology. It begins with ancient DNA (aDNA) extraction from fossilized remains. Scientists sequence these fragmented genomes to build a digital blueprint. This blueprint is then used in comparative genomics, set against the gray wolf's genome to pinpoint the key genes responsible for dire wolf phenotypes, like larger size or a broader skull. Using the CRISPR-Cas9 editing tool, these genetic variants are "pasted" into a gray wolf cell's genome. Finally, this engineered nucleus is used in somatic cell nuclear transfer (cloning) to create an embryo, which is then implanted into a surrogate host. This technological prowess is met with severe criticism. First, the name is scientifically misleading. A 2021 Nature study confirmed dire wolves are a distant lineage, not close relatives to grey wolves, meaning the result is a hybrid proxy species, not a resurrection. This proxy itself is an ecological gamble, its original habitat is gone, and it could become a new invasive predator. Furthermore, many scientists see it as a costly distraction, siphoning hundreds of millions in "spectacle science" funding, away from the more urgent, practical mission of saving the thousands of species currently on the brink of extinction.

~Sai Sowmya Pallavi , Ist Year, B. Tech. Biotechnology

STUDENT SPOTLIGHT

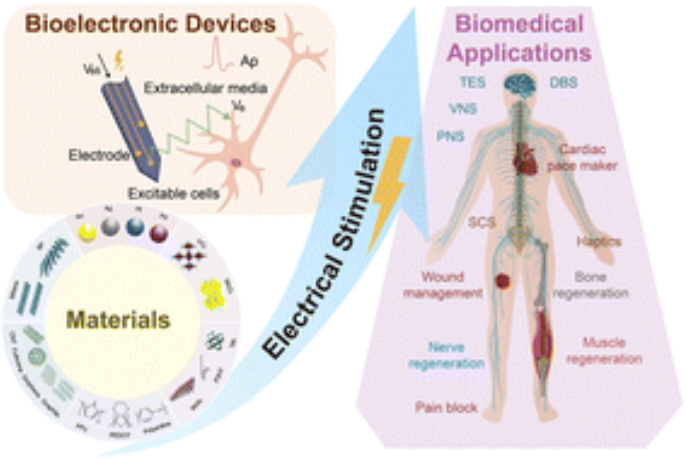
Bioelectronics

Biotechnology in electronics, or bioelectronics, is an interdisciplinary field that merges biology and electronics to create devices that interface with biological systems. These technologies are used for monitoring, diagnosing, and treating diseases through applications like implantable sensors, neural interfaces, and robotic prostheses. Examples include devices that measure blood sugar levels, stimulate nerves to treat pain or depression, and sensors that use engineered cells to monitor environmental conditions. Biomolecular electronics (also called bioelectronics), a subfield of molecular electronics, involves the investigation of native, as well as modified, biological molecules (e.g., chromophores, proteins, DNA), rather than organic molecules synthesized in the laboratory. Because natural selection processes have solved problems similar to those that must be solved in harnessing organic compounds, and because self-assembly and genetic engineering provide sophisticated control and manipulation of large molecules, biomolecular electronics is a very promising field. Bioelectronics is a hot research topic, yet an important tool, as it facilitates the creation of advanced medical devices that interact with biological systems to effectively diagnose, monitor and treat a broad spectrum of health conditions. Electrical stimulation (ES) is a pivotal technique in bioelectronics, offering a precise, non-pharmacological means to modulate and control biological processes across molecular, cellular, tissue, and organ levels. This method holds the potential to restore or enhance physiological functions compromised by diseases or injuries by integrating sophisticated electrical signals, device interfaces, and designs tailored to specific biological mechanisms. This review explains the mechanisms by which ES influences cellular behaviours, introduces the essential stimulation principles, discusses the performance requirements for optimal ES systems, and highlights the representative applications. From this review, we can realize the potential of ES based bioelectronics in therapy, regenerative medicine and rehabilitation engineering technologies, ranging from tissue engineering to neurological technologies, and the modulation of cardiovascular and cognitive functions. This review underscores the versatility of ES in various biomedical contexts and emphasizes the need to adapt to complex biological and clinical landscapes.



STUDENT SPOTLIGHT

Biotronics is another area that includes the development and implementation of a new class of polymers that possess unique optical and electromagnetic properties that no other known polymer has. They have already demonstrated significant improvements in electronic and optoelectronic device performance. These non-fossil fuel-based photonic and electronic Biopolymer materials, derived from deoxyribonucleic acid (DNA) biowaste and silk, are abundant, inexpensive and green materials that will not deplete our natural resources or harm the environment. They have the potential to compete with, or maybe someday even replace, fossil fuel-based plastics for applications ranging from eyeglasses to the higher technology applications light emitting diodes, transistors and solar cells.



This new Biotronics technology shows great promise for a number of both photonic and electronic applications, with demonstrated increase in device performance. This opens up a whole new field for bioengineering, in addition to the current genomic sequencing and clinical diagnosis and treatment applications. Where silicon is today's fundamental building block for inorganic electronics and photonics, Biopolymers hold promise to become tomorrow's fundamental building block for organic photonics and electronics.

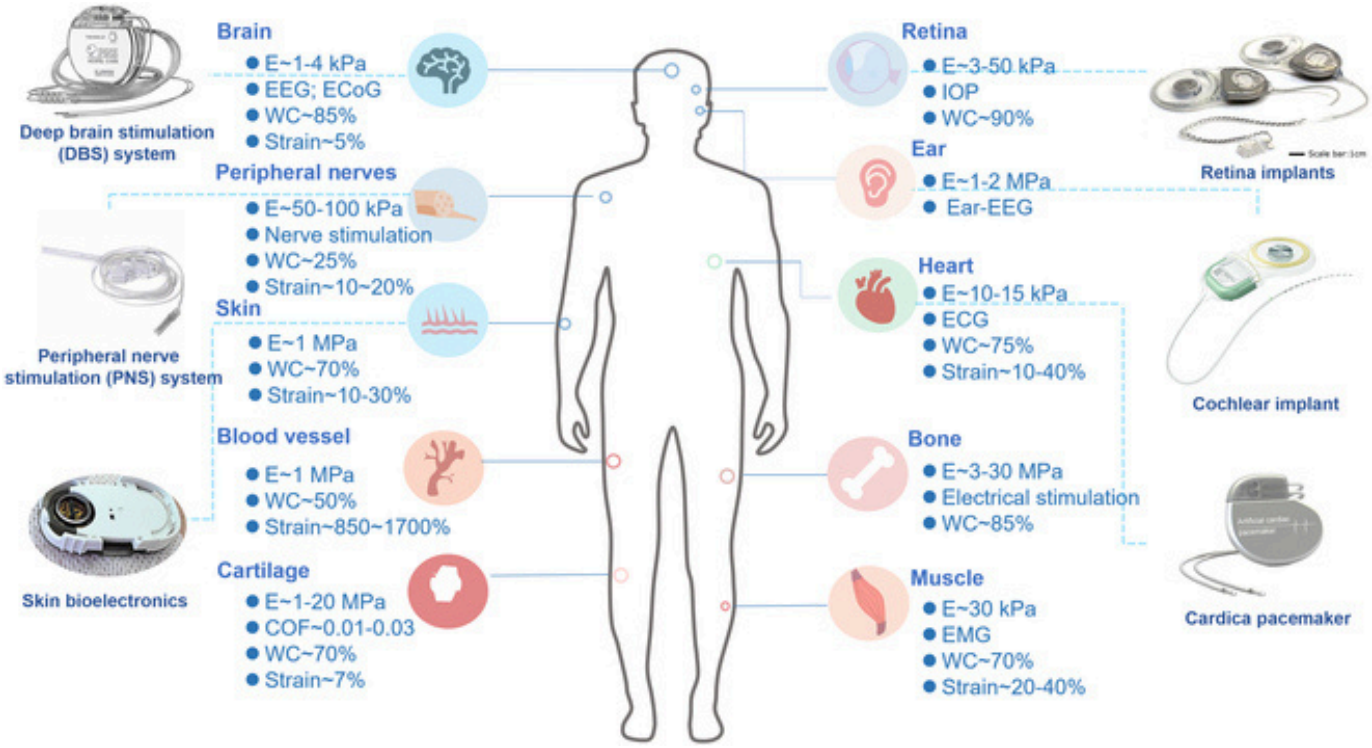
Biocomputation is a hybrid field that combines computer science and biology (1) to build computational models of real biological systems, using the tools and concepts of information science, so that biological systems can be seen from a different theoretical perspective and/or (2) to use biological systems or processes as metaphor, inspiration, or enabler for the development of new computing technologies and new areas of computer science.

Key applications and examples-

- Health monitoring and diagnostics: Bioelectronic devices can be used for the real-time monitoring of physiological signals. Ex: A glucose monitor is a portable device that measures a diabetic patient's blood sugar levels.
- Bioelectronic Therapies: Advancements in Neuromodulation. Bioelectronic devices provide interesting channels for therapeutic interventions beyond diagnostics and monitoring. Bioelectronic therapies heavily rely on neuromodulation, which modifies brain activity through electrical or electromagnetic stimulation. Bioelectronic devices can treat neurological conditions like Parkinson's disease, manage chronic pain, and even help people with spinal cord injuries regain control over their bladder and bowels by precisely targeting specific brain circuits.
- Therapeutic devices: Electronic stimulation can be used to treat various medical conditions. Ex: Vagus Nerve Stimulation (VNS) can help reduce inflammation in patients with diseases like arthritis.

STUDENT SPOTLIGHT

- Neural interfaces and prosthetics: Neural interfaces, which create a direct line of communication between the brain or nervous system and outside equipment, are one of the most exciting uses of bioelectronic devices. These interfaces allow people who are paralyzed or have lost limbs to operate prosthetic limbs or other assistive equipment solely with their minds. Bioelectronic devices can bridge the gap between the mind and machine by recording and decoding brain impulses, giving individuals in need fresh mobility and independence. These devices can help restore mobility and function by connecting with the nervous system. Ex: Robotic prostheses can be controlled by the user's own nerve signals.



- Bio-integrated sensors: Real time monitoring for Enhanced Healthcare. These are devices that use living cells to perform sensing functions. Ex: Engineered cells housed on an electronic chip can monitor factors like nitrogen levels in soil for agriculture.
- Molecular and organic electronics: This subfield explores the use of biological molecules, like DNA and proteins, or biopolymers for electronic functions. Ex: Biomolecular diodes that operate on the principles of photosynthesis and Bio-Organic Thin Film Transistors (TFTs) are being developed.

Core principles

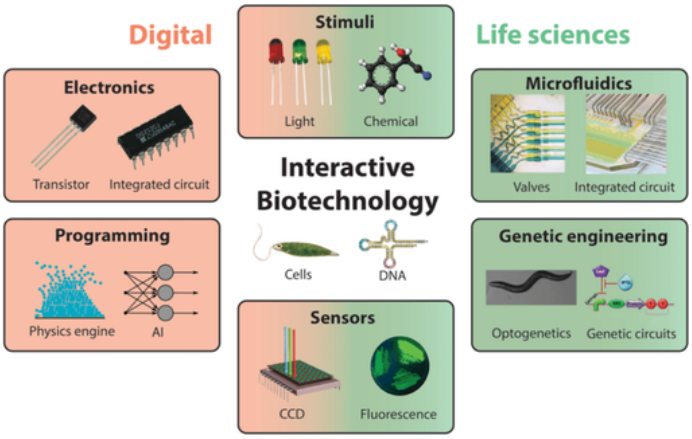
- Signal transduction: The fundamental principle is translating signals between the biological world and the electronic world. Biological systems generate electrical signals (e.g., nerve impulses), and bioelectronic devices use sensors to detect these and electronics to process them.
- Interfacing: A key challenge is creating a seamless interface between the soft, wet, and ionically charged biological world and the hard, dry, and electronically charged world of electronics.

STUDENT SPOTLIGHT

- Miniaturization: Bioelectronics aims to create smaller and more sophisticated devices, such as implantable sensors or microscopic cell-based biosensors.

In the future, many computing and electronic devices will consist of biologically derived or inspired materials that will increase their usefulness for various applications.

Bioelectronic devices are altering the healthcare landscape by fusing biology and electronics. These tools are opening up new possibilities for diagnosis, therapy, and personalized medicine, from neural interfaces that restore mobility to implantable sensors that monitor health from within. Bioelectronic devices have the potential to revolutionize healthcare and enhance the quality of life for many people as researchers continue to elucidate the workings of the human body and create cutting-edge technologies. As we continue on this incredible adventure at the nexus of biology and technology, the future promises intriguing possibilities.



~Kaustubh Ramesh, I[st] Year,
B. Tech. Biotechnology

Cryonic Rebirth

Prepare to be thrilled by the world of cryopreservation, a remarkable biotech field that's not just about freezing time but revolutionizing life itself! Imagine placing a living cell, a tissue sample, or even a reproductive cell into suspended animation at temperatures as low as -196 degrees Celsius—the temperature of liquid nitrogen. At this cryogenic extreme, all biological activity, including degradation, is effectively halted, allowing the sample to remain viable for potentially centuries! . This isn't science fiction; it's the foundation of modern regenerative medicine. Cryopreservation, often referred to as "cryoptics" due to the optical and biological complexities involved, is the secret weapon behind some of the most promising advances in healthcare. The amazing applications are mind-boggling.

- In reproductive medicine, it's routine for cryopreserved sperm, eggs, and embryos to lead to successful pregnancies decades after freezing, offering hope and options.
- But, the real excitement is in stem cell therapy and regenerative medicine. Cryobanks worldwide are safeguarding precious batches of hematopoietic stem cells (for cancer treatments) and mesenchymal stromal cells (for tissue repair). By preserving these "master cells," we ensure an on-demand supply for therapies that can repair damaged organs or treat debilitating diseases. This long-term, functional storage capability is absolutely critical for clinical trials and personalized medicine.
- The biggest challenge? Preventing the formation of lethal ice crystals that can shatter cell membranes. Scientists overcome this using specialized "antifreeze" molecules called cryoprotective agents (CPAs) and advanced techniques like vitrification, which flash-freezes samples so quickly they turn into a glass-like solid, bypassing ice formation altogether.

STUDENT SPOTLIGHT

Cryopreservation is transforming the biomedical landscape, enabling massive biobanks that safeguard the genetic diversity of our planet and the building blocks of human health. It is a field bursting with possibility, where the cold of deep-freeze holds the warm promise of future cures.

~Saketh Musunuri, I[st] Year,
B. Tech. Biotechnology

Before the Brain Breaks: The Biomarker Revolution Changing Neuroscience

Neurodegenerative diseases are rising faster than ever, over 55 million people today live with dementia, and this number will surge to 139 million by 2050. Parkinson's alone affects 10 million worldwide. Yet most patients are diagnosed years too late, often 2–3 years after symptoms begin, when nearly half of their neurons in critical regions are already lost. This is where biotechnology steps in, turning the invisible into the measurable. Modern biomarker platforms can now detect Alzheimer's and Parkinson's changes 10–15 years before symptoms, giving doctors a window that never existed before. Biotech tools like Simoa, mass spectrometry, and multiplex immunoassays have boosted detection sensitivity by nearly 100 times—tau, NfL, and amyloid proteins once detectable only at 100 pg/mL can now be measured below 1 pg/mL. Meanwhile, blood biomarkers such as plasma p-tau are replacing invasive spinal taps and opening the door for population-level screening.

Imaging is evolving too: positron emission tomography (PET) tracers like Pittsburgh Compound-B reveal amyloid plaques in living brains, while genotype and transcriptome analyses use AI to push diagnostic accuracy from 75% to 94% through multi-omics integration.

The global biomarker market reflects this momentum, soaring toward $130 billion by 2030 as more than 1,200 clinical trials rely on biomarkers to identify who will benefit from emerging drugs. Together, biotech and neuroscience are rewriting the timeline of brain disease. What was once diagnosed too late can now be seen in its earliest whispers, turning neurodegeneration from an inevitability into something we may finally detect, treat, and eventually prevent.

~Nashrah Iram Mehdi, I[st] Year,
B. Tech. Biotechnology

Placement Data - 2024

The 2024 graduating batch of the Department of Biotechnology has shown strong academic curiosity, consistent performance, and a clear vision for future growth. This year's outcomes reflect a balanced mix of students pursuing higher studies, entering research roles, and beginning their careers in industry. The batch has demonstrated both depth in subject knowledge and confidence in taking up opportunities across India and abroad.

A major share of the graduates secured admissions into well-known international universities. Students went on to pursue master's programs at places such as Monash University, University of California, Northeastern University, Roosevelt University, Wright State University, and University of Maryland Baltimore County. Some students also secured unique roles such as Graduate Research Assistantships within leading research institutions and medical schools. This highlights the scientific readiness and research aptitude of our graduates.

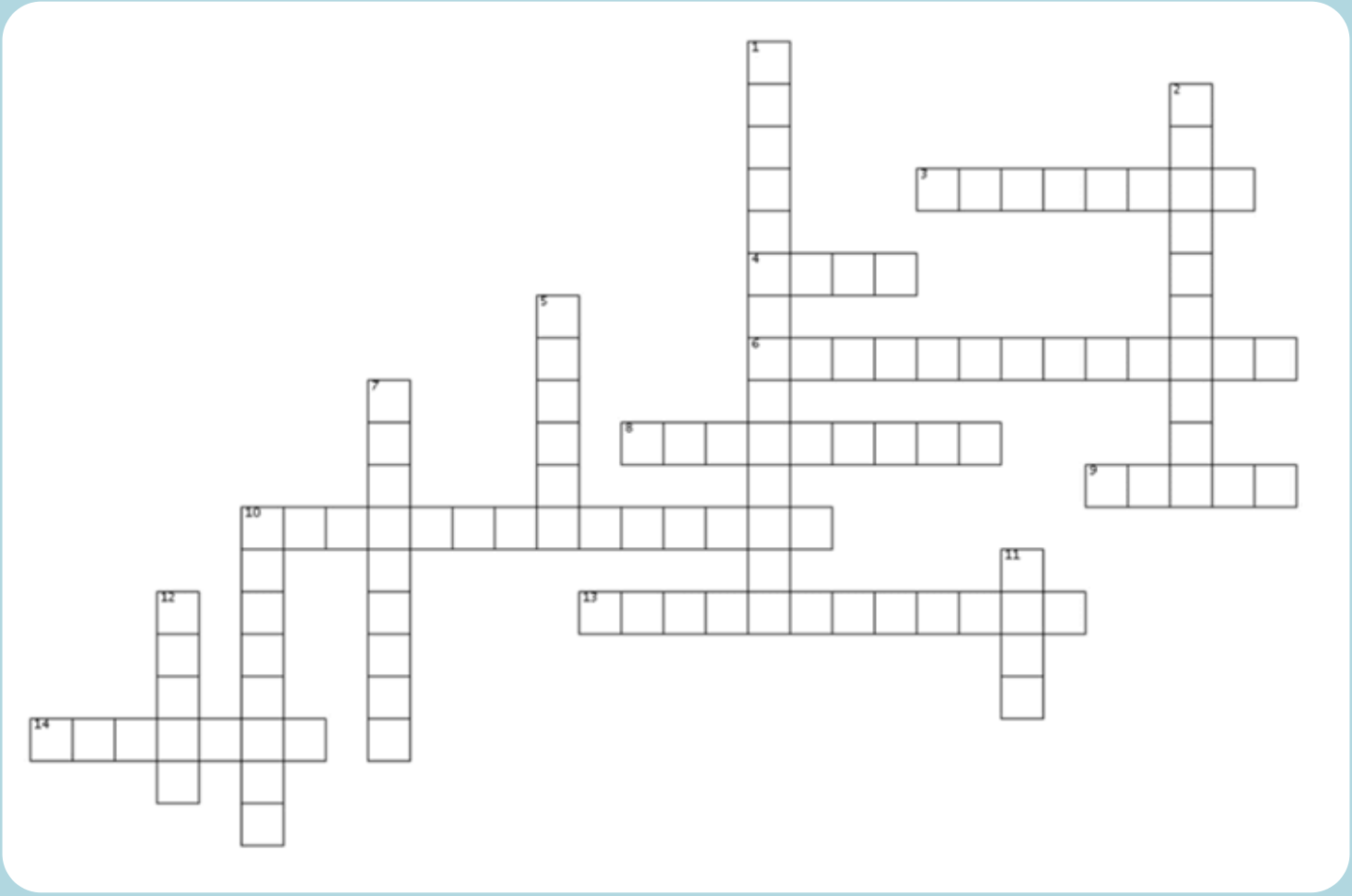
In India, several students chose to continue their education in highly competitive programs. Admissions into institutes like IIT Hyderabad, IIT Guwahati, BITS Hyderabad, and JNTU Hyderabad show the academic strength of the batch. A few students also began Ph.D. journeys at international universities, further reinforcing the department's emphasis on research-oriented training.

This year also saw good performance in national and international competitive exams. Students qualified and earned strong scores in GATE, GRE, IELTS, TOEFL, and BITS . Achieving these scores requires dedication, consistent practice, and solid conceptual understanding, which the students demonstrated throughout their preparation. These achievements played a key role in helping them secure admissions to top institutions.

On the placements front, a few graduates started their professional careers with reputable organizations. Students were placed in companies such as Dr. Reddy's Laboratories, Accenture, and Sonix HR Solutions. Roles ranged from technical trainee positions to industry-focused biotech work, giving students early exposure to professional environments.

Overall, the 2024 biotechnology batch stands out for its ambition, discipline, and willingness to explore diverse career paths. From advanced degrees in biotechnology and biomedical engineering to research roles and industry placements, the graduates have taken meaningful steps toward contributing to healthcare, life sciences, and emerging biotechnological fields. Their achievements reflect the department's commitment to nurturing capable, confident, and globally competitive professionals.

Crossword



DOWN:

1. This interdisciplinary field is concerned with the computational interrogation of large-scale biological data.
2. Alexander Flemming discovered the first antibiotic. What is it called?
5. What is the most common element found in the human body?
7. Which cells are responsible for the clotting of blood?
10. The AlphaFold 2 program is good for predicting the structure of what biomolecule?
11. People who get surgery for cataract get this replaced.
12. The microorganism 'Yeast' is commonly used by bakers to make this.

ACROSS :

3. Which hormone is also referred to as 'feel good' hormone?
4. How many chambers are in the human heart? Four
6. Which cells are responsible for transport of oxygen?
8. What is the connective tissue that connects bones to bones?
9. Mycology is the study of this microorganism.
10. How do plants produce food?
13. This is the most common cancer type.
14. Mosquitoes are carriers of this infectious 'M' disease.

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