Kristu Jayanti College

AUTONOMOUS Bengaluru

Reaccredited A++ Grade by NAAC | Affiliated to Bengaluru North University

Kristu Jayanti College 1999 - 2024 Empowering Visions, Enriching Lives

Synapse

Annual Newsletter
Department of Life Sciences

Volume 10 | February 2025

The day in which you have not done good to another will not be recorded in your book of life

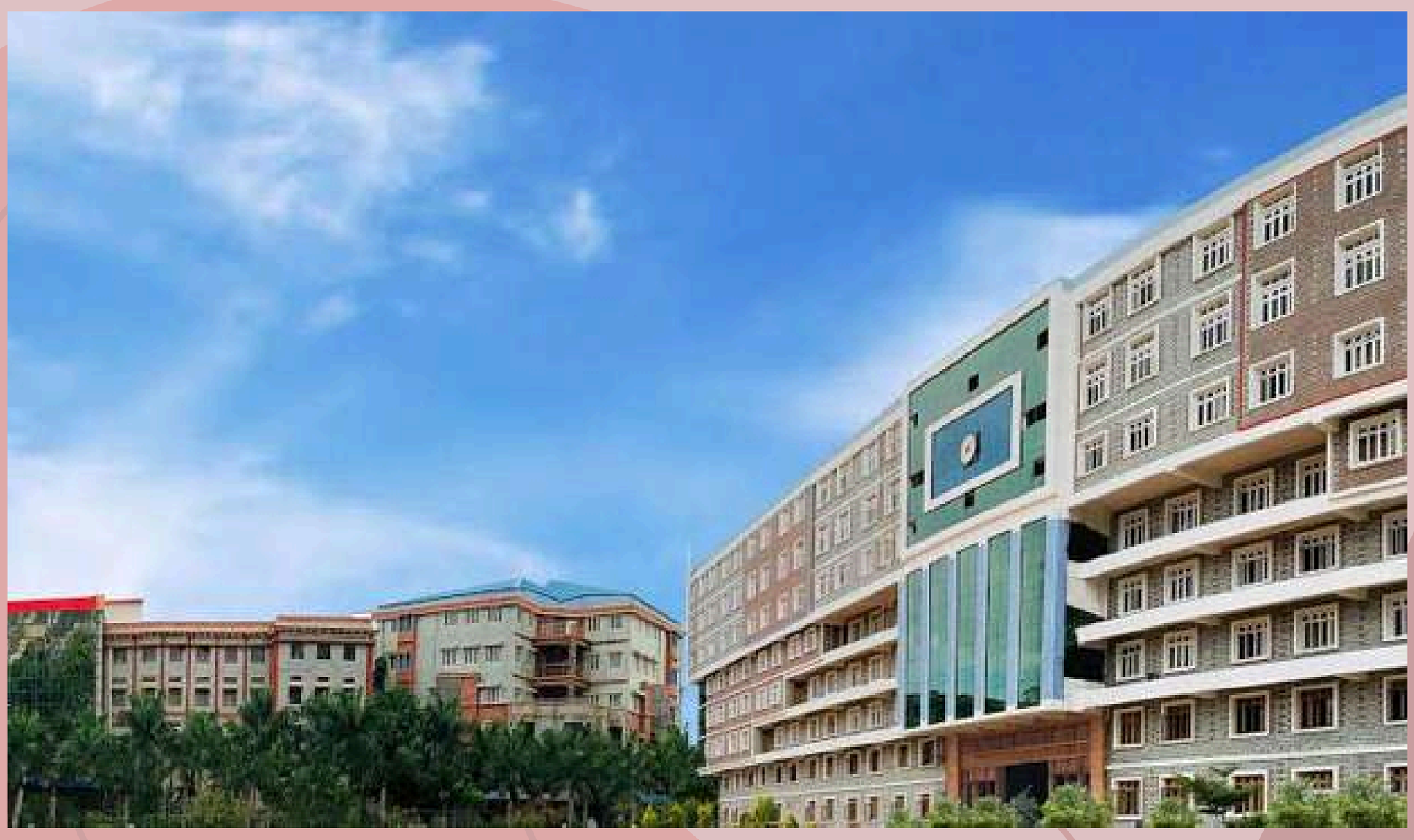
St. KURIAKOSE ELIAS CHAVARA

Founder, CMI Congregation

Kristu Jayanti College (Autonomous)

Kristu Jayanti College, established in 1999, is managed by the Bodhi Niketan Trust, formed by the members of St. Joseph Province of the Carmelites of Mary Immaculate (CMI). The institution is dedicated to providing quality education, fostering academic excellence, instilling values, promoting civic responsibility, encouraging environmental consciousness, and equipping students with global competencies.

Affiliated with Bengaluru North University, the college has been reaccredited with an A++ grade by NAAC in its third cycle in 2021. In the NIRF 2024 rankings, the college secured the 60th position among the top 100 colleges in India. The college received the DBT Star College status from the Department of Biotechnology, Government of India, under the strengthening component. The institution was also honored with the National Level Clean and Smart Campus Award, presented by Shri Dharmendra Pradhan, Minister of Education, Government of India.



Department of Life Sciences

Established in 2002, the Department of Life Sciences at Kristu Jayanti College is a premier institution dedicated to fostering excellence in education and research. With a vision to equip students with the knowledge and skills essential for the rapidly evolving Life Sciences sector, the department offers undergraduate programs in Biotechnology, Microbiology, Biochemistry, Genetics, and Botany, along with postgraduate programs in Biotechnology, Microbiology, and Biochemistry. Backed by cutting-edge laboratories and a strong emphasis on research, the department nurtures scientific curiosity and prepares students for promising careers in emerging fields of Life Sciences.

Message from the Principal....

Rev. Dr. Augustine George
Principal, Kristu Jayanti College

It is a great pleasure to know that the department of Life Sciences is bringing out its annual newsletter “Synapse” for the academic year 2024-25. This publication stands as a testament to the hard work, dedication, and innovation displayed by the students of the Department of Life Sciences. Over the past year, the Department of Life Sciences has been at the forefront of academic excellence, nurturing a passion for discovery and understanding in the world of biology and beyond. The Department's unwavering commitment to fostering a curious, critical, and scientific mind-set among students is something we hold in the highest regard. The newsletter serves not only as a showcase of the department’s accomplishments but also as an inspiration to continue exploring, questioning, and learning. I extend my heartfelt wishes to all all students and faculty members who have worked tirelessly to curate and refine the content of the newsletter. Let us continue to strive for excellence and look forward to an even more exciting future as we embark on new challenges and opportunities in the ever-evolving field of life sciences.

Message from the Dean....

Dr. Calistus Jude A. L.
Dean, Faculty of Sciences

It is with great pleasure that I introduce the latest edition of ‘Synapse’ the annual newsletter of the Department of Life Sciences Synapse is a vibrant reflection of the department’s academic spirit and commitment to excellence. This publication brings together a rich tapestry of content, featuring news snippets, emerging trends, and research insights in the field of Life Sciences.

What makes this newsletter truly special is the voice of our students, who contribute thought-provoking articles alongside coverage of the various programmess and activities organized by the department. It serves as both an informative and inspiring platform, showcasing the dynamic engagement of faculty and students in advancing knowledge and innovation.

I appreciate the Department of Life Sciences for its unwavering dedication, the faculty for their mentorship, and the editorial team comprising both faculty and students for their efforts in curating this insightful edition. May this newsletter continue to serve as a source of learning, inspiration, and collaboration for all.

Message from the Head of the Department....

Dr. S. Vijayanand
Head, Department of Life Sciences

I am happy to share with you the latest news and updates from our department. As we Continue to strive for excellence in education, research and innovation. I am Proud to highlight our achievements and milestones. Our students have consistently demonstrated exceptional in both academic and Cocurricular activities. Department follows a dynamic, forward-thinking curriculum which focuses on innovative discipline specific teaching pedagogies. Case studies, expert lectures, entrepreneurship skills, summer internship program, Research colloquium & empowerment seminars, short term research projects, extension programs, Hands on training Program & workshops in specific domains ensure a productive learning experience and focus on holistic development of students. The department is committed to excellence in teaching and research, which is reflected in its highly committed and dedicated faculty members specialized in Multidisciplinary domains. Numerous flagship programs offered by the department provide opportunities for students to advance their careers. The Department of Life Sciences' yearly newsletter, "Synapse," is an assortment of scientific articles written by the department's students. I appreciate the editorial team for their sincere efforts in publishing the issue.

From the Editors' Desk

Synapse, the annual newsletter of the Department of Life Sciences, Kristu Jayanti College serves as a comprehensive compilation of insightful articles and reflections contributed by both students and faculty, highlighting the department's commitment to academic excellence and research advancement.

Synapse aims to showcase the latest developments in various scientific domains, emphasizing the department's role in disseminating valuable knowledge and fostering intellectual curiosity. The newsletter stands as a testament to the continuous efforts of our students and faculty in contributing to the ever-evolving field of Life Sciences.

In addition to research highlights, Synapse provides an overview of departmental activities, including expert talks, exhibitions, and academic achievements, reflecting the dynamic and collaborative environment within the department. We hope this publication serves as an informative and inspiring resource for the student and research community, offering valuable insights into the progress and accomplishments of the Department of Life Sciences at Kristu Jayanti College.

Student Editors

Marissa Fernandes
Sunny Gabriel
Pavani A. Shetty
Rachel Sunil

Faculty Co-ordinators

Dr. Arpita Mishra
Dr. Anoja Kurian
Dr. Nathiya T.

Photo on the Cover page

Scientific Name: *Cyperus alternifolius*
Common Name: Umbrella Palm
Picture Courtesy: Marissa Fernandes at KJC campus.

Index

01 THE BIOLOGICAL GLOW: BIOLUMINESCENCE

Bioluminescence is like nature's own light show. A phenomenon that brings the dark corners of our world to life. Imagine wandering through a moonlit forest and discovering mushrooms glowing softly underfoot, or standing on a beach where the waves sparkle with tiny, twinkling lights from bioluminescent plankton.

In the depths of the ocean, where sunlight barely penetrates, bioluminescent organisms illuminate the darkness. Creatures like jellyfish use their light to communicate, attract mates, or lure unsuspecting prey into their grasp. Some even employ this light as a clever defense mechanism, creating a flash to confuse predators.

This enchanting glow isn’t just beautiful—it serves essential purposes in the lives of the creatures that wield it. On land, fireflies own this super power their flickering lights creating a light show wherever they go. Each flash is a signal, a way to find a partner in the vast expanse of night. Similarly, certain Bioluminescence typically results from a biochemical reaction involving a light-emitting molecule called luciferin and an enzyme called luciferase. When luciferin is oxidized in the presence of luciferase, light is produced. Some bioluminescent organisms can produce light in multiple colors, primarily blue and green, which travel the farthest underwater. Overall, bioluminescence is a remarkable example of nature's innovation, showcasing how life can adapt in stunning ways.

Pavani A Shetty
1st Year B.Sc. BTGEBC ‘B’

02 THE SCIENCE OF DREAM HACKING JOURNEY INTO THE DEPTHS OF YOUR MINDS

Imagine stepping into your own dreams with total awareness, like an explorer venturing into hidden worlds. You walk through vivid landscapes, create impossible realities, solve your biggest life puzzles, and unlock buried memories. Sounds like science fiction? Dream hacking is closer than you might think, and it's sparking a revolution in how we understand our sleeping mind.

The Mystery of Dreams - And the Desire to Control Them

For millennia, people have wondered about the purpose of dreams. Are they random scenes, reflections of daily life, or windows into something deeper? Modern science suggests dreams serve critical functions in processing emotions, solidifying memories, and even enhancing creativity. But can we actually steer this process, shaping our dreams to solve real-world problems or ignite creativity? Researchers are determined to find out—and some early breakthroughs suggest we're already on the brink of doing so.

Lucid Dreaming: Where Fantasy Meets Reality

The first step into dream hacking often starts with lucid dreaming—the ability to realize you're dreaming while you're still inside the dream. Lucid dreaming allows you to take control, turning your imagination into reality. Imagine gliding over cities, traveling to ancient worlds, or engaging in a conversation with a version of yourself from the future. In a lucid dream, this can all feel as real as life itself.

Techniques to achieve lucidity are simple yet powerful. They include "reality checks" throughout the day (like asking yourself if you're dreaming), keeping a dream journal, and practicing the "MILD" technique (repeating a phrase like "I will be aware I'm dreaming" as you drift off to sleep). The more you practice, the more likely you are to gain that *'Eureka!'* moment inside your dream—opening a door to unlimited possibility.

Dream Incubation: Planting Seeds in Your Mind

What if you could prepare for a big decision or seek a creative breakthrough.. by simply going to bed? Dream incubation lets you “seed” themes, problems, or ideas ideas before sleep, guiding your subconscious to work on them while you dream.

To solve problems or overcome creative blocks, visualize the issue before sleep and affirm you'll find the solution in a dream. Studies suggest this can nudge your subconscious to work on the problem, potentially yielding unexpected insights during sleep.

In fact, artists, scientists and even inventors have relied on dreams for inspiration. Salvador Dalí famously caught ideas for his paintings in the twilight state before sleep, while Thomas Edison would drift off holding metal balls in hands, jolting awake with new insights. This “creative drift” method is just a preview of what dream hacking can do when fully unlocked.

The Frontier of Dream Technology: Hacking Dreams with Wearables

Dream hacking technology is no longer the stuff of science fiction. Wearable devices—like the iBand+ and the Aurora Dreamband —track sleep stages, using EEG to monitor brain activity, and employ gentle lights or sounds to influence dreams. By detecting when you’re in REM (Rapid Eye Movement) sleep, these devices emit stimuli that can be incorporated into your dreams, making it easier to recognize that you’re dreaming or even shape what unfolds.

One groundbreaking study focused on Targeted Dream Incubation (TDI), where researchers recorded audio prompts, like the sound of a beach or a forest, and played them as participants entered REM. These sounds then appeared in the participants' dreams, showing that subtle, timed cues can influence dream content. Such technology holds promise not only for helping people explore their creativity but for treating conditions like PTSD or improving memory retention.

Ethical Questions and Futuristic Visions

“Dream hacking, with its potential to unlock creativity and explore the subconscious, also raises ethical concerns like sleep advertising and potential harm. Researchers are working to ensure responsible development."

So, as you drift off tonight, remember: *Your dreams may hold answers you never thought possible. And soon, you might have the power to reach in and bring those answers back into the waking world.*

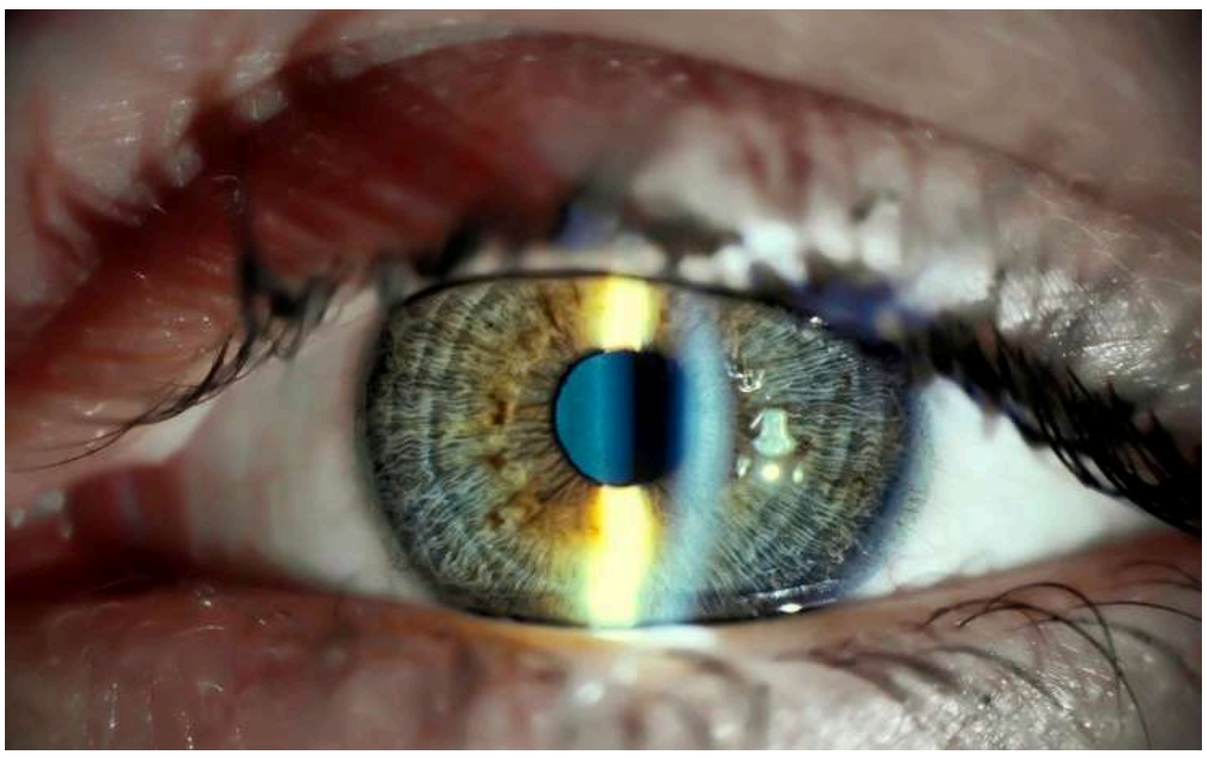
Tanishka D Kumar
1st Year B.Sc. BTGEBC ‘B’

03

STEM CELL FOR VISION

World-first stem-cell treatment restores vision in people

A novel stem cell treatment utilizing reprogrammed induced pluripotent stem (iPS) cells has cells has successfully restored vision in four patients with corneal damage, with three of them showing sustained improvements for over a year. The treatment has demonstrated promising results without severe side effects or immune rejection, but further trials are necessary to establish its safety and efficacy.



They took blood cells from healthy donors and reprogrammed them into an embryonic-like state, then transformed them into corneal epithelial cells. The procedure included scraping off scar tissue from the damaged cornea and stitching on the epithelial sheets derived from the donor, followed by placing a protective contact lens on top.

Outcomes of the treatment showed that all four recipients experienced immediate improvements in vision, with three maintaining substantial gains over a year. None of recipients experienced severe side effects, and there were no signs of tumor formation or immune rejection of the grafts, even in patients who did not receive immunosuppressant drugs. However, one recipient showed slight reversals in vision during the observation period. Additionally, there was a reduction in the area of limbal stem-cell deficiency (LSCD) in all recipients, indicating a positive response to the treatment.

Yes, researchers plan to assess the safety and efficacy of the stem cell treatment for corneal restoration in upcoming clinical trials, which are set to launch in March. This will help determine the treatment's effectiveness and further evaluate its safety profile.

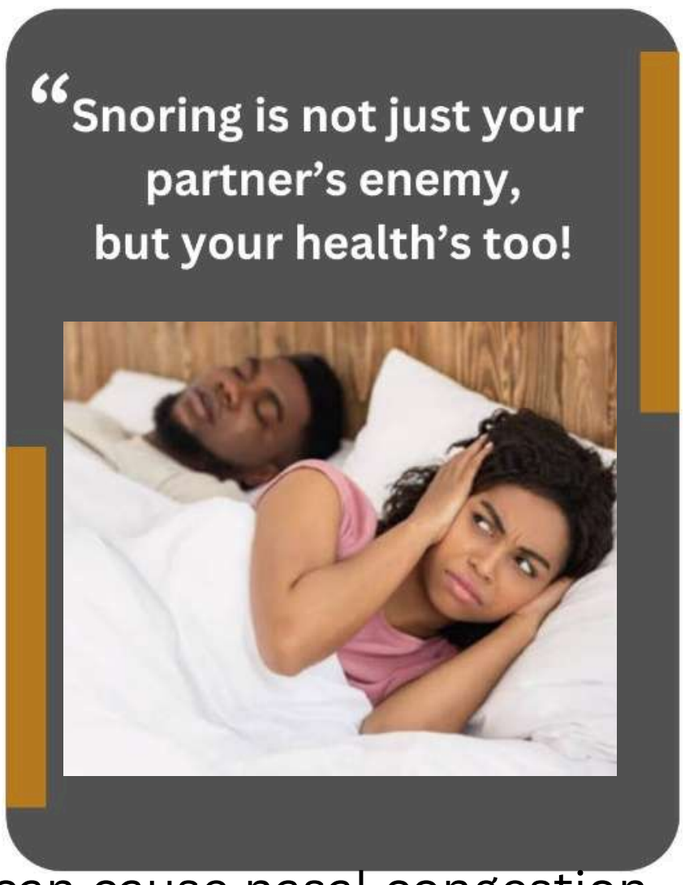
Sruti Bisoyi
2nd Year B.Sc. MBGE

04 THE SNORES : THE SCIENCE BEHIND SNORING

Snoring is a common phenomenon that occurs when airflow through the mouth and nose is partially obstructed during sleep. This obstruction leads to the vibration of the throat tissues, producing the characteristic sound of snoring.

Causes of Snoring:

- **Anatomical Factors:** The structure of person's mouth and throat can contribute to snoring. A thick or long soft snoring. A thick or long soft palate, enlarged tonsils or a deviated septum can obstruct airflow.
- **Obesity:** Excess weight, particularly around the neck, can put pressure on the airway leading to increased snoring.
- **Age:** As people age, throat muscles can weaken, making snoring more likely.
- **Sleep Position:** Sleeping on the back can cause the tongue and soft tissues to collapse into the airway, obstructing airflow.
- **Alcohol and Sedatives:** These substances relax the throat muscles, increasing the likelihood of snoring.
- **Smoking:** Irritation of the airway from smoke can lead the inflammation and increased snoring.
- **Nasal Issues:** Conditions like allergiees, cold, or sinus infections can cause nasal congestion, leading to snoring



05 UNIQUE IDENTIFIERS: BEYOND FINGERPRINTS

While human individuality is often identified through fingerprints, animals have their own unique identifiers:

- **Paw Prints:** Many mammals, such as dogs and cats, have unique paw prints that can vary in size and shape. They differ from one individual to another.
- **Nose Prints:** Dogs have distinct nose prints, which are unique to each individual, similar to human fingerprints.
- **Fur Patterns:** Species like tigers, leopards, and zebras have unique fur or coat patterns that can distinguish individual animals
- **Whisker Patterns:** In some animals, like cats, the arrangement of whiskers can vary and serve as a form of identification.
- **Scale Patterns:** Reptiles can have unique scale arrangements or patterns, useful for identification in some species. These traits serve a similar purpose human fingerprints, helping to differentiate individuals within a species.

Pavani A Shetty
1st Year B.Sc. BTGEBC ‘B’

06 DEAF MOSQUITO

Researchers have identified that the knockout of the trpVa gene in male Aedes aegypti mosquitoes leads to deafness, which in turn results in a complete lack of of interest in mating. It highlights the importance of sound, specifically the wingbeats of female mosquitoes, in initiating courtship behaviours among males. This discovery could provide valuable insights for mosquito population control strategies, particularly in enhancing methods like the sterile insect technique (SIT) to mitigate disease transmission.

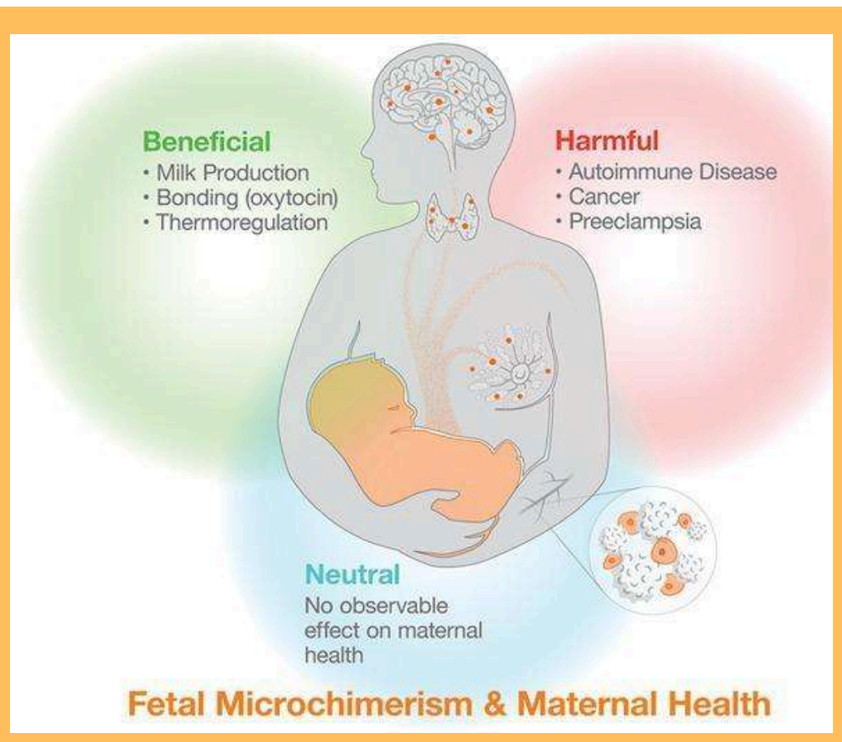
The knockout of the trpVa gene male Aedes aegypti mosquitoes deaf, which completely eliminates their interest in mating. Without the ability to hear the wingbeats of females, which are crucial attracting males, the deaf males do not respond to females even placed together for extended periods. In contrast, normal males, who female wingbeats, actively engage in mating behaviour. This indicates that sound is not only necessary but sufficient to stimulate mating desires in male mosquitoes. Understanding the role of sound in mosquito courtship could lead to several potential applications:

- **Sterile Insect Technique (SIT) Enhancement**: By targeting the auditory mechanisms involved in mating, researchers could develop more competitive sterile males that can effectively mate with females, thereby reducing mosquito populations and disease transmission.
- **Targeted Pest Control:** Insights into the auditory cues that attract male mosquitoes could inform the design of traps or lures that exploit these sounds,
- **Disease Management:** By manipulating mating behaviours through sound, it may be possible to disrupt the reproductive cycles of disease-carrying mosquitoes, potentially lowering the incidence of diseases like dengue, Zika, and yellow fever.
- **Behavioural Studies:** Understanding the sensory cues in mosquito mating can provide a framework for studying similar mechanisms in other insect species, which could have broader implications for pest management and ecological research.

This discovery not only enhances our understanding of mosquito behaviour but also opens up new avenues for innovative pest control strategies. By leveraging the insights gained from this study, particularly in relation to the sterile insect technique (SIT), we may develop more effective methods for managing mosquito populations and mitigating the spread of mosquito- borne diseases. Overall, this research represents a significant step forward in the intersection of behavioural ecology and public health.

Sruti Bisoyi
2nd Year B.Sc. MBGE

07 CHIMERISM - GENETIC IMPOSTERS



Microchimerism is displayed during pregnancy when there occurs bidirectional transfer of genetic material/cells between mother and her baby (fetus).

What if a person could have more than one set of DNA? What if there was another person's DNA in your body that is not genetically yours?

Let us talk about chimerism, the Let us talk about chimerism, the word chimerism comes from the Greek mythical monster, Chimera. The chimera is part lion, part dragon and part goat. Like in its namesake chimerism involves multiple organisms together in one body or tissue. It is the biological condition of having more than one set of DNA within a single organism.

Chimerism is quite different from mosaicism where an organism has multiple sets of DNA because of a mutation in the original cell. In chimerism originate from genetically distinct beings. Chimerism can occur artificially with things like transplants or grafts or naturally in one of two ways.

The first is an extremely rare case where a woman who is pregnant with twins or triplets and one of the zygote or fertilized egg dies early in pregnancy, the other zygote absorbs the cells or tissues of one that did not survive and develop entire sections of their bodies belonging to another person.

The second way chimerism can occur naturally but is much smaller but far more common in what's called micro-chimerism. Rather than whole tissues individual cells are exchanged between pregnant organisms and their babies, the result is that both parties have cells from completely different people in their bodies even years after the pregnancy occurred. Scientists are not sure how common micro- chimerism is, but one study looking at brain tissue of female cadavers who had at one point been pregnant with boys found that 64 of them had cells with XY chromosomes in them.

Since XY chromosomes can only exist in biological males these cells could have come from their sons. This is absolutely mind boggling because it means that another person's cells could have been actively affecting these women's thoughts and actions.

Since there is evidence that it may happen pretty frequently in humans, some scientists have suggested that it could have an impact on the incidence of diseases such as autoimmune diseases like scleroderma. The body normally has a very strong immune response to foreign human cells, so what could be the medical effect of micro-chimerism be? It's worth asking all these questions about how micro-chimerism relates to disease. But also makes you wonder if the cells in your body can be genetically distinct, then what makes you.... You?

Albin Jose
3rd Year B.Sc. BTGE

08 CHIMERIC MONKEY

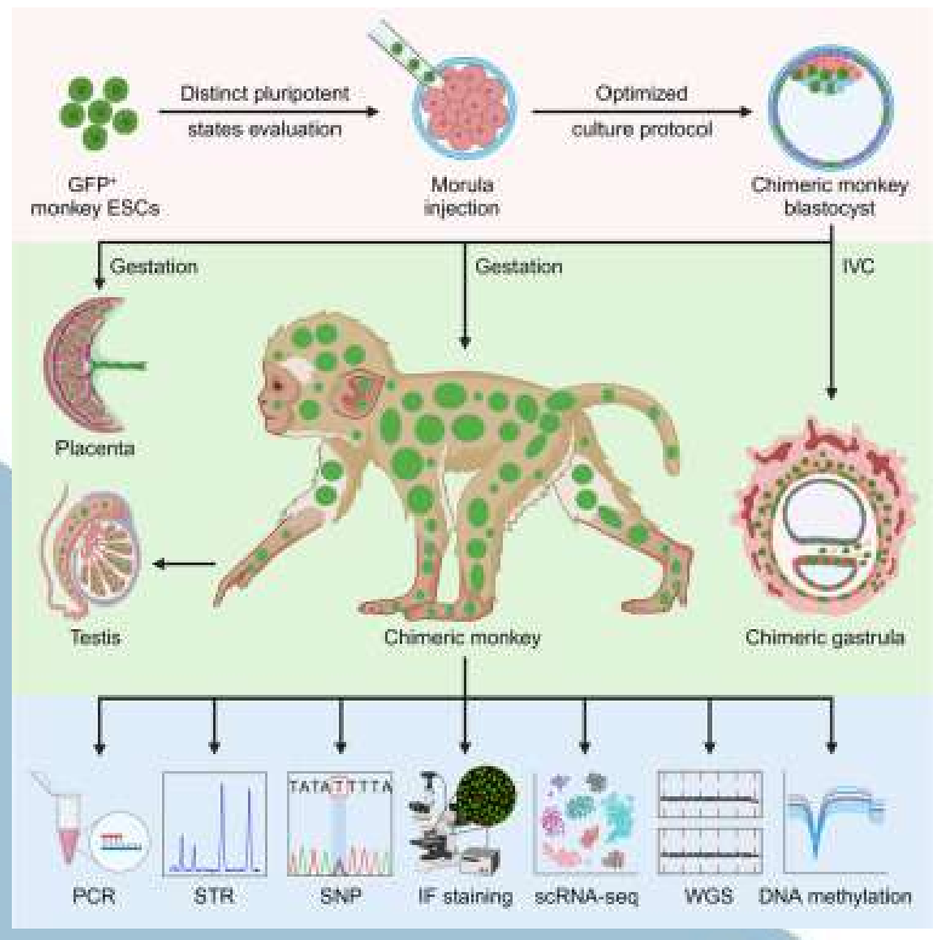
Live birth of chimeric monkey with high contribution from embryonic stem cells

Embryonic Stem Cells (ESCs) are pluripotent cells derived from the inner cell mass of a blastocyst, which can differentiate into any cell type in the body. They possess the ability to self-renew and maintain their pluripotent state under specific culture conditions.

Chimeric Embryos are embryos that contain cells from two or more different genetic sources, often created by introducing ESCs into a host embryo, allowing them to contribute the development of various tissues within the chimeric organism.

The isolation, culture, and analysis of ESCs and chimeric embryos from cynomolgus monkeys, includes various

methodologies such as single-cell RNA sequencing, genomic analysis, and optimization of culture conditions for naive and primed ESCs.



The analysis of the contribution of naive embryonic stem cells (ESCs) in chimeric monkeys involved several techniques such as:

- **Genomic DNA PCR** (to detect specific markers (e.g., GFP, SRY, and actin) in tissue samples from chimeric monkeys)
- **Single-Nucleus RNA Sequencing (snRNA-seq)** (to analyse the contribution of injected ESCs to brain cells, revealing that (91%) of brain cells originated from the injected ESCs
- **Deep Sequencing of Mitochondrial DNA SNPs and Genomic DNA SNPs** (to analyse genetic variations between the oocyte donor and the ESC donor)
- **Fluorescence-Activated Cell Sorting (FACS)** (to quantify the percentage of GFP- positive cells in peripheral blood mononuclear cells (PBMCs) and bone marrow cells (BMCs) of the chimeric monkeys).

The comprehensive approach allows for the effective generation and analysis of chimeric embryos using cynomolgus monkey ESCs

1. ESC Culture

- **Media Optimization**: Various culture media (4CL, 5iLAF, RSeT, PXGL, LCDM) were tested but the 4CL medium was found effective in maintaining pluripotency and enhancing cell survival.
- **Cell Line Generation:** GFP-labelled ESC lines were generated for tracking and analysis purposes.

2. Embryo Injection

- **Morula Injection:** Morula-stage host embryos were injected with the GFP-labelled naive ESCs.
- **Embryo Transfer**: The injected embryos were then transferred into surrogate female monkeys to allow for gestation and development

3. In Vitro Culture

- **Prolonged Culture**: The injected embryos were cultured in vitro to monitor development and assess the integration of ESCs.
- **Characterization Pipeline**: A thorough characterization pipeline was established, including GFP cell counting, single-nucleotide polymorphism (SNP) analysis, and single-cell transcriptomic profiling to evaluate the contribution of ESCs to various tissues.

4. Teratoma Formation

- **Teratoma Assays:** To assess the pluripotency of the derived ESCs, teratoma formation assays were conducted. This involved injecting ESCs into immunocompromised mice to observe the formation of teratomas, which contain differentiated cell types from all three germ layers.

5. Genetic Analysis

- **Genomic Integrity Assessment**: The genomic integrity and epigenetic status of the GFP-labelled cells were analysed, focusing on DNA methylation patterns and gene expression differences between ESC-derived and host cells.

The study achieved live births of chimeric monkeys with significant contributions from these naive ESCs, ranging from 20% to 90% across various tissues. This high level of chimerism was confirmed through genomic analyses and transcriptomic mapping.

Sruti Bisoyi
2nd Year B.Sc. MBGE

09 DARK MATTER - MORE THAN MEETS THE EYE

Why is 95%of the Universe missing?

Fritz Zwicky: The First real evidence for dark matter came in 1933 which is used to measure the visible mass of a cluster of galaxies.

Here comes the Dark matter which does not interact with light and cannot be viewed. All the atoms and light in the universe together make up less than five percent of the total contents of the cosmos. The rest is composed of dark matter and dark energy, which are invisible but dominate the structure and evolution of the universe.

But it is present because of its effect due to gravity which is due to the stars on the edge that move a lot faster than they should. This matter is something that is a new kind of fundamental particle, not protons, not neutrons and entirely new. These can penetrate through all other forms of matter, which means that they may even be able to transverse right through our planet without losing any energy. So this invisible matter that dictates how our universe works is known by particle physics as WIMP's which is abbreviated as Weakly Interacting Massive Particles. Finding Dark matter is not able to be done particularly because of viewing ordinary matter which blocks our view of the stuff that we can't see. Cosmic rays would affect the working and setting of laboratories on the earth surface. Astronomer's using NASA's Hubble Space Telescope took advantage of a giant cosmic magnifying glass to create one of the Sharpest and most detailed maps of dark matter in universe.

Dark Matter isn't simply dark: it's invisible. Light of all types seems to pass through as though it's completely transparent. The clusters of galaxies have their own dark matter, which outweighs everything else put together.
The WMAP was launched in 2001 to observe fluctuations in the universe and observe how its gravity bends and distorts light from more distant objects.

Shrinidhi Jayaraman
1st Year B.Sc. BTGEBC 'B'

10 SEQUENCE SEARCH

Search for the words vertically, horizontally and diagonally.

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Denaturation
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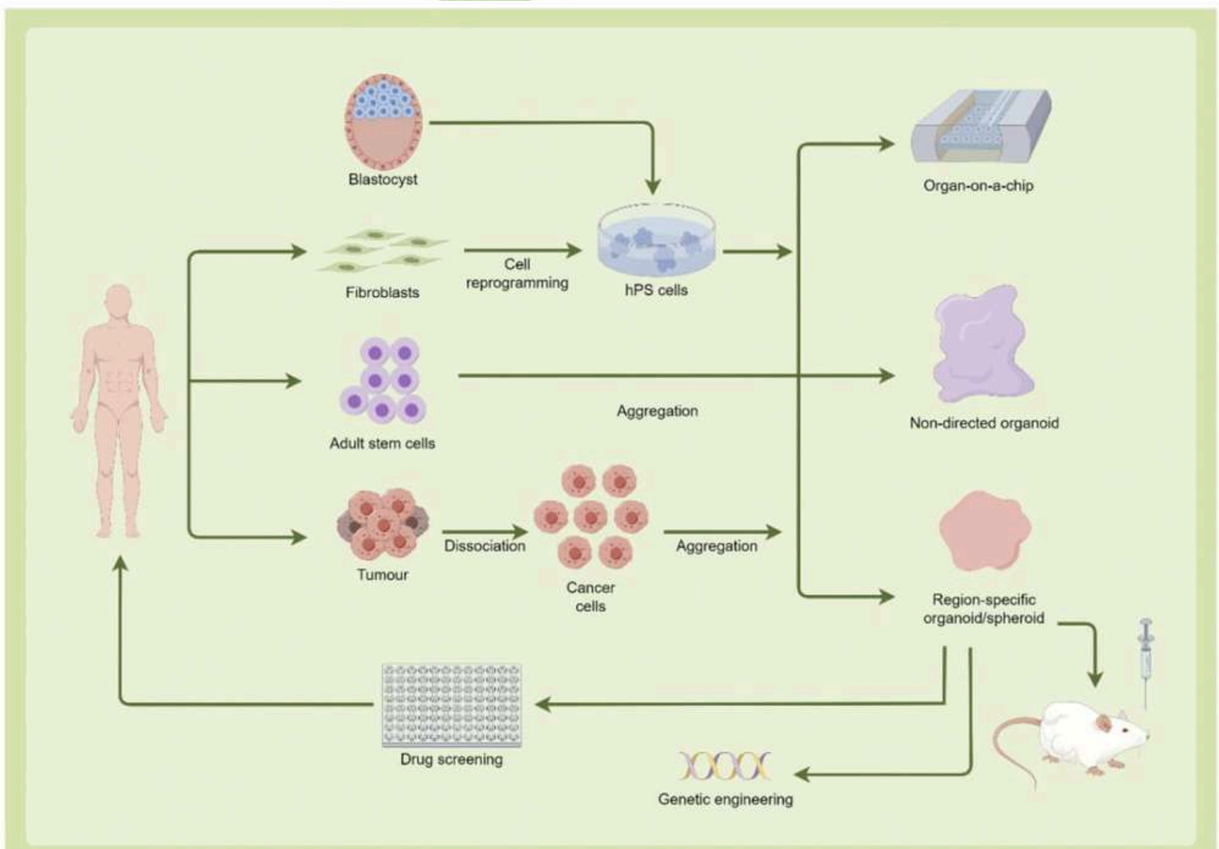
Elongation
Hepatitis B
Lactose
Lysosome
Mitosis
Molarity
MS media
Mutations
Naphthalene
Necrosis
Ozonolysis
Prions
Ribozymes
Spirulina
Tapetum
Uracil
Xerophytes
Zymogen

Marissa Anastasia J. Fernandes
3rd Year B.Sc. BTGE

11 RESTRUCTURING BIOENGINEERING : THE INVENT OF STEM CELLS

Stem cell bioengineering is an advanced research methodology therapeutic which uses recently developed regenerative medicine through engineered stem cell systems to improve clinical therapeutic perspectives. Stem cells are those cells that continuously and rapidly divide and make exact copies of themselves. Several stem cells like hemapoietic stem cells are used to support blood and immune such

as organoids for creating cellular products. This process also helps in cells, basal stem skin cells are used to support immune cells, basal stem skin cells and mesenchymal stem cells support bone, cartilage, muscle and fat. The important methods used in this field of bioengineering are to bioprocesses for human stem cell maintenance and expansion, micro/ nanofabrication for tissue like substitutes and 3D cultivations such as organoids for creating cellular products.



This process also helps in 3D cell culture techniques such as recreating in vitro cellular environments, guiding cell mechanisms using gene editing tools like CR signalling and to know molecular disease CRISPR-Cas 9 and spheroid/organoid models. Through stem cell bioengineering, cerebellar tissues and active neuronal networks that are derived from iPSCs (Induced Pluripotent Stem Cells) are used to enhance neural study models without needing to culture animals. Several pedagogies such as microencapsulation techniques allow cardiac cells to mature in co-culture and replicate crucial heart tissue characteristics. This specific biotechnological field also incorporates the necessity of using 3D liver spheroid models that includes biochemical cues and growth factors. These are directed to the liver progenitor cells, leading it to biliary differentiation. Bioengineering of stem cells also progresses in β-cell differentiation and maturation aid. They are helpful in evolving cells that are responsive to glucose and are used mainly for diabetes therapy.

In conclusion, the evolution of stem cell bioengineering brings about a transformation in the world of biomedicine. With the emergence of several cell based treatments, this certain area of medical science is much helpful in making progress rapidly. It works with the aim to bring out lab-oriented works into real-life medical applications. Stem cell bioengineering holds a firm grip for producing regenerative medicine through the combined efforts of modern day engineering techniques with that of cell biology. This has led to the fabrication of functional tissues and certain cell systems for therapeutic purposes.

Devikrishna Sinilal
3rd Year B.Sc. BTGE

12 APPLICATION OF MICROORGANISMS IN CHOCOLATE PRODUCTION TECHNOLOGY

Chocolates are multi-phase systems of particulate matter (sugar, cocoa, milk components) and continuous phases (cocoa butter, milk fat, emulsifiers).

Cocoa solids are derived from beans of Theobroma cacao. West Africa produces over 70% of the world's cocoa. Chocolate is known for its taste, health benefits, and sensory properties. Studies suggest it is easily digestible and beneficial for the nervous system.

The production of chocolate involves many steps, including the contribution of microorganisms. The unique chocolate flavor originates from the growth conditions and fermentation of cocoa beans. While useful microbes enhance taste, harmful microbes can compromise quality and safety.

Fermentation Process

Chocolate production begins with hand-picking ripe cocoa pods. After opening the pods and removing the beans, fermentation occurs naturally through microorganisms present on fruits, knives, and other surfaces. Yeasts dominate initially, followed by Lactobacillus (lactic acid bacteria) and Acetobacter (acetic acid bacteria). Over-fermentation can lead to the growth of spore-forming bacteria like Bacillus and molds, producing off-flavors and toxins. Proper storage below 8% humidity and husk removal during manufacturing help control mold and toxin levels.
The degree of fermentation is indicated by the bean color. Fermentation reduces bitterness, astringency, and acidity, while drying decreases moisture to safe levels for storage and transport.

Microbial Safety in Chocolate

To ensure microbial safety, chocolate must have low water activity, high fat and sugar content, and a pH of ~5.5. Although bacteria cannot grow under these conditions, pathogens like Salmonella can survive. Proper roasting is crucial for pathogen elimination.

Role of Probiotics

Milk-containing chocolates include probiotics such as Lactobacillus acidophilus, Lactobacillus johnsonii, Bifidobacterium longum, and Bifidobacterium bifidum. These probiotics resist stomach acid, attach to intestinal walls, and produce antibacterial compounds like lactic acid. They also produce acids (butyric, propionic, acetic) in the colon, lowering pH and destroying pathogenic bacteria, thereby improving digestive health.

Conclusion

Microorganisms play a vital role in chocolate formation, contributing to its taste, safety, and health benefits. Beyond chocolate, they support the microflora in our digestive system, promoting overall health.

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13

HUMAN BODY AFTER DEATH:
DECOMPOSITION AND CREMATION

Have you ever thought of what happens to the human body after death during decomposition and cremation?

After death, the human body undergoes profound transformations. Decomposition and cremation each path illustrates the inevitability of change in strikingly different ways. While decomposition is a slow, methodical return to the earth, embodying nature's cycle, cremation is an explosive release, a swift departure from the physical realm. Decomposition fosters life as nutrients return to the soil, while cremation emphasizes the ephemeral nature of existence, transforming the body into a memory captured in ash. Each path reflects different beliefs about life, death, and what lies beyond, showcasing the profound ways we confront mortality.

Decomposition: The Slow Embrace of Nature

Decomposition is a gradual, natural process, marked by the body's return to the earth. Immediately after death, rigor mortis sets in, stiffening the muscles. Within hours, the body begins to cool, as blood circulation ceases and cellular respiration halts.

Stages of Decomposition:

Autolysis: Enzymes break down tissues, leading to cell breakdown.
This stage can cause a foul odor as cells begin to burst.
Bloat: Gases produced by bacteria lead to swelling, distending the abdomen.
This stage attracts insects, particularly blowflies, which lay eggs that hatch into larvae.
Advanced Decay: Soft tissues diminish, and the body is reduced to bones, with only remnants of skin and hair. The environment plays a crucial role here; moisture, temperature, and presence of scavengers influence the pace.
Skeletonization: Eventually, only bones remain, completing the cycle of life as they become part of the soil, nurturing new life.

Cremation: The Rapid Release of Spirit

In contrast, cremation is a swift, intense transformation. The body is subjected to high temperatures, typically around 1400 to 1800 degrees Fahrenheit, for about two hours. This process is a fiery farewell, reducing the body to ash in a matter of moments.

Stages of Cremation:

Ignition: The body, enclosed in a casket or container, is placed in a cremation chamber. As the flames ignite, they envelop the body, marking the beginning of rapid combustion.
Destruction of Tissues: Proteins and fats combust quickly, producing gases and smoke. The heat destroys soft tissues, leaving behind only skeletal remains and ashes.
Reduction: The bones, once exposed to the flames, break down and are processed into finer particles. This stage represents a complete transformation, with the body reduced to a collection of ashes.
Ash Collection: The final product is gathered, often placed in an urn, symbolizing the end of the physical form and the essence of the individual.

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14 EPIDEMIOLOGY

The COVID-19 pandemic familiarized many people with the idea of uncontrolled diseases, popularizing terms such as “transmission,” “incubation period,” “contact tracing,” and “herd immunity.”

For epidemiologists, these concepts are essential to their work, as they have long been preparing for outbreaks. Their expertise is essential for evaluating the impact of the coronavirus, but their responsibilities extend beyond just new viruses and pandemics. So, what does this specialized field involve, and how do epidemiologists address public health issues? Epidemiology examines how frequently diseases occur and distribute among various populations and the reasons for these patterns. The information collected through epidemiological research is essential for creating and evaluating health strategies aimed at preventing diseases and managing current health issues. To accurately interpret disease-specific epidemiological data, it is important to consider both both past and current disease incidents. A rise in reported casesexpected seasonal patterns does that coincides with expected seasonal patterns does not necessarily indicate an epidemic. Therefore, the organized collection, and reporting of disease occurrence data are essential for comprehending short-term changes in disease prevalence.

There is a global agreement that specific diseases, such as cholera, plague, and yellow fever, must be reported to the World Health Organization in Geneva, Switzerland. The main epidemiologic methods include descriptive, analytic, and experimental approaches. Of these, descriptive epidemiology is the most frequently used to study disease occurrences..

Descriptive epidemiology involves collecting data from various sources to define how diseases occur. This information is categorized by time, location, and individual characteristics. Epidemiologic data analyses four temporal trends.

The secular trend investigates disease occurrences over a long period, generally years, and is influenced by population immunity and factors such as socioeconomic and nutritional improvements. The periodic trend may indicate changes in the antigenic characteristics of the pathogen responsible for the disease. The seasonal trend reflects changes in disease incidence that align with environmental factors that assist the pathogen's replication or spread.

Finally, the epidemic trend signifies a sudden increase in disease cases due to conditions that promote transmission. Analyzing epidemiologic data by location includes three main components: the place where the individual experienced the disease, the location where they were infected from the source, and the site where the source was contaminated with the causative agent. For instance, during a food poisoning incident, a person may become ill at home after eating contaminated food from a restaurant, with the source being undercooked chicken infected at a poultry farm.

The third component of descriptive epidemiology centers on the infected individual, requiring a thorough collection of pertinent information like age, gender, occupation, lifestyle choices, socioeconomic status, vaccination history, and any existing health conditions. In analytic epidemiology, two primary methods are used: the case-control method and the cohort method. The case-control method compares individuals with the disease against a similar group without the disease to identify differences that may account for the disease's occurrence. On the other hand, the cohort method examines two populations—one that has been exposed to a potential causal factor and another that has not— to monitor the effects of that factor over time.

The case-control method is generally easier, quicker, and less expensive, but it can introduce bias in group selection and depends on accurate recall of past experiences. The cohort method, while providing more precise data and direct risk estimates related to exposure, is usually more time-consuming and costly to carry out.

Experimental Epidemiology entails using an experimental approach. In this process, a hypothesis is developed and an experimental model is constructed to manipulate one or more selected factors. The results of these manipulations will either confirm or contradict the original hypothesis.

Additional classifications are conducted based on these methods to determine the location, timing and manner in which a disease has occurred.

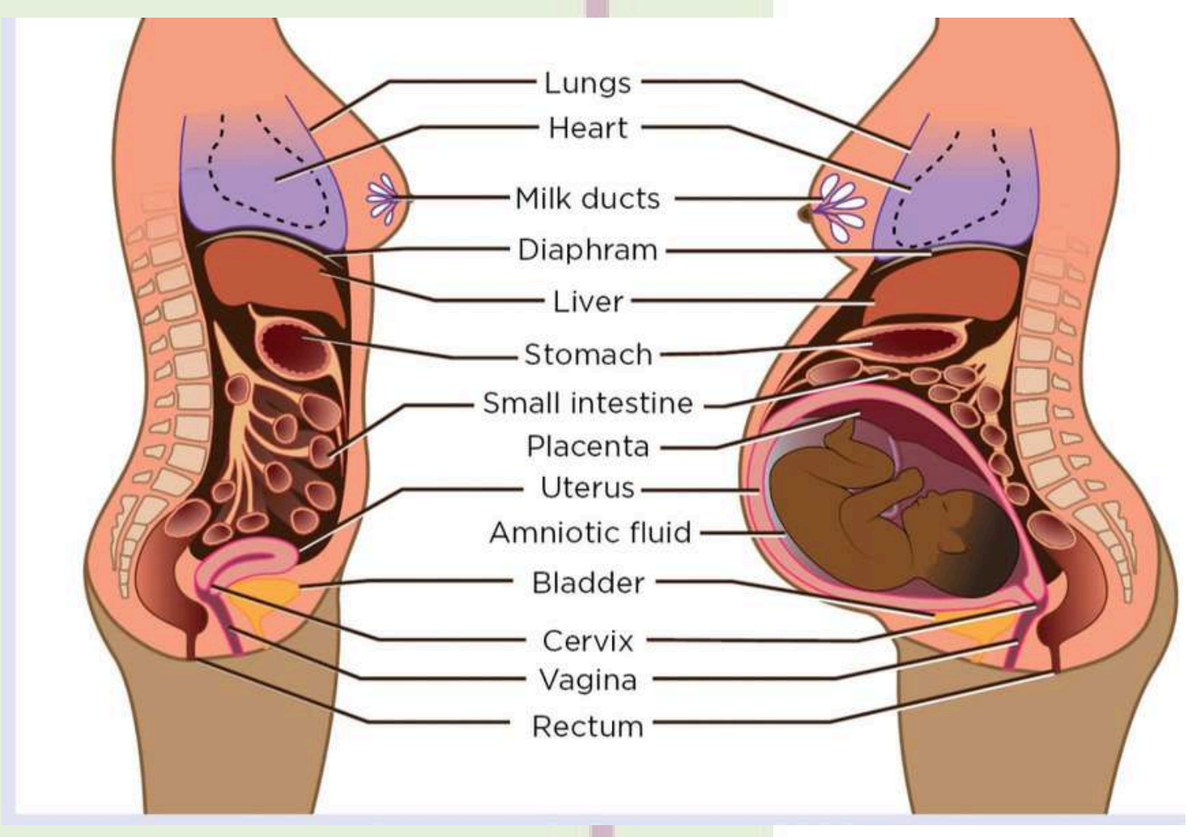
15 MOVEMENT OF ORGANS DURING PREGNANCY

As a new life grows within a female body, the organs have to move and shift to make room for the developing fetus. This could cause the various symptoms observed during pregnancy like heartburn, backpain and vomiting etc.

During the First Trimester, there isn't much obvious noticeable changes found. The uterus begins to expand and the belly might just start showing up. The fetus is approximately the size of a grapefruit and the uterus is still in its usual position.

During the Second Trimester, the uterus moves out of the pelvis and reaches between the breasts and the belly button. By now the fetus is somewhat the size of a carrot or a large mango. The bladder undergoes increased pressure thus increasing the urge of urination. The ligaments in the hips and back prepare for the fetal development and delivery and thus can cause backpain or unease. The compression of stomach and intestines can also cause heartburn or indigestion.

During the Third Trimester, the baby has grown to a size of a watermelon or pumpkin. The uterus extends to to the ribcage. The abdominal organs such as liver and stomach move upwards and are compressed thus giving the feeling of a full tummy even when it's not. The organs in the thoracic cavity are also applied high pressure hence making it difficult to breath. About 2 months after childbirth the organs return to their normal position.



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16

THE SCIENCE BEHIND FOOD PAIRING FLAVOR CHEMISTRY

The article explores the science behind food pairing, focusing on flavor chemistry. It explains how understanding the chemical compounds responsible for flavors can help create harmonious and delicious combinations.

Key Concepts

- Flavor Compounds
  Molecules responsible for flavors, such as volatile organic compounds (VOCs), aldehydes, and esters.
- Flavor Profiles
  Unique combinations of flavor compounds in ingredients.
- Synergy
  The enhancement of flavors when ingredients are combined.

Examples of Successful Pairings

- Salty-Sweet
  Chocolate and sea salt
  (shared flavor compounds: pyrazines).
- Umami-Rich
  Mushrooms and soy sauce
  (shared flavor compounds: glutamates).
- Citrus-Herb
  Lemon and rosemary
  (complementary flavor profiles)

Principles of Food Pairing

- Complementary Pairing
  Combining ingredients with similar flavor profiles.
- Contrasting Pairing
  Combining ingredients with similar flavor profiles.
- Bridge Ingredients
  Ingredients that share flavor compounds with multiple ingredients.

Applications

- Culinary Innovation
  Chefs and food scientists can create new flavor combinations.
- Food Industry
  Flavor chemistry informs product development
- Nutrition
  Optimizing flavor profiles can encourage healthy eating.

Flavour Chemistry Techniques

- Gas Chromatography
  Analyzing VOCs to identify flavor compounds.
  Mass Spectrometry
- Identifying molecular compounds structures of flavor

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17 MEET THE OBELISKS: MYSTERIOUS NEW MICROBES FOUND IN THE HUMAN BODY

As biologists gather and analyze extensive quantities of genetic sequences from plants, animals, and microbes, they continue to come upon surprises, which include a few that could call into question the very definition of existence. In January 2024, a brand new virus-like organism was determined that lives in micro organisms that live in the human mouth and gut!!

They are referred to as "Obelisk". Those "obelisks", as the Stanford excavation crew calls them, have genomes that seem like they are made up of loops of RNA, and sequences belonging to them have been discovered all around the world. "It is crazy," says Mark Pifer, a flora and fauna biologist.

At the University of North Carolina at Fire, his graduate student Ivan Zheludev, and their colleagues determined these obelisks in a brand new search for undiscovered RNA genomes. Among human microbial databases surveyed, obelisk sequences have been found in 7 percent of human intestine microorganisms and ½ of the bacteria in the human mouth. The obelisks located in microbes from one-of-a-kind elements of the frame have special sequences, hearth et al. document in a preprint published on bioRxiv published on bioRxiv on January 21. Due to the fact the obelisks include genes that vary from any formerly from any formerly determined in different organisms, they "represent a diverse magnificence of RNA that has colonized and stays undetected in the human and global microbiomes," the crew writes. A massive question is whether or not viruses developed from an increasing number of complex viroids and obelisks, or whether not they first emerged after degrading into those easier systems.

Obelisks share a few similarities with viroids, which might be small spherical pieces of single-stranded RNA. Like viruses, viroids need a number to duplicate and may infect eukaryotes (organisms with cells that have a nucleus) and cause disease. especially, they have been documented substantially in flowering vegetation, as well as in some fungi and animals. However, unlike viruses, they lack an external protein coat. This makes them one of the best-dedicated collections of genetic cloth on earth. Wherein obelisks vary in their shape and structure. The obelisks are bent into rods rather than final flat circles, their RNA sequences do not heal any regarded viroid sequences, and they may be additionally the first viroid-like factors located in bacterial cells instead of in more complex organisms. Viroids and their family do not eat, reproduce, or mate, blurring the road between dwelling and non-living matters. A closer look at the obelisk may also assist scientists in tracing the origins of life on this planet: a few researchers accept as true that viroids and their relatives represent the oldest and most primitive styles of lifestyles or at least some of their predecessors. If they can infect organisms throughout the evolutionary tree, they will have performed a role in shaping the myriad species we realize today. “There’s so much we don’t know,” Hefferon says. "It is like locating a fossil from a whole other world."

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18 UNLEASH THE TRUE POTENTIAL OF YOUR BRAIN WITH NEUROPLASTICITY

Have you ever considered that many individuals who have lost a limb continue to perceive it as if it’s still there? This phenomenon, known as "phantom limb sensation," is a testament to how our brains often experience various area where the limb pain, or even the feeling of movement. The brain remains intricately connected to that part of the body, which explains these perplexing powerful function. People sensations in the once was, including itching sensations. Understanding phantom limb sensations is crucial, as it highlights the brain's remarkable ability to process information about our bodies, even after a significant loss. This happens because the brain areas that once controlled the missing limb don’t simply “turn off” after amputation. Instead, those areas become active in response to signals from nearby brain regions, illustrating neuroplasticity.

The ability of our neurons to change and modify as we learn, grow, and develop over time. Our brains are extremely malleable from birth up till the age of 25. Neuroplasticity is triggered by intense focus but occurs during deep sleep and rest. It is also the basis of brain repair after an injury. Neurons communicate by sending electrical signals down their axons, which trigger the release of neurotransmitters into the synaptic cleft (the gap between neurons). These neurotransmitters bind to receptors on the next neuron, either exciting or inhibiting it to continue the signal.

The neurotransmitters are then cleared away to allow new signals to pass. Neuroplasticity is activity-driven and works on the principle of use it or lose it, that is, frequently used synapses are strengthened while less used synapses become weak over time. This also explains how someone can master a particular action or behavior through repetition over time.

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19 SACCADIC MASKING

Ever wondered why you can’t see your eyes moving in the mirror or why your vision does not turn blurry or confused while you move your eyes?

Saccadic Masking is a phenomenon where your ability to see is stopped temporarily during rapid eye movements. called saccades. When your eyes shift your focus from one point to another is when these rapid eye movements occur and they usually occur in few milliseconds.

It is obviously not a good idea to have your vision turned into a blurry mess every time you shift your eyes’ focus. So, what your brain does is, it puts your visual system on a “pause” (sends a signal to the visual system to reduce visual sensitivity before the saccade begins). Even when the retina continues to receive visual information, the sensitivity to fast motion is suppressed.

When the saccade is finished, the brain now shows you the image that you see in the new position and shifts its backwards in time so that it feels like you were watching it the whole time your eyes were moving. It fills in the gap between the first point and second point which gives the illusion the visual perception was continuous during the saccade. The image you see after the saccade is processed with heightened sensitivity which stabilizes the new image as the brain quickly adjusts to the new visual scene.

The brain filters out the blurry or disoriented image generated by the saccade ensuring that there is no disruption while viewing allowing you to experience a seamless vison with no awareness of the saccades happening multiple times during a second.
You can experience this effect when looking at the ticking second hand of an analog clock. Move your eyes (not your head) away from the second hand, then look back at the second hand. It seems like it takes longer than a second to move and then resumes to move normally!

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20 THE FUTURE OF MEDICINE

HOW AI AND MACHINE LEARNING REVOLUTIONIZE DISEASE DIAGNOSIS AND DRUG DEVELOPMENT

Artificial Intelligence (AI) and Machine Learning (ML) have become transformative forces in healthcare, particularly in disease diagnosis, detection, and drug development. By analysing vast amounts of data, these technologies enhance our ability to understand and treat diseases more effectively and efficiently.

Applications in Disease Diagnosis and Detection :

- **Enhanced Imaging Analysis-** AI-driven algorithms are widely used in advanced biomedical imaging techniques to improve the accuracy of disease detection. For instance, identifying critical conditions such as cancers and tumors through radiological images. A study published in Nature demonstrated that an AI system could outperform radiologists in diagnosing breast cancer from mammograms, achieving an accuracy rate of 94.6% compared to 88% for human experts.
- **Predictive Analytics-** AI and ML are crucial for predictive analytics, which can foresee possible disease outbreaks and individual patient risks. For instance, the HealthMap system helps AI to analyze data from various sources and predict infectious disease outbreaks. This is a great advantage for researchers as such early predictions can help them start working on researches that aid possible drug therapies or preventive measures against the possible disease outbreak. A study in The Lancet Digital Health highlighted the effectiveness of AI in predicting COVID-19 hotspots using data from social media and public health records. (Zhang et al., 2021)
- **Drug Design and Therapy**

  Drug Discovery- AI accelerates drug discovery by predicting how different compounds will interact with biological targets. Traditional drug discovery processes can take years and cost billions; however, AI models can analyse millions of compounds quickly. For example, Atom wise uses AI to screen potential drugs and has contributed to the discovery of promising compounds for diseases like Ebola and multiple sclerosis. This in turn is linked with proteomics and drug. designing.(Chen et al., 2020).
- **Personalized Medicine-** AI enables personalized medicine by analyzing genetic data and patient history to give effective treatments. For instance, the use of Machine Learning algorithms to analyze genomic data allow clinicians to identify which patients are likely to respond to specific therapies, significantly improving treatment efficacy. Through the AI and MLs help, RNA and DNA sequencing can be carried out in patients which clinicians to get an idea of how the patients genome can be responsive to a certain type of drug and whether it can be effective in eradicating the underlying health conditions in a particular person or not. A notable example is the use of AI in oncology, where treatment plans can be customized based on the genetic makeup of a patient's tumor (Kourou et al., 2015).

- **Challenges and Ethical Considerations-** While the benefits of AI and ML in healthcare are significant, there are challenges, including data privacy concerns, algorithmic bias, and the need for regulatory frameworks. Along with this, there are certain limitations to what extent we can rely on machines and consider the accuracy provided by them as nothing is absolutely perfect and error free..

AI and machine learning are revolutionizing the fields of disease diagnosis, detection, and drug development. By leveraging data-driven insights, these technologies promise to enhance patient outcomes and streamline healthcare processes and tend make our lives easier by taking up time consuming tasks. As we continue to navigate the complexities of integrating AI into medicine, ongoing research and ethical considerations will be essential to fully realize its potential in the coming years for our future generations.

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21

YOUR TOOTHBRUSH IS DIRTY!!

Did you know that our toothbrushes, yes those brushes you use to clean your teeth, can have upto 100 million bacteria in it? Yes, uncovered toothbrushes when kept in bathrooms are a breeding ground for various types of bacteria, some even being quite harmful for the human body.

Some of the most common micro- organisms found are E. Coli which can cause diarrhea, staph bacteria which can cause skin conditions and various other types of fungi and viruses. Many of these bacterial species can survive upto a week on the brush.

Although it is unlikely that you will get sick from brushing with a dirty toothbrush, it is still a good idea to keep your brushes clean. To maintain oral hygiene, it's recommended to replace your toothbrush every 3-6 months, or sooner if the bristles are frayed. Regular replacement helps minimize bacteria buildup and ensures effective cleaning.

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22

THE SCIENCE BEHIND THE GASSY TALES: FARTS

What Are Farts?

Farts, or flatulence, are the release of gas from the digestive system through the rectum. This gas is a normal byproduct of digestion.

Causes of Farts

- **Swallowed Air**: Eating or drinking quickly can lead to swallowing air, which can then be expelled as gas.
- **Digestion**: Certain foods break down in the gut, producing gases like hydrogen, carbon dioxide, and methane.
- **Food Intolerances**: Lactose intolerance or gluten sensitivity can lead to increased gas production.
- **Bacterial Fermentation**: The gut microbiome ferments undigested food, creating gas.

Common Gassy Foods:

- Beans and legumes
- Cruciferous vegetables
- Dairy products (for those who are lactose intolerant)
- Whole grains Certain fruit

Types of Gas:

- **Hydrogen:** Produced by fermentation of carbohydrates.
- **Methane:** Produced by certain gut bacteria; not everyone produces it.
- **Carbon Dioxide:** Result of digestion and swallowing air.

Fun Facts:

- The average person farts about 14 to 23 times a day.
- Farts can travel at speeds up to 10 miles per hour.
- The smell of farts is primarily due to sulfur compounds.

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23 KUMIS: THE FERMENTED WONDER DRINK WITH A KICK

Imagine a drink so ancient that it has survived through centuries, bringing together culture tradition, and a delightful tang that could tickle your taste. Let me introduce you to, **“Kumis: The milk Wine”** This fermented dairy beverage traditionally made from mare’s milk, has a rich history and a vibrant cultural significance that makes it a true gem of the Central Asian cuisine.

Kumis: The milk Wine

- **A Historical Glimpse**

Originating among the nomadic tribes of the Central Asian steppes, particularly the Turks, Mongols and Kyrgyz people in Turkey, Mongolia and Kyrgyzstan, this drink has been part of their diet for millennia. Historical records suggest that kumis was consumed as far before as 500 B.C.

- **The Birth of a Beverage: How Kumis Started**

The story of kumis starts with the humble mare and her milk. The nomads discovered that if they left mare’s milk out in the sun (or perhaps just forgot about it for a bit), it would ferment, creating a delightful, bubbly drink.

Over time, they refined this process, utilizing leather bags made from horse skin to mix and churn the milk while on the move. Voilà!

- **Traditional Aspects of Kumis**

Kumis is not just about the drink; it’s a cultural ritual. The process of making kumis is steeped in tradition. Traditionally, the milk is collected from mares and poured into a churn (often made from leather). The mixture is then agitated, either by shaking it or by using traditional tools, to promote fermentation. This process can take several hours to days, depending on the desired taste and strength of alcohol. This results in a fizzy beverage with a slightly sour taste that packs a punch!

- **The Components of Kumis**

Kumis primarily consists of:

- **Mare’s Milk:** The star ingredient, known for its unique composition and high nutritional value.
- **Lactobacillus:** The bacteria that help ferment the milk.
- **Yeasts:** They contribute to the carbonation and alcohol content, making kumis a delightful mix of refreshment and relaxation.

- **Nutritional Value: A Drink Worth Tasting.**

Kumis isn't just a fun beverage; it's also a nutritional powerhouse! Here's a quick breakdown of its benefits:

- **Probiotics**: Thanks to the fermentation process, kumis is rich in probiotics, which can aid digestion and boost gut health.
- **Vitamins and Minerals:** It contains essential nutrients like vitamin C, B vitamins, calcium, and magnesium
- **Low in Lactose:** The fermentation reduces lactose levels, making kumis more tolerable for those with lactose intolerance.
- **Moderate Alcohol Content:** With an alcohol content ranging from 0.5% to 2.5%, kumis can give you a mild buzz due to its alcoholic nature.

Sip, Smile, and Savor

Kumis is not just a drink; it's a celebration of culture, history, and the spirit of community. Whether you're drinking it out of a traditional leather bag or a fancy glass, kumis invites you to experience the flavors of Central Asia in every frothy sip. Right now, the trend or popularity of this super drink has been drying out due to the lack of traditional practices being continued. However, of anyone is interested to have a taste of this drink, the authentic versions are available in the Kemalpasa regions of Izmir District in Turkey and in countried like Mongolia,Kyrgyztan and Uzbekistan. So, the next time you find yourself in a situation where someone offers you a glass of this fizzy delight, don't hesitate—embrace the culture, enjoy the tang!

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24 TALKING TREES

When we look at trees in a forest, they seem like solitary individuals competing for access to sunlight. We think of them as disconnected loners, striving for water and nutrients, with the winners shading out the losers and having no interaction with their neighbors. But as it turns out, there's more to trees than meets the eye.

Forest trees have evolved to live in cooperative, interdependent relationships, maintained by communication and a collective intelligence. These towering columns of living wood draw the eye upward to their outspreading crowns, but the real action is taking place underground, just a few inches below our feet. Trees share resources, pass on warnings, and transfer information across generations, allowing the forest to behave as if it were a single organism. Scientists call these networks 'mycorrhizal networks.' The fine, hair-like root tips of trees join together with microscopic fungal filaments to form the basic links of the network, operating as a symbiotic relationship between trees and fungi—essentially, an economic exchange. The threads of these fungi penetrate the root cells of their host trees and form tiny structures inside them. This is how they interact with trees and share resources.

As a kind of fee for their services the fungi consume about 30 percent of the sugar that trees photosynthesize from sunlight. This sugar fuels the fungi as they scavenge the soil for nitrogen, phosphorus, and other mineral nutrients, which are then absorbed and consumed by the trees.

Trees connect to each other through their root systems, using them to share resources across the entire forest. f one tree is growing in soil rich in potassium, it will pull up more potassium than it needs and send it out through the root system to trees growing in areas with less potassium.

And one of the most fascinating things? Trees communicate their needs. If a tree is sick, damaged, or starving, it sends chemical messages through the root system, signaling to other trees to send it more food—almost like a tree equivalent of an immune system. Isn't it amazing how the Creator has made such intricate and precise systems that inspire wonder?

In an ancient forest, you find very old trees whose roots cover entire regions of the forest floor, with leaves that reach high above the canopy. Over time, these trees have evolved to take in more resources than they need. Researcher Suzanne Simard and her team found that the largest, oldest trees—called “mother trees”—are the hubs of these underground fungal networks. They are the most connected nodes in the forest network. And one of the most fascinating things? Trees communicate their needs. If a tree is sick, damaged, or starving, it sends chemical messages through the root system, signaling to other trees to send it more food—almost like a tree equivalent of an immune system. Isn’t it amazing how the Creator has made such intricate and precise systems that inspire wonder?

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These “matriarch” or “mother” trees share their excess carbon and nitrogen through the mycorrhizal network with the young seedlings, which can improve seedling survival. In a single forest, a mother tree may be connected to hundreds of other trees. For anything she can’t get on her own, she acts as a central hub, gathering spare resources from the rest of the forest and passing them on to the younger trees.If we as a society could follow the example of these trees—those with greater resources coming together to support those in need—we could perhaps live in a more robust and flourishing community.

And I love the idea that trees share resources through their roots; it’s a silent reminder to us that when we share our resources with others, we should do so quietly, without seeking recognition, and watch as individuals around us thrive.

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25 THE HUMAN BODY IN SPACE: A JOURNEY OF TRANSFORMATION

When astronauts leave the Earth's protective embrace, they enter a realm where the laws of physics shift dramatically, leading to a series of profound their bodies

Muscle Atrophy: In space, the absence of gravity means that muscles no longer need to work as hard to support the body. As a result, astronauts can experience significant muscle atrophy, particularly in the legs and back. Without the regular stress of weight-bearing activities, muscles shrink and weaken. To combat this, astronauts engage in rigorous exercise regimens, specialized equipment resistance and helps maintain muscle mass.

Bone Density Loss: Similar to muscles, bones also suffer in microgravity. Astronauts can lose up to 1% of their bone mass each month. This can make astronauts more susceptible to fractures upon their return to Earth. Preventative measures, including resistance training and nutritional supplements, are essential to mitigate these effects.

Fluid Redistribution: In microgravity, bodily fluids are no longer pulled downwards by gravity. Instead, they shift toward the upper body and head, resulting in a phenomenon often described as "moon face", where the face appears swollen. This fluid redistribution can also increase intracranial pressure, affecting vision and overall comfort. Astronauts may experience headaches and changes in visual acuity.

Cardiovascular Changes: The cardiovascular system undergoes notable adjustments in space. The heart may become more spherical as it adapts to the lack of gravitational pull. This alteration can lead to a decrease in cardiovascular fitness, making it challenging for astronauts to regain their stamina upon returning to Earth.

Immune System Dynamics: Space travel also affects the immune system, which can behave unpredictably in the altered environment. Astronauts may experience changes in immune response, becoming more susceptible to infections. Research has shown that stress, radiation exposure, and microgravity can all play roles in modifying immune function, prompting ongoing investigations into how to best support astronauts' health during long missions.

Sleep Disruption: Without the natural rhythms of day and night, astronauts often struggle with sleep. The continuous exposure to artificial light and the absence of a clear sleep-wake cycle can lead to insomnia and fatigue. Maintaining a proper sleep schedule is crucial for cognitive function and overall well-being, making sleep management a key component of mission planning.

Radiation Exposure: In space, astronauts are exposed to higher levels cosmic radiation than on Earth, which can increase the risk of cancer and other health issues. This radiation exposure poses a significant challenge for long-duration missions, such as those planned for Mars. Ongoing research aims to understand the effects of radiation on human health and develop protective measures.

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26 THE FRUIT FLY TALES: UNPACKING GENETIC SECRETS OF HUMAN

Thomas Hunt Morgan began to breed flies around 1905. A year later, he was breeding maggots by the thousands, in milk bottles filled with rotting fruit in a third floor laboratory at Columbia University. Bunches of overripe bananas hung from sticks. The smell of fermented fruit was overpowering, and a haze of escaped flies lifted off the tables like a buzzing veil every time Morgan moved. The students called his laboratory the Fly Room. It was about the same size and shape as Mendel's garden — and in time it would become an equally iconic site in the history of genetics. Morgan's main question was to answer the intrinsic nature of chromosomes and the transmission of chromosomes from parents to offspring. It has been more than 100 years now, The fruit fly man gives answers to the basic chromosomes structure and functions .

Today most of the universities are equipped with a fly room that conducts research in genetics. But why do we need drosophila for Human genetic research? We already know the advantages in Drosophila in research, the factors including life span, easy breeding. technology etc. This article is about why we are still using this tiny species of fly with the chromosome number of 8 as model organism for humans that contain 46 chromosomes.

Even though Drosophila has only 8 chromosomes, it possesses over 14,000 genes, when we compare this with humans, we have around 20,000 protein coding genes that span a total of 46 chromosomes . Many characteristics of flies, including their morphology, behavior, and disease mechanisms, show similarities with humans.

Around 75 percent of the genes that are known to cause illness in humans, also occur in flies, Because of these features Drosophila plays a main role in human disease modeling and translational medicine.The disorders studies including rare disorders such as muscular dystrophy and congenital disorder, chromosomal abnormalities like aneuploidy and translocation. Lifestyle diseases, including obesity, diabetes, and cancer, are also relevant. Notably, Drosophila has homologs for about 60% of the genes associated with human cancers, making it a valuable model organism for cancer research. One example is p53, the tumor suppressor gene, which is implicated in a host of human cancers.

Drosophila melanogaster (fruit flies) exhibit several behaviors that are similar to humans, particularly in areas related to neural and genetic control of behavior. The behavior of drunken flies is virtually identical to that of humans, which means that drugs that treat alcoholism in flies may also be successful in treating alcoholism in humans. There are also mutant flies that are deprived of sleep, much in the same way a lot of humans are. They're great models for studying insomnia and drugs to treat insomnia. There's also mutation in flies called fruitless, and this fruitless gene among other genes, can trigger and affect sexual orientation. So by altering serotonin levels in these flies we see that it causes male-male preference. And this male-male preference due to this mutation is actually seen in other animals as well. We can study those flies with this mutation and absorb their behavior to better understand the underlying cause of aggression. So you may be wondering: an aggressive fruit fly? Well, it sounds strange but it's not; flies can be aggressive. They demonstrate wing threats, they can box and fence using their legs, so they'll push and punch each other.

Beyond disease modeling and behavior modeling, we can use fly to research developmental processes - where and when developmental genes are expressed and how these genes influence one another. During early embryonic development, Drosophila helps researchers understand how genes regulate body axes, segment orientation, and segment identity, controlled by proteins in mRNA. Homeotic genes (Hox genes) in mammals play a crucial role in determining the location and development of body structures. Fascinatingly, some non-functional Hox genes in humans may occasionally be reactivated, revealing ancestral traits like vestigial tails. This highlights genetic homology across species, indicating a shared evolutionary history. An excellent example of this is the Eyeless gene in flies, which is homologous to the Pax6 gene in humans and mice, both regulating eye formation. These genetic similarities make Drosophila an ideal organism for studying gene function, development, and evolution.

The tiny star behind five Nobel Prizes in Medicine continues to be an invaluable organism in groundbreaking discoveries that have shaped our understanding of genetics and biological processes. From Thomas Hunt Morgan’s pioneering work in the early 20th century to the 2017 Nobel Prize in Physiology or Medicine was awarded to Jeffrey C. Hall, Michael Rosbash, and Michael W. Young on circadian rhythm research, Drosophila has consistently demonstrated its value as a model organism. Its well-mapped genome, rapid life cycle, and ease of genetic manipulation make it an indispensable tool in scientific research, leading to significant insights into human health and disease.

Niranjan K. V.
3rd Year B.Sc. BTGE

27 FANTASTICALLY FERMENTED: A GLOBAL JOURNEY THROUGH MICROBIAL PRACTICES IN FOOD AND SKINCARE

Introduction

Fermentation, a microbial process that involves microorganisms like bacteria, yeasts, and molds, has shaped cultures worldwide by inculcating this method in food, dairy, beverages and even skin care. This ancient practice transcends the mere practice of food preservation, influencing culinary traditions, health practices, and even skincare routines. From the tangy taste of kimchi to the nourishing benefits of fermented oils, the diverse applications of fermentation is profoundly important in our daily lives. This article explores various fermentation and microbial practices across cultures, showcasing their unique contributions to food, skincare, and overall wellness.

Fermented Foods Around the World

Kimchi – Korea

Kimchi, a staple in Korean cuisine, is an exemplary example of fermentation's culinary magic. Predominantly made from napa cabbage and radishes, it undergoes lactic acid fermentation, resulting in a tangy, spicy dish rich in probiotics which aids in digestion. Historically, kimchi was developed as a means of preserving vegetables during harsh winters, but today, it is a delicacy enjoyed by many aorund the world for its unique taste, health benefits, including improved gut health and immune function. (Lee et al., 2020).

Sauerkraut – Germany

Similar to kimchi, sauerkraut is fermented cabbage, but its flavor profile is much more milder when compared to Kimchi. It is not necessarily spicy. Originating in Germany, this dish is celebrated for its digestive benefits. The fermentation process enhances the bioavailability of vitamins, particularly Vitamin C, making it a nutritional powerhouse (Mäkelä et al., 2018).

Miso – Japan

Miso is a fermented soybean paste, which is very important in traditional Japanese cuisine. The fermentation process involves the use of koji mold, which breaks down the soybeans, resulting in a rich umami flavor. Miso is not only a flavor enhancer in soups and marinades but also a source of beneficial probiotics and antioxidants. (Sakamoto et al., 2019).

Kefir – Caucasus Region

Kefir, is a fermented dairy product originating from the Caucasus region. It is made by adding kefir grains to milk. This probiotic-rich drink is known for it's tangy flavour and health benefits, including improved digestion and lactose tolerance.
(Tamime & Saadah, 2021).

Fermentation in Skincare

Fermented Oils – Traditional Chinese Medicine

In Traditional Chinese Medicine, fermented oils are used for their nourishing properties which can heal the skin texture and make skin supple and healthy. For instance, fermented sesame oil is believed to enhance skin elasticity and provide deep hydration.

Yogurt – Ancient Beauty Ritual

Yogurt has long been utilized in various cultures as a natural skincare remedy. Rich in lactic acid, it exfoliates the skin, while probiotics promote a healthy skin microbiome. Women in ancient Egypt famously bathed in sour milk, harnessing its moisturizing and rejuvenating properties, which helps clearing blemishes, and gives a glowing skin. (Keenan et al., 2020).

Health Benefits of Fermented Products

Sake – Japanese Rituals

Sake, is a fermented rice beverage, is not only consumed but also used in skincare. Sake contains beneficial enzymes and amino acids that help the skin to be illuminated, hence making it a popular ingredient in Japanese beauty products. Sake baths are believed to soften the skin and improve its texture. (Fujii et al., 2018).

The health benefits of fermented foods and skincare products are well-documented. Regular consumption of fermented foods can improve gut health, boost the immune system, and even support mental health through the gut-brain axis (Duncan et al., 2017).
Similarly, fermented skincare products can enhance skin health by promoting hydration and reducing inflammation. However, they must be consumed -and used in skin in moderation and not in excess as their low pH levels result in their acidic nature and excessive consumption can cause acidity and unwanted digestive issues and allergic reactions in skin when used excessively without patch tests.

Kimchi – Korea

Yogurt – Ancient Beauty Ritual

Miso – Japan

Kefir – Caucasus Region

Sauerkraut – Germany

Sake – Japanese Rituals

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28 NATURE'S PROTECTIVE PIGMENT: MELANIN

The next time anyone asks, Hey! Why are you so dark? Don't hesitate to mention about this natural protector you've got. Melanin is often celebrated for its role in determining skin color, but its influence extends far beyond aesthetics. This remarkable pigment is essential for protecting organisms and contributing to various physiological processes. Melanin is a complex polymer produced in specialized cells called melanocytes, found primarily in the skin, hair, and eyes of humans and other animals. It comes in several forms, including eumelanin (black and brown pigments) and pheomelanin (yellow and red pigments).

The amount and type of melanin produced in an individual are largely determined by genetics and can be influenced by environmental factors, such as UV exposure. As people age, melanin production can decrease, leading to graying hair and changes in skin pigmentation, such as age spots.

One of the most significant functions of melanin is its ability to absorb harmful ultraviolet (UV) radiation from the sun. By doing so, it protects DNA from damage, which can lead to skin cancers.
Individuals with higher melanin levels tend to have a lower risk of skin cancer due to this natural barrier.

Melanin is not exclusive to humans; it plays crucial roles in many species. In animals, it contributes to camouflage, aiding survival in the wild. For instance, darker pigmentation can help creatures blend into shadowy environments, while lighter hues can reflect sunlight in sandy or snowy habitats.

Melanin's impact goes beyond mere protection from UV rays. It is also involved in various biological processes, including:

- **Vision:** In the eyes, melanin helps protect against damage from light and plays a role in visual acuity.
- **Hearing:** Melanin is found in the inner ear, where it helps in the proper functioning of auditory
- **Neurological Health:** Certain types of melanin are found in the brain, where they are believed believed to have roles in neuroprotection.

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1st Year B.Sc. BTGEBC 'B'

29 THE CHILLS: THE SCIENCE BEHIND GOOSEBUMPS

Imagine yourself sitting idle and a gust of chill air sweeps over you, your covering with tiny bumps making your hair stand straight. What are these?

Goosebumps, goosebumps are more than just a curious reaction; they’re remarkable blend of biology and emotion that reflects our evolutionary past.

Goosebumps, scientifically known as piloerection, are a physiological response characterized by the tiny muscles at the base of hair follicles causing the hair to stand upright. Goosebumps are controlled by the autonomic nervous system, which regulates involuntary bodily functions. The sympathetic branch of this system is responsible for initiating the response.

When you experience cold temperatures or strong emotions (fear, excitement), adrenaline is released. This hormone triggers the contraction of arrector pili muscles, causing the hair follicles to pull upright, resulting in the bumps.
In animals, piloerection helps trap air, providing insulation against cold. This is less effective in humans due to our reduced body hair.

Goosebumps are a fascinating interplay of biology, evolution, and emotion. While their original purposes may no longer be relevant to modern humans, they remain a vivid reminder of our evolutionary history and the complex between our bodies and feelings.

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30

THE SCIENCE OF FAT STORAGE:

HOW MEN AND WOMEN DIFFER

Fat storage differs between men and women due to a combination of biological, hormonal, and physiological factors. Here are the key differences:

1. Distribution Patterns

Men: Typically store fat in the abdominal area (android or apple-shaped), leading to a higher risk of visceral fat accumulation, which is linked to health issues such as heart disease and diabetes

Women: Generally store fat in the hips, thighs, and buttocks (gynoid or pearshaped), which is considered less risky for metabolic health compared

2. Hormonal Influences

Estrogen: In women, estrogen promotes fat storage in the lower body, especially during puberty, menstruation, and pregnancy.

Testosterone: In men, higher levels of testosterone promote fat distribution in the abdominal region and can lead to increased muscle mass.

3. Body Composition : Muscle vs. Fat

Men typically have a higher percentage of muscle mass compared to women, which affects overall fat storage and metabolism. Muscle tissue burns more calories at rest, influencing fat accumulation.

4. Metabolism : Caloric Burn

Men usually have a higher basal metabolic rate (BMR), meaning they burn calories more quickly than women, which can influence fat storage over time.

5. Aging Effects:

As both men and women age, changes in hormone levels can alter fat distribution patterns. Women may experience an increase in abdominal fat after menopause due to decreased estrogen levels.

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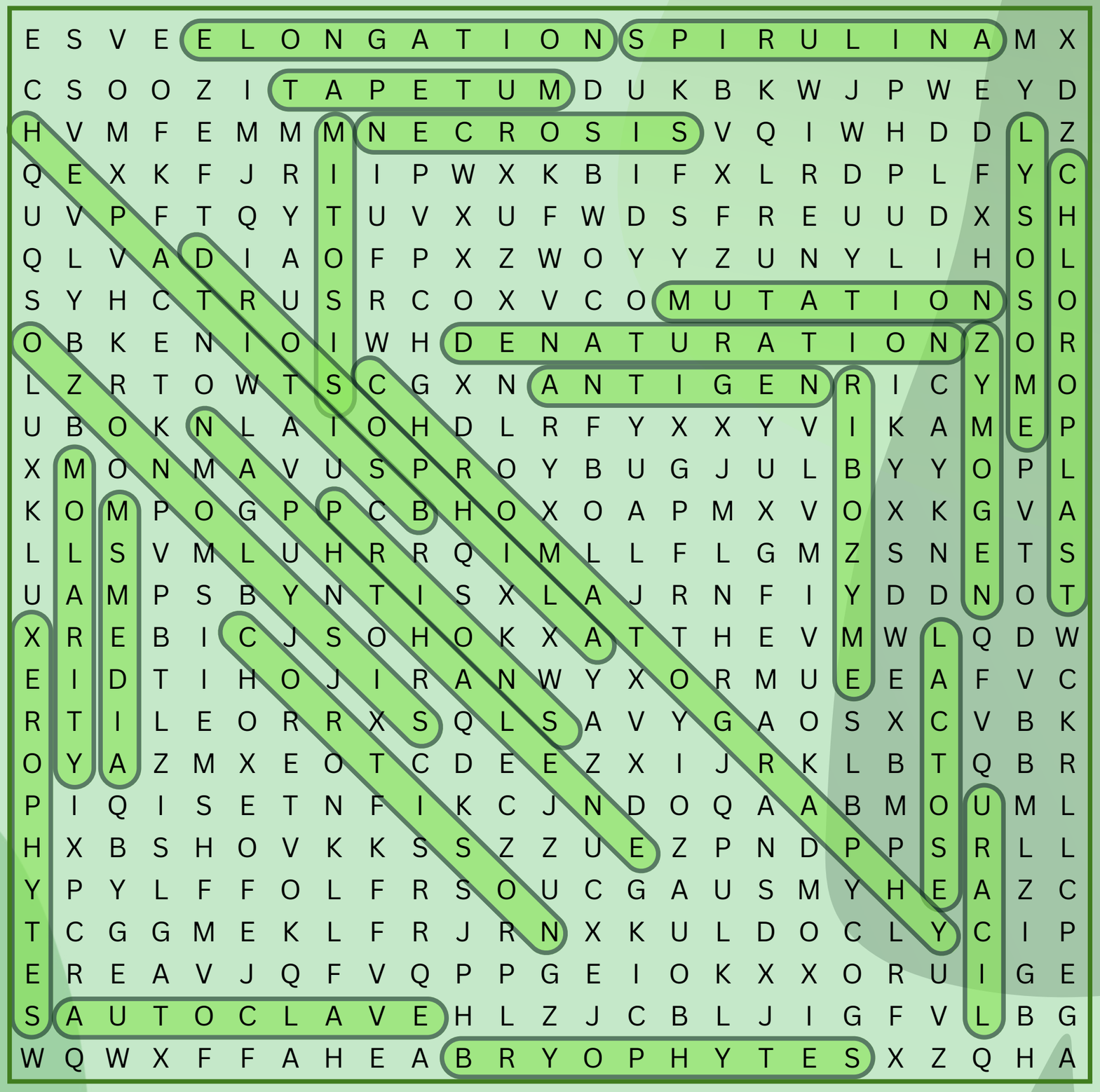
SOLUTIONS

Sequence Search



Marissa Anastasia J. Fernandes
3rd Year B.Sc. BTGE

31 HORSESHOE CRAB: A LIVING FOSSIL IN MODERN MEDICINE

Horseshoe crabs are some of the oldest marine arthropods belonging to the order Xiphosurida and family Limulidae. Although they are not true crustaceans (subphylum) they bear more resemblance with chelicerates (subphylum). They often times referred to, as “living fossils”, because as creatures they have roamed the oceans of the Earth for over 450 million years, even predating the dinosaurs by millions of years.

They have a very distinct appearance, bearing a helmet-like shell and a long, spiny tail, these features have helped them survive mass extinctions which have wiped out many species of their time and after.

Horseshoe crab has an evolutionary resilience, that can only be seen in very little organisms, and this can be linked to their own unique physiological features. There are four existing species that live in the marine areas of the Atlantic and the Gulf coasts if Southeast Asia and North America. These arthropods play a pivotal ecological role, providing a crucial food source for migrating birds and supporting various other marine life forms.

However, the most important contribution of horseshoe crabs comes in their ecological contributions; more so, these animals are incredibly vital to medical science. The copper-salted blue blood of the horseshoe crab holds a very valuable substance called Limulus Amebocyte Lysate, or LAL, for short. This factor became such an extremely essential constituent in biomedical testing since it coagulates by the presence of bacterial endotoxins, making it very vital in the evaluation of the safety of vaccines, medical devices, and intravenous drugs.

Despite their capacity to exhibit such extreme resilience, they are still susceptible to existing threats. These populations are at risk from humans as a result of over-medicalized exploitation, habitat destruction aside from over-bait fishing. Conservation strategies and crabbing regulations go a long way to ensure their survival.

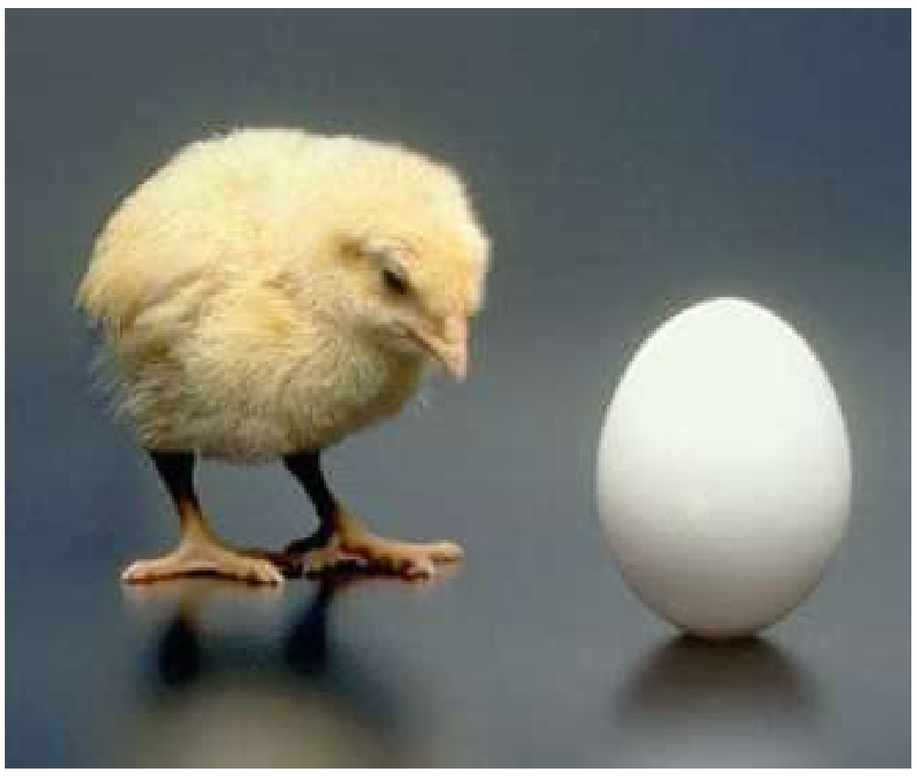
As we delve into the marvelous biology of horseshoe crabs, it leads us to realize that ancient creatures are not relics of the past but, instead, actors in the modern science world. Nature's strength was testified when geological epochs passed without really affecting them; on the other hand, the contribution of their existence for human health has an underlining importance of maintaining protection and understanding for the imperceptible balance between evolutionary history and contemporary science.

Marissa Anastasia J. Fernandes
3rd Year B.Sc. BTGE

32

CHICKEN OR EGG?
WHAT CAME FIRST?

The age-old question of whether the chicken or the egg came first has been a subject of much debate among humans. To solve this puzzle, we must delve into the historical and evolutionary origins of chickens and their eggs.



Eggs, as a means of reproduction, have existed long before the emergence of chickens. Dinosaurs, the earliest fish that crawled onto land and even the bizarre marine creatures of the Cambrian period 500 million years ago all laid eggs. While these were not chicken eggs, they were still the fundamental reproductive units that allowed these organisms to thrive. Technically, an egg is a membrane-bound container in which an embryo can develop into an independent being. These basic egg structures first appeared with the evolution of the first amniotes, a group of animals that could reproduce on land. Prior to the amniotes, most animals laid their eggs in water to prevent it from drying. Over time, a more complex egg structure evolved, featuring three additional membranes: the chorion, amnion, and allantois. This integrated "life support system" allowed embryos to obtain nutrients, dispose of waste, and respire, enabling animals to lay their eggs on land rather than in water.

So in tracing the evolutionary history of eggs, it becomes clear that the egg predates the chicken, as the fundamental reproductive unit existed long before the modern chicken species emerged.

The Australian Academy of Science suggests that the first chicken likely arose from a genetic mutation (or mutations) in the zygote of two proto-chickens. In this scenario, the two proto-chickens mated, combining their DNA to form the initial cell of the first chicken. During this process, genetic mutations occurred in that original cell, and these mutations were then replicated in every subsequent cell as the chicken embryo developed, resulting in the first chicken.

According to research, amniotic eggs first appeared around 340 million years ago, long before the earliest chickens, which evolved around 58,000 years ago.This timeline indicates that the egg likely preceded the chicken. Amniotic eggs provided the necessary environment for the development of various animal embryos, including those that would eventually give rise to chickens.

However, there is one specific protein called ovocleidin-17 (OC-17) that exists only in the ovary of a chicken. Scientists have concluded that the chicken must have come before the chicken egg, since OC-17 is necessary for the formation of an eggshell. This protein accelerates the process of eggshell formation, allowing hens to build and lay their eggs in just 24 hours

The question of whether the chicken or the egg came first is a longstanding puzzle. Technically, eggs in general predate the existence of chickens. This idea is grounded in the theory of evolution, which explains how species change and develop over time. Birds, including chickens, descended from reptiles millions of years ago. Early reptiles laid eggs, and over countless generations, genetic mutations and natural selection led to the emergence of birds. At some point, a bird species very similar to a chicken laid an egg, and due to a genetic mutation during fertilization, the first true chicken hatched from this egg. However, the formation of chicken eggs specifically does require the presence of chickens, as they produce the necessary proteins.

The answer depends on how one defines a "chicken's egg." If it refers to an egg laid by a chicken, then the chicken must have come first. But if it refers to an egg that will hatch into a chicken, then the egg could be considered to have come first, when an earlier chicken species laid an egg that developed into the first chicken.

Ultimately, chickens and their eggs are intrinsically linked - chickens produce eggs, and eggs produce chickens. The chicken and the egg are mutually dependent, making it difficult to definitively determine which came first in the evolutionary timeline. The puzzle remains unresolved, a testament to the complexity of biological origins.

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33 HAIR, FUR, AND WOOL: UNDERSTANDING GROWTH IN HUMANS AND ANIMALS

While humans, animals, and sheep all grow hair, fur, and wool respectively for protection and insulation, the specific functions and structures of these growths differ based on environmental needs and evolutionary adaptations

Human Hair: Humans grow hair primarily for protection and insulation. Hair helps regulate body temperature, provides a barrier against UV radiation, and offers some degree of protection for the skin. Hair also plays a role in sensory perception, as it can detect changes in the environment. Human hair has an average growth rate of about half an inch per month. Generally less dense and varies in texture (straight, wavy, curly) among individuals.

Animal Fur: Animals grow fur for insulation and protection. Furprovides warmth in colder climates, helps with camouflage, and protects against environmental elements like wind and rain. The density and type of fur can vary greatly depending on the species and their habitat. Many animals shed fur during warmer months to regulate temperature, often thicker in colder climates.

Sheep Wool: Sheep grow wool as a specialized form of fur that provides superior insulation. Wool is composed of tightly packed fibers that trap air, offering warmth while remaining breathable. The unique structure of wool allows it to wick moisture away from the skin, making it ideal for various climates.Additionally, sheep produce wool continuously, which humans have harvested for textiles.

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34

HYDROPONICS
-THE GEN Z FARMING

Ever heard of plants growing without soil? Plants which produces a better yield than plants grown normally? Well there is a way to do so and this procedure is termed as **Hydroponics**.

Hydroponics is the technique in which plants are grown using a water based-nutrient solution rather than soil, and can include an aggregate substrate, or growing media, such as vermiculite, coconut coir, or perlite. Hydroponic production systems are used by small farmers, hobbyists, and commercial enterprises.

Hydroponics was first demonstrated by Julius Von Sachs, a German Botonist , in 1860. It originated in the ancient city of Babylon, where present Iraq is located. The Hanging Gardens of Babylon, one of the Seven Wonders of the Ancient World, is the first known example of soil-less growth of plants. This was around 600 BC.

The three main basic nutrients (macronutrients) used in hydroponics are nitrogen, phosphorus, and potassium, also known as NPK. Micronutrients used in hydroponics include iron, manganese, zinc, copper, boron, molybdenum, and chlorine.

A hydroponic microclimate is the climate conditions in a greenhouse or other hydroponic space. The ideal microclimate for hydroponic crops is generally between 65–80°F (18–27°C). To maintain the ideal microclimate, you can use a system to control the temperature and humidity.

This way of farming is widely considered to be the most futuristic and though it does require high maintenance costs, modern farmers will definitely look into this way of growing crops. The yield is far more productive than crops grown normally. Soil degradation or erosion would never be a thought of dismay for them. It also doesn't demand much of manpower and makes things far more easier for the farmers.

We all know that crops grow in certain seasons and time but in Hydroponics it's never a issue as it is grown in a microclimatic conditions and it allows growers to harvest predictable yields year-round , while taking half the time less than soil-grown plants.

A wide variety of plants can be grown including veggies , leafy greens and herbs.

Hydroponics has been widely accepted in India and its beginning to take it's stand as the most efficient way to grow crops quicker and healthier. Safe to say that it has ignited the young minds to pursue Agriculture as a great career option.

Sunny Gabriel
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35 "THE HIDDEN CODE IN OUR BLOOD: HOW SCIENTISTS CRACKED THE ANWJ MYSTERY"

Blood groups are identified by antigens and antibodies. Antigens are protein molecules on the surface of red blood cells, while antibodies are proteins found in plasma that recognize foreign substances. AnWj: The New Blood Group System Unlocked by Science, Revealing Genetic Mysteries in Rare Blood Types.

The AnWj blood group was first identified and named after its unique antigenic characteristics in the 1970s. The recent scientific breakthrough that uncovered the genetic basis of the AnWj antigen was led by Dr. Louise Tilley and her team at the NHS Blood and Transplant (NHSBT) organization in collaboration with researchers from the University of Bristol. This team used advanced genetic sequencing to trace the AnWj-negative blood type to a mutation in the MAL gene, which is responsible for the presence or absence of the AnWj antigen on red blood cells.

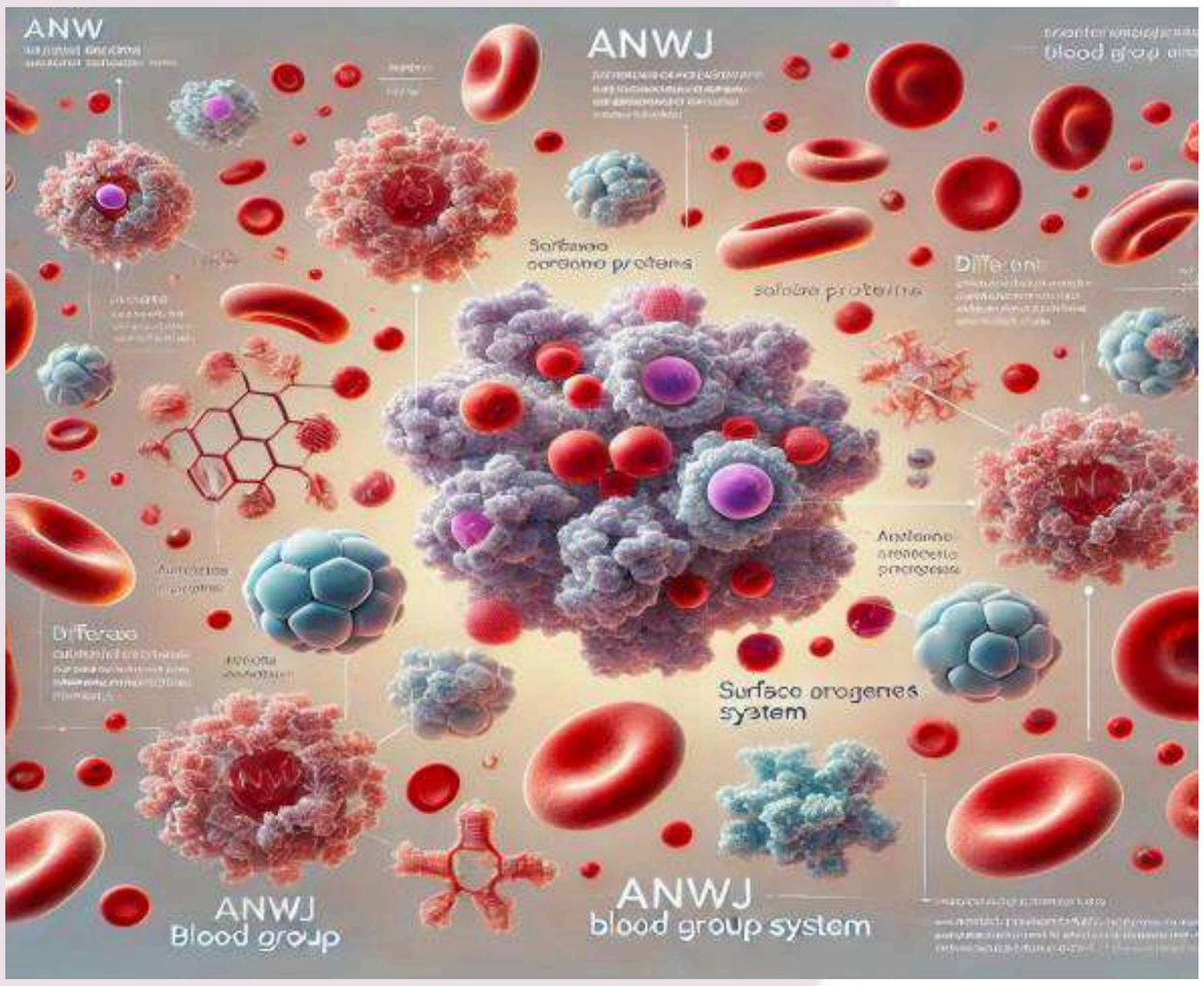
The AnWj blood group was named after two patients, Anton and Wj, who were among the first individuals identified with antibodies against this specific antigen. The AnWj antigen is part of the MAL blood group system, the 47th blood group system to be discovered. More than 99.9% of people are AnWj-positive

1.AnWj-Positive: Most people have AnWj-positive blood, which means their red blood cells express the AnWj antigen on their surface. This antigen is the product of the MAL gene, which encodes the necessary protein to display the Anwj marker. Being AnWj-positive generally does not affect health or transfusion compatibility beyond typical ABO and Rh considerations.

2. AnWj-Negative: AnWj-negative blood is extremely rare, meaning individuals lack the AnWj antigen on their red blood cells due to a genetic deletion or mutation in the MAL gene.

This absence makes transfusions more complex, as AnWj-negative individuals can develop antibodies against the AnWj antigen. As a result, they require AnWj-negative blood to avoid immune reactions during transfusions. Individuals may temporarily lose the AnWj antigen in certain medical conditions, such as specific cancers or blood disorders.

The MAL gene (Myelin and Lymphocyte protein) is responsible for producing a protein found on the surface of certain cells, including red blood cells. It plays a role in cell signaling and is involved in forming myelin sheaths in the nervous system, which protect nerve fibers and facilitate efficient nerve signal transmission.



In the context of blood types, the MAL gene influences the expression of the AnWj antigen on red blood cells. Individuals with certain mutations or deletions in this gene lack the AnWj antigen, making them AnWj-negative. This gene-based difference is significant for transfusion medicine because AnWj-negative individuals may develop antibodies against the AnWj antigen, requiring careful blood matching to avoid immune reactions.

Through advanced exome sequencing, the researchers found that specific deletions in the MAL gene lead to the AnWj-negative blood type. Therefore ,“The AnWj blood group system proves that even in the well-studied world of blood, there are still hidden genetic frontiers to be explored and testament to the power of genetic research, reshaping our approach to rare blood compatibility and patient care.”

Komalavathi
1st Year B.Sc. BTGEBC ‘A’

36 NEXT-GENERATION SEQUENCING (NGS) TECHNOLOGY

Next-Generation Sequencing (NGS) is a modern nucleic acid sequencing technology that allows scientists/researchers to sequence large amounts of genetic material both quickly and accurately. In comparison to the traditional sequencing, NGS is a major advancement as it offers faster, cheaper, and more efficient ways to analyse nucleic acids. It has revolutionized the field of biology, particularly genomics, by enabling large-scale projects such as whole genome sequencing, transcriptome analysis, and the study of genetic variation in organisms.

How NGS Works:

NGS begins by breaking the nucleic acid molecules from the biological samples into smaller fragments. Then, each of these fragments are attached to special adapters followed by sequencing them simultaneously i.e. several fragments are sequenced at the same time. This process results in millions of short sequences of DNA, known as "reads." With the help of advanced software, these reads are assembled to obtain the complete nucleic acid sequence of the organism

Different types of NGS platforms are currently available from different vendors namely Illumina, PacBio, and Oxford Nanopore. Despite their differences in the methods to read the DNA, these platforms involve the same basic principle of parallel sequencing to generate voluminous nucleic acid data.

Applications of NGS:

1. Genetic Research: NGS has equipped us to study the entire genome of organisms, identify mutations, and understand how genes work together to influence traits and diseases, especially in fields like human genetics and evolutionary biology.

2. Medical Diagnostics: Diagnosing genetic disorders, identifying mutations related to diseases (for e.g. cancer), and personalizing treatments on an individual's genetic profile are all benefitted because of NGS. Additionally, NGS also helps to detect infectious diseases by sequencing the genetic material of the involved pathogens.

3. Cancer Genomics: Mutations in tumor DNA responsible for growth of cancer cells are being identified using NGS. Thus, helping in treatment decisions, such as choosing targeted therapies focussing on specific mutations.

4. Microbial Sequencing: NGS is used to study microbial communities, including bacteria, viruses, and fungi. Besides helping to track pathogens and understanding their antibiotic resistance, NGS also aids in exploring the role of microbes in human health

Conclusion:

Next-Generation Sequencing can be concluded as a powerful tool with its ability to sequence large volumes of gene data quickly and affordably. Thus, has opened up new opportunities for performing cutting edge research, improved diagnostics, and enhanced personalized medicine. Continuous improvements in it are expected to play greater roles in advancing scientific knowledge and improving healthcare outcomes in the near future.

Dr. Gurunathan S

Events Organised by the department of Life Sciences

International Conference on Transdisciplinary Research in Life Sciences: Perspectives and Prospects 2024

22 - 23 February 2024

The Department of Life Sciences, in collaboration with The University of Trans-Disciplinary Health Sciences and Technology (TDU),organized the International Conference on Transdisciplinary Research in Life Sciences (ICTRLS-2024). The conference, held over two days, aimed to explore new perspectives in life sciences through transdisciplinary research. Keynote speakers included Padma Shri Prof. Darshan Shankar, Vice Chancellor of TDU, and Dr. S. Natesh, Honorary Fellow at ATREE. The conference featured plenary sessions, oral presentations, and poster discussions, focusing on collaborative research in agriculture, healthcare, and Ayurveda.

Vignana Vicintana Research Colloquium-2025

09 January 2025

The Research Colloquium at Kristu Jayanti College, Bengaluru, featured a series of presentations and discussions aimed at inspiring research. The event commenced with the Presidential Address by Fr. Augustine George, followed by Dr. Somnath Dutta's inaugural speech. Dr. Dutta also delivered a keynote on Cryo EM-based structural analysis, while Mr. Jobin Thomas presented on Cheminformatics and drug discovery. Dr. Challaraj Emmanuel shared insights on biofilm technology, and the event concluded with a student presentation on drug repurposing for Kyasanur Forest Virus.

5th Edition of Vidwat Sammilan

17 March 2024

The Department of Life Sciences, Kristu Jayanti College organized the 5th edition of Vidwat Sammilan, 'an interactive session with institutional leaders' which was focused on 'Requirements for Developing Passion for Research and Synthesize Quality Research Programme'. The programme was presided over by Prof. Ramesh Chander Kuhad, Director, D P G Institute of Technology and Management, Gurugram, former Vice-chancellor, Central University of Haryana and a former member, of the University Grants Commission in an attempt to enlighten the students on the importance of research. The students of the Department of Life Sciences received valuable information about the importance of research and its necessity for the betterment of humanity.

Pre-event to International Trade Fair on Organics and Millets 2025

Date: 10 January 2025

The Department of Life Sciences hosted a pre-event for the International Trade Fair on Organics and Millets, emphasizing sustainable agriculture and millet-based products. The event featured a Millet Master Chef competition, a display of millet products, and a panel discussion on millets' nutritional and environmental significance. Dignitaries and experts highlighted millets' role in promoting healthy lifestyles and sustainable farming practices.

Inter-Collegiate UG & PG Biofest - Bioaura 2024

24 January 2024

Bioaura is an intercollegiate biofest organized by the Life Sciences Department, aimed to celebrate the vibrant aspects of science while enhancing students' core skill in events. Themed "Odyssey of the Cell," the fest provided a platform for students to showcase their talents in speech, logic, and reasoning through nine events: Athena's Trivia (Quiz), Dionysus' Discourse (Debate), Poseidon's Pitch (Biopreneur),Apollo's Anecdotes (JAM), Circe's Sorcery (Lab Skills), Medusa's Mystery (X Files),Hercules' Harold (Biomanager), Alpheus Artistry (Sketching), and Juno's Jest (Scientific Meme Making). Final-year students organized the event under the guidance of Dr. Esther Shoba R and Dr. Sriram Thiruvengadam from the Life Sciences Club

Inter-Collegiate UG exhibition Creatrix 2025

29 January 2025

The Department of Life Sciences organized Creatrix-2025 on January 29, 2025, a Life Sciences exhibition highlighting the significance of the life sciences field and its technological advancements through innovative strategies. Rev. Fr. Dr. Augustine George, Principal, inaugurated the event, and he addressed the student community. He emphasized the crucial role of Life Sciences in shaping futuristic goals and driving scientific progress across various sectors. He also encouraged students to explore their potential in transforming exhibit ideas into entrepreneurial ventures. There were 75 model exhibits were presented by the students of II and IV Semester students of Life Sciences. Notably, several exhibits demonstrated the potential to evolve into start-ups, providing students with opportunities to embark on entrepreneurial ventures.

Intra-Collegiate PG Biofest - BioVentura 2024

15 October 2024

Bioventura'24, an intra-collegiate Postgraduate Biofest, was held on 15th October 2024 at Kristu Jayanti College with the theme "Neuron Nexus," focusing on neuroscience and innovation. The event, inaugurated by Chief Guest Mr. Jai Mhatre, Associate Manager at Symbio Generics, featured insights on the intersection of biotechnology and neuroscience. Organized by III Semester M.Sc. students for their I Semester peers from Biochemistry, Biotechnology, and Microbiology, the fest included 10 events such as Bio Manager, Quiz, Debate, JAM, and Biopreneur. Bioventura'24 fostered creativity, collaboration, and scientific exploration, embodying the essence of its theme.

Inter-Collegiate UG exhibition Creatrix 2024

27 February 2024

Creatrix 2024, held on February 27th, 2024, celebrates innovation and exploration in Life Sciences as part of National Science Day. Over 100 student groups presented exhibits across botany, biotechnology, genetics, biochemistry, and microbiology. Guided by faculty coordinators Dr. Malathi R, Dr. Deepak P, and Dr. Saraswathi, and led by student secretaries Mr. Pranav Rao and Ms. Soumya Sivakumar, the event ran smoothly. Inaugurated by Rev. Fr. Emmanuel PJ and Chief Guest Ms. Lipika Sahoo, it featured exhibit evaluations by faculty judges, with prizes awarded for outstanding presentations. Creatrix 2024 provided a vibrant platform for scientific inquiry and innovation.

Intra-Collegiate UG Biofest - Connoisseur 2024

24 September 2024

The Department of Life Sciences organized "Connoisseur 2024" on 24 September 2024, fostering scientific curiosity and creative engagement among first- and second-year B.Sc. Life Sciences students. Inaugurated by Rev. Fr. Deepu Joy and graced by Dr. Gopi Kadiyala, CEO of Kyntox Biotech, the fest featured the theme "Immuno Plex 24. " Students participated in 10 events, including Bio Manager, Biopreneur, Debate, and Bioscavenger, showcasing their knowledge and talents. Winners were felicitated by distinguished faculty, and the event highlighted entrepreneurship and biological innovation under the guidance of Dr. Roopa P and Dr. Deepak P.

Workshop on Computational OMICS

March 23 - 24 & April 06 - 07 2024

The Department of Life Sciences organized a four-day hands-on workshop on Computational OMICS, focusing on the application of computational techniques in analyzing high-throughput data. The workshop, inaugurated by Rev. Fr. Jais V. Thomas, featured experts like Dr. Nitish Malhotra and Ms. Akshara Dubey, who trained participants in tools such as R, Python, and RNA-seq, with a focus on drug discovery, disease research, and phylogenetic analysis. The event also included sessions on structure-based drug discovery and molecular visualization using PyMOL which was handled by Dr. Dileep.

Workshop on Scientific Writing

07 August 2024

The Department of Life Sciences at Kristu Jayanti College hosted a workshop for III semester M.Sc. students from Biochemistry, Microbiology, and Biotechnology. Dr. Vijayanand led the session on research guidelines and project scheduling, while Dr. Dileep Francis discussed experimental design. Dr. Kushi Anand guided students on writing research synopses, and Dr. Arun Kumar concluded with scholarly writing and referencing techniques.

Workshop on Digitized Clinical Platform

3 February 2024

The Department of Life Sciences, in collaboration with Cloudbyz, organized a workshop on Digitized Clinical Platforms. The workshop provided an overview of cloud-based software solutions used in clinical trials. Ms. Ananya from Cloudbyz explained the clinical trial phases and the role of digital platforms in optimizing healthcare processes, offering valuable insights into the integration of technology in life sciences and healthcare systems.

Workshop on Gene Expression Profiling Using Real-Time PCR

19 - 20 February 2024

The Department of Life Sciences organized a two-day workshop on gene expression profiling using real-time PCR. Dr. Deepti Saini from Protein Design Pvt. Ltd. led the workshop, covering topics such as RNA isolation, cDNA preparation, and RT-qPCR. Students received hands-on training in molecular techniques and learned to interpret gene expression data, with practical sessions using laboratory equipment like the Nanodrop.

Workshop on Computational OMICS 2

19-21 & 26-27 October 2024

The Department of Life Sciences organized a five-day hands-on workshop on Computational OMICS, focusing on the application of computational techniques in analyzing high-throughput data. The workshop, inaugurated by Rev. Fr. Jais V. Thomas, featured experts like Dr. Nitish Malhotra and Ms. Akshara Dubey, who trained participants in tools such as R, Python, and RNA-seq, with a focus on drug discovery, disease research, and phylogenetic analysis. The event also included sessions on structure-based drug discovery and molecular visualization using PyMOL.

Workshop on Zero Waste Day

11 March 2024

In collaboration with the UNAI Hub for SDG-1, the Department of Life Sciences hosted a workshop titled "Waste to Value" on Zero Waste Day. Dr. Prasanna Kumar C. led a session on the production of ethanol from bio-waste, using algae, fruit peels, and other organic materials as sugar sources. Students observed the processes of fermentation and distillation, gaining insight into sustainable practices and environmental conservation.

Value-Added Course on Bio-entrepreneurship

8 – 14 August 2024

A Value-Added Course on Bio-entrepreneurship for M.Sc. students in Biotechnology, Biochemistry, and Microbiology was conducted by Dr. Esther Sobha R, Dr. Shinomol George, and Deepak P. The course covered entrepreneurship fundamentals, biotech industry challenges, and business plan development.

Workshop on Hydra Culture and Maintenance

29 October 2024

A hands-on workshop on Hydra culture and maintenance was organized for BSc Microbiology students. The workshop provided training on feeding live Artemia to Hydra, an essential skill for life sciences and microbial research. Student volunteers guided participants in Hydra maintenance, while students appreciated the opportunity to engage directly with the organisms and learn about their importance in scientific investigations.

Value Added Courses (VAC)

24 - 30 July 2024

The Department of Life Sciences conducted Value Added Courses (VAC) from 24th to 30th July 2024, focusing on Sustainable Practices in Mitigating Climate Change, Essentials of Research in Science, and Biotechnological Applications in Forensic Science. These courses offered hands-on learning through activities, presentations, and case studies, enhancing students' practical knowledge in these vital areas.

Anti-Ragging Week

16 August 2024

The Department of Life Sciences organized an awareness program as part of Anti-Ragging Week. The event, titled ‘Amicabilis Rendezvous,’ involved friendly interactions between senior and junior students. Dr. S. Vijayanand conducted a session on the legal aspects of ragging, followed by III-year UG students sharing their campus experiences. The students were also introduced to the Anti-Ragging Committee of Kristu Jayanti College.

Capacity Building Training On Life Skills Education

16, 19 & 20 August 2024

The Department of Life Sciences organized a Capacity Building Training on Life Skills Education for I year PG Life Science students from 16th to 20th August 2024. The training focused on enhancing the students' ability to manage life's challenges effectively through ten core life skills: Self-awareness, Empathy, Creative Thinking, Critical Thinking, Problem Solving, Decision Making, Communication, Interpersonal Relations, Coping with Emotions, and Coping with Stress. These skills are crucial for personal and professional development, fostering emotional regulation,

teamwork, time management, and resilience. By emphasizing critical thinking and decision-making, the program aimed to empower students to face complex situations with confidence and adapt to a dynamic world.

Capacity Building Training on Life Skills Education AY 2024-2025

12-14 August 2024

The Department of Life Sciences held a Capacity Building Training on Life Skills Education for I-year UG Life Science students. The training emphasized ten life skills, including Self-awareness, Critical Thinking, Problem Solving, and Coping with Stress. The activities included games, discussions, and skits, promoting holistic development and professional competencies in students.

Session on Civic Responsibilities

05 August 2024

A session on civic responsibilities was conducted for final-year UG students by the Department of Life Sciences. Prof. Mahesh S Betasur, Assistant Professor at Kristu Jayanti College of Law, led the session, discussing the importance of active citizenship, voting, community service, and local governance. The session encouraged students to take an active role in their civic duties and engage in democratic processes.

World Taxonomy Day and Biodiversity Conservation

13 March 2024

The Centre for Environment and Sustainability, in collaboration with the Department of Life Sciences at Kristu Jayanti College, marked World Taxonomy Day. This expert lecture aimed to raise awareness about sustainable practices concerning our daily resources, ensuring economic, environmental, and social needs are met, while also fostering prosperity for present and future generations. To impart comprehensive insights, Dr. Priyadarsanan Dharma Rajan, Senior Fellow from Ashoka Trust for Research in Ecology and the Environment, was invited to share his expertise. He delved into the topic "Shaping the Future: Sustainability and Changing Paradigms of Conservation".

Placement Orientation

16 October 2024

The Department of Life Sciences organized a placement orientation session for final-year undergraduate students, led by Mr. Kumar C from Cipla Limited. The session highlighted the pharmaceutical industry's growth, the significance of quality assurance, and key skills needed for students to excel in the industry, concluding with a Q&A session.

Commemoration of National Nutrition Week

27 August 2024

The Department of Life Sciences commemorated National Nutrition Week at Government School, K Narayanapura, with 140 students from grades 1 to 5. The event included nutrition education sessions, a quiz, poster presentations, and distribution of dry fruits.

Role of Probiotics in Human Health

27th August 2024

Dr. Sivamaruthi B. S. from Chiang Mai University delivered a lecture on probiotics' role in gut health for final-year M.Sc. students. He emphasized the benefits of probiotics in preventing gastrointestinal issues like IBS and IBD, supported by scientific evidence.

Training in Usage of Kristu Jayanti Data Centre

27 August 2024

A training session was held for Life Sciences faculty on using the Kristu Jayanti Data Centre. The session included demonstrations on uploading student and faculty files, as well as handling department-related data activities.

Expert Lecture on Understanding and Managing PCOS

03 September 2024

The Department of Life Sciences organized an expert lecture on PCOS, delivered by Dr. Chandrika Anand, for B.Sc. and PG students. Dr. Anand discussed the rising prevalence of PCOS, its symptoms, and treatment plans, emphasizing lifestyle changes for effective management. The session provided students with a deeper understanding of PCOS and its impact on women's health.

Endophytic Fungi: Insights from the Author's Desk

04 September 2024

On September 4, 2024, Dr. Manon Mani V, Assistant Professor at Kristu Jayanti College, conducted a research empowerment session for first-year MSc Microbiology students. The session focused on endophytic fungi and their potential applications in agriculture, biotechnology, and medicine. Dr. Mani elaborated on the role of these fungi in plant health, sustainable agriculture, and ecological balance. She also shared her research methodologies and provided guidance on scientific writing and publication.

Alumni Expert Talk on Research Careers in Life Sciences

31 August 2024

On August 31, 2024, Ms. Sylvia, an alumna and Senior Researcher from the Indian Institute of Science, Bengaluru, conducted an expert talk for final-year UG students in Biotechnology, Microbiology, Biochemistry, and Botany. Her insights into career opportunities, competitive exams, Ph.D. applications, and research-focused skills were invaluable for students navigating their academic and professional paths.

Seminar on Innovation to Incubation

18 October 2024

The Biopreneurship Club, in collaboration with the Kristu Jayanti Incubation Centre, organized a seminar titled "Innovation to Incubation" for MSc Microbiology students. Dr. Muruganantham A, Director of the Kristu Jayanti Incubation Centre, led the seminar, guiding students on transforming innovative ideas into viable businesses in the life sciences field. The seminar provided insights into incubation processes, available support systems, and the steps to turn scientific innovations into commercially successful enterprises, fostering entrepreneurial thinking in biotechnology and microbiology students.

Life Science Club Logo Designing Competition

11 September 2024

On the same day, Dr. P. Deepak, Assistant Professor, led a session titled "Research Insights: Behind the Paper" for second-year MSc Microbiology students. The session aimed to enhance students' understanding of research processes and the journey from formulating research questions to publishing papers. Dr. Deepak shared real-time examples on accessing journals, structuring papers, and navigating the peer review process. The interactive session provided students with practical tips and resources, empowering them to conduct quality research.

Microbe Role Play Report: Microbes as Villains or Superheroes

18 September 2024

The III-semester MBGE students performed a creative role-play to depict the dual roles of microbes as villains (pathogens) and superheroes (beneficial microbes). The performance highlighted the impact of microbes on human health, ecology, and their essential contributions to life processes, aligning with the theme of International Microorganisms Day, "Beyond the Scope."

International Microorganism Day
17 September 2024

Healthy Gut, Healthy You: The Science Behind Microbial Wellness

Kristu Jayanti College marked International Microorganism Day with a session on "Healthy Gut, Healthy You" featuring Dr. Mukil Maruthamuthu, CEO of GUT-iCARE. Dr. Mukil discussed the importance of a balanced gut microbiome in health and wellness, highlighting how probiotics, prebiotics, and dietary changes contribute to microbial wellness, particularly in the context of modern healthcare.

International Microorganisms Day Spell Bee Competition in Microbiology

The Department of Life Sciences conducted a Spell Bee Competition for first-year BSc MBGE students to mark International Microorganisms Day. The competition focused on microbiology-related terms, offering students an exciting and engaging experience while enhancing their confidence and knowledge of the subject.

Reel Making Competition

In celebration of International Microorganism Day, MSc Microbiology students participated in a reel-making competition on "Instrumentation in Life Sciences Lab." Ten teams created educational reels about laboratory equipment, providing insights into their working principles, uses, and handling. The best reels were recognized by a panel of judges.

Microart Photography Competition

To commemorate International Microorganism Day, the Department of Life Sciences hosted a MicroArt Photography Competition for B.Sc. students, where participants took photos of bacteria under microscopes and engaged in agar art. Nine teams participated, submitting 32 entries, and all participants received certificates.

National Intellectual Property Festival 2.0
20 September 2024

Kristu Jayanti College participated in the National Intellectual Property Festival 2.0, organized by NIPAM and CSIR-IP. Dr. Nitin Tewari and Dr. Nirangan Yoele discussed IPR's significance and components, such as patents, copyrights,and trademarks. The event included an interactive session on real-world IPR examples and concluded with a vote of thanks by Ms. Niranjana.

Expert Lecture on "The IPR Bridge"
20 September 2024

An expert lecture on Intellectual Property Rights (IPR) was conducted for PG students of Life Sciences by Ms. Prajanya G P, Wise Program Coordinator at IPR-KSCST. The lecture covered the significance of protecting intellectual property, particularly in the context of patents and related ideas, and how to navigate the IPR process in an evolving technological landscape.

"Microbes in Daily Life" Exhibition
20 September 2024

To celebrate International Microorganisms Day, the Department of Life Sciences, in collaboration with the Life Sciences Club, organized an exhibition on the theme "Microbes in Daily Life". The exhibit showcased microbial diversity, their roles in ecosystems, and their importance in healthcare, food production, and agriculture. Over 100 visitors explored the displays, which included interactive models and microbial art.

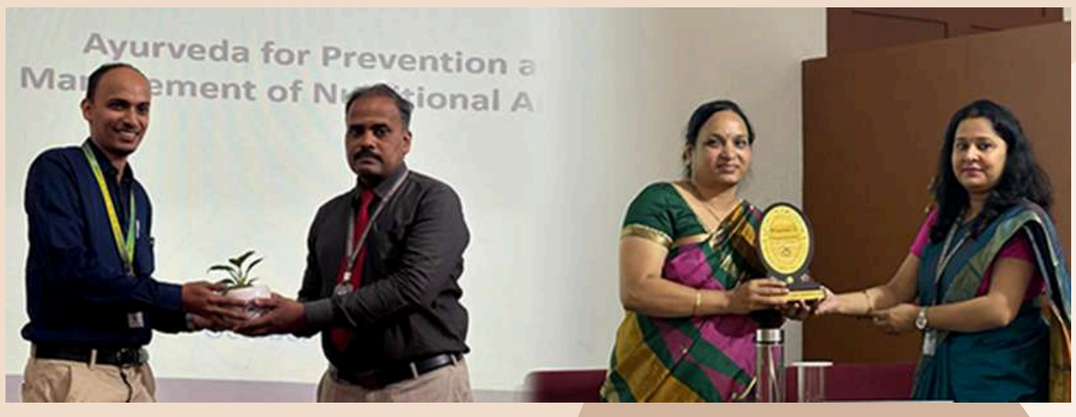
Awareness about Benefits of Biofertilizer

24 September 2024

As part of the biofertilizer distribution event on September 24, 2024, the Department of Life Sciences also conducted an awareness session for farmers, students, and faculty members. MSc Microbiology students created posters and models to educate visitors on the benefits of biofertilizers for sustainable agriculture. They also demonstrated the effects of biofertilizers on vegetables grown in the campus terrace garden.

Ayurveda Health Camp

18 October 2024



In collaboration with TDU, the Department of Life Sciences organized a health camp to promote Ayurveda's holistic approach. Vice Principal Dr. Lijo P. Thomas inaugurated the event, which included free consultations, wellness product stalls, and educational sessions on Ayurveda's relevance inmodern healthcare, attended by over 150 participants.

Research Insights: Behind the Paper

04 September 2024

The Life Science Club organized a Logo Designing Competition for undergraduate students, encouraging them to blend art and science in creating a logo representing the core values of life sciences. The winning design will serve as the official logo for the Life Science Club, fostering creativity and community among students.

International Expert Lecture on Viral Genetic Medicine: Genesis and Progress

08 October 2024

Kristu Jayanti College hosted an international expert lecture by Dr. Sam Laurel Stephen on viral genetic medicine, focusing on the use of viral vectors for gene therapy. Dr. Stephen shared insights into the development of lentivirus, retrovirus, and adenoviral vectors, emphasizing their clinical applications. The lecture, attended by UG and PG students, fostered interactive discussions and sparked interest in biotechnology and genetic medicine.

Expert Lecture on The Future of Healthcare Career Paths in Clinical Research and Data Management

10 October 2024

An expert lecture by Ms. Maria Jonita Lourdes was conducted for PG Life Sciences students, discussing career opportunities in clinical research and data management. Ms. Lourdes, Data Specialist at Labcorp Drug Development, highlighted key roles such as Clinical Research Associate, Data Manager, and Biostatistician, explaining their contributions to the clinical trial process. The session provided students with insights into the essential skills required for a career in this vital healthcare sector.

Biocon Biologics STEM Mentoring Programme

14 October 2024

The Department of Life Sciences hosted the Biocon Biologics STEM Mentoring programme for final-year postgraduate female students. Mr. Chella Pandian from Biocon Biologics inspired the students to develop "ASK – Attitude, Skill, Knowledge" and discussed how the mentoring programme could encourage women to pursue careers in STEM fields.

Student Panel Explores Nobel Prize-Winning Research

05 November 2024

A student panel discussion on "Micro RNAs in Gene Control" was organized by the Department of Life Sciences, where MSc Biotechnology and Microbiology students explored the 2024 Nobel Prize-winning research. Moderated by Maria Taitus, panelists Rishika Sai Yerramalli, Shreya Srivastava, Selva Priya S, Desamala Niveditha, Agna Rose John, and Stella Dass analyzed the role of microRNAs in gene regulation and their medical implications.

"Lab to Land" activity at Guanella Preethi Nivas Old Age

29 October 2024

M.Sc. Microbiology students from Kristu Jayanti College conducted a "Lab to Land" activity at Guanella Preethi Nivas Old Age Home, where they planted vegetable seeds using biofertilizers they had prepared. The activity, guided by Dr. Nathiya T and Dr. K. Frankline Noah, also involved soil nutrient analysis to ensure compatibility with sustainable agriculture practices.

Career Orientation Programme- 2025: Expert Lecture on Career Opportunities in Marine Biology

16 January 2025

An expert lecture was organized for IV semester Post-Graduate students in Biotechnology, Microbiology, and Biochemistry at Kristu Jayanti College. Dr. M. C. Remany, Principal Scientific Officer at Rajiv Gandhi Centre for Aquaculture, delivered insights on aquaculture and marine biology career opportunities. The session included information on government schemes, competitive exams, and internships, followed by an interactive discussion with students on career prospects in aquaculture and marine biology.

Lalbagh Botanical Garden, Bengaluru

13 August 2024

The Department of Life Sciences organized a field visit to Lalbagh Botanical Garden, Bengaluru, for III and V Semester Botany students on 13th August 2024. The visit aimed to expose students to diverse plant species and develop their understanding of taxonomy through experiential learning. Students explored India's largest collection of tropical and sub-tropical plants, including centuries-old trees, and examined the floral displays in the glasshouse. The visit also highlighted plant conservation techniques and the horticultural practices of the Karnataka Government, fostering a deeper interest in plant taxonomy and conservation.

Industrial Visit to Sinchana Sheep and Goat farm

22 November 2024

Animal breeding involves selective mating to enhance desirable traits in successive generations. To provide III Year BSc (BTGE and MBGE) students with hands-on experience in breeding techniques and livestock improvement, the Department of Life Sciences organized a field visit to Sinchana Sheep and Goat Farm, Marenahalli, Bengaluru, on 22nd Nov 2024. Mr. Muzammil, the farm consultant, explained key principles of animal breeding and the benefits of livestock farming. Faculty members Mr. Arun K and Dr. Jagadisha TV from Kristu Jayanti College guided and supervised the visit, ensuring students gained valuable insights.

Industrial Visit to Nueberg Anand Academy of Laboratory Medicine (NAALM)

29 August 2024

The Department of Life Sciences organized an industrial visit to Nueberg Anand Academy of Laboratory Medicine (NAALM) on 29th August 2024 for V semester B.Sc. Biotechnology and Biochemistry students. The students explored various departments, including diagnostic laboratories for hematology, biochemistry, and microbiology. The visit provided a deeper understanding of industry practices, enhanced their practical knowledge, and gave them an opportunity to interact with industry experts.

Industrial Visit to Centre for Cellular and Molecular Platforms (CCAMP), Bengaluru

04 September 2024

Students from the BioNova program participated in an industrial visit to the Centre for Cellular and Molecular Platforms (C-CAMP) on 4th September 2024. The visit gave students a direct exposure to the thriving entrepreneurial ecosystem, interacting with incubatees working on innovative life sciences and biotechnology startups. The hands-on experience at C-CAMP boosted the students' perspectives on business and entrepreneurship, providing insights into the commercialization of scientific innovations. The visit proved to be an inspiring event, fostering an entrepreneurial mindset among the students.

Industrial Visit to The Centre for DNA Fingerprinting and Diagnostics (CDFD)

21 - 22 October 2024

The Department of Life Sciences organized an industrial visit to The Centre for DNA Fingerprinting and Diagnostics (CDFD) in Hyderabad, Telangana, from 21st to 22nd October 2024. Exclusively for III Semester M.Sc. students specializing in Biotechnology, Biochemistry, and Microbiology, the visit aimed to provide hands-on exposure to diagnostic techniques and molecular biology research. Students explored the Diagnostic Laboratory, including units in hematology, biochemistry, and microbiology, and visited research labs focused on DNA fingerprinting and genetic diagnostics. The visit provided valuable experiential learning, exposing students to high-end laboratory instruments, bioinformatics, and career opportunities in life sciences.

BioNova The Biopreneurship Cell at Kristu Jayanti College launched

21 August 2024

for actively fostering student entrepreneurship through various initiatives and events. This entrepreneurship training program aimed to bridge the gap between biosciences and business by equipping life science students with essential skills in bio-product development and startup management. With enthusiastic participation from students and alumni, the program offered hands-on workshops, startup support, and skill-building opportunities, empowering students to transform their research into viable business ventures. Under this programme several student startups were launched.

The launch of **Cervam Private Limited**, on 18th October 2024, founded by **MSc Biotechnology student Mr. Udayaprakash**, was held at Kristu Jayanti College. The venture focuses on organic oils, herbal care, and vegan wellness products, aiming to meet the growing demand for sustainable and eco-friendly wellness solutions.

On **8th October 2024**, **Appachiiii Pvt. Ltd.**, founded by **MSc Biotechnology student Gopika P S**, was launched as the second start-up under BioNova. The company focuses on reviving traditional remedies through premium natural products, such as the popular health drink Chukku Brew. The launch event, graced by the esteemed Smt. K. Ratna Prabha, IAS (Retd.), emphasized the growing importance of biopreneurship in sustainable business practices. Appachiiii's recognition at the Bengaluru Tech Summit with the Best Campus Company Award 2024 further reinforced the success of the BioNova program in nurturing student innovations.

Another significant milestone was the launch of **Paramparika Foods Pvt. Ltd.** on 8th November 2024, during the Millet Mela event. Founded by **BSc Biotechnology student Ms. Anu K. Raphael**, the company promotes millet-based nutrition with its flagship product, Ragi Koozh, a fermented Ragi drink. This startup aligns with the Government of India's ODOP (One District One Product) scheme, contributing to the promotion of local and sustainable food products. The event underscored the role of biotechnological innovation in addressing nutritional needs and fostering a healthy lifestyle.

The **Hydragen Pvt. Ltd.** pre-launch on **14th November 2024**, led by **BSc MBGE student Tharun Balaji**, showcased the company's focus on simplifying the use of hydra as an alternative animal model for aquatic toxicity assays. Alongside, **Thrive Ups Pvt. Ltd.** and **Bioline Pvt. Ltd.** were also pre-launched, with Thrive Ups focusing on sustainable urban gardening solutions through its flagship product EcoZyme, and Bioline aiming to produce biodegradable bioplastics, addressing pressing environmental challenges. These launches reflect the college's commitment to nurturing innovative solutions for both scientific and societal needs.

In addition to the startup launches, several key workshops and expert sessions were held to enhance the entrepreneurial skills of students. These included the Udyam Registration Essentials session, which provided insights into the legal requirements for biotechnological startups, and Building a Startup Ecosystem lecture by Mr. Joseph Paul Arackalan, which inspired students to leverage institutional support for their ventures. The Biopreneurship Cell Exhibition in October 2024 also showcased successful student-led startups, including Agri Foods Pvt. Ltd., Appachiiii Pvt. Ltd., and Cervam Pvt. Ltd., reflecting the transformation of academic knowledge into impactful businesses. Through these initiatives, Kristu Jayanti College continues to play a crucial role in empowering future biotech entrepreneurs.

Bengaluru Tech Summit with the Best Campus Company Award 2024

BioStart: Grooming Future Biopreneurs

26 August 2024

BioStart, organized by the Biopreneurship Club and Entrepreneurship Centre, featured Ms. Nithya K V, founder of Orincer, who shared her entrepreneurial journey with students from the BioNova Programme. The session covered biotech opportunities, bio-entrepreneurship fundamentals, and developing sustainable bio-solutions.

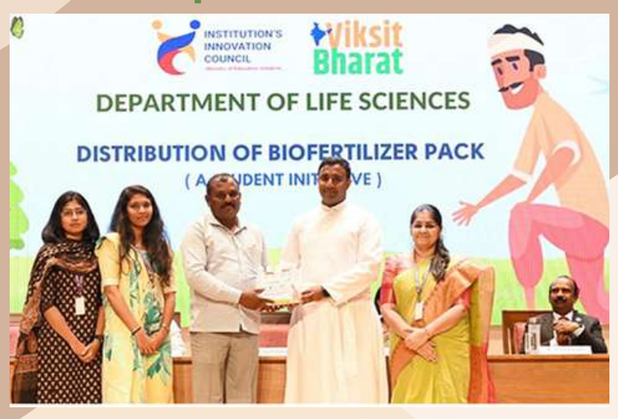
Inauguration of the Biopreneurship Club

21 August 2024

The Biopreneurship Club was inaugurated with Mr. Jestin V. Thomas, CEO of LEADS Clinical Research, delivering the keynote address. The event was attended by faculty and students and focused on encouraging biopreneurship among students.

Biofertilizer Distribution to Local Farmers

24 September 2024



As part of the "Government of India's One District One Product (ODOP)" Scheme under the ‘Make in India’ initiative, the Department of Life Sciences distributed biofertilizers to local farmers on September 24, 2024. The biofertilizers were created by final-year MSc Microbiology students under the guidance of Dr. Sangeetha Menon. The products distributed included Azotofert, RhizoNitroFix, and PhosphoBact. Farmers received free samples and placed bulk orders, supporting sustainable farming solutions.

Expert Lecture on Building a Startup Ecosystem in Educational Institutions

19 October 2024

The Biopreneurship Club, in collaboration with the Kristu Jayanti Incubation Centre and the Department of Computer Science, hosted an expert lecture by Mr. Joseph Paul Arackalan on building a startup ecosystem in educational institutions. Held at the SKE Auditorium, the session provided valuable insights on nurturing entrepreneurial ecosystems, helping students transform their ideas into successful businesses. The lecture emphasized the importance of institutional support in fostering innovation and entrepreneurship.

Organic Manure Distribution to Local Farmers

24 September 2024

On September 24, 2024, Mr. Mithun, a second-year BSc Biotechnology & Genetics student and founder of the agri-startup 'Agri Foods', donated organic manure developed by his company to Mr. Basavaraj, Vice President of the Farmer’s Produce Organization, Karnataka. This donation was part of the "Kristu Jayanti Sarva Vikas" and Campus Farmers Market program organized by the Institution Innovation Council. This initiative encouraged sustainable practices and supported students in gaining entrepreneurial experience.

Students achievements 2024-2025

Details of awards / recognitions received

Sl. No.	Name of the Student	Name of the award	Awarding Agency	Type of award / recognition
1.	Ms. Gopika N 23MSBT19	Best campus company of the Year 2024	Bengaluru Tech Summit 2024	Entrepreneurship

Details of student publications

Sl. No.	Name of the Student	Title of the book / Article	Details of Publisher, Month, Year of publication, ISSN No
1	Dietibiang 18LS401006 Phirakordor 18LS401014	Molecular characterization of beneficial microflora from Commercial vermiwash and its efficacy on seed germination of Vigna radiata l.	Agricultural research journal September, 2024 2395-146X

Details of papers presented

Sl. No.	Name of the Student	Full programme Title & Venue / Organiser Details	Title of Paper Presented / Published / Project / Any Other
1.	Pratiksha N 23MSBC32	One day National conference in emerging trends on biological sciences, SRM Institute of Sciences and Technology, Chennai	Keratinases- A gateway for Biotechnological innovations
2.	Rithika R 23MSBC35	One day National conference in emerging trends on biological sciences, SRM Institute of Sciences and Technology, Chennai	The multipurpose protein: Collagens impact on health and environment
3.	Sandra James 23MSBC36	One day National conference in emerging trends on biological sciences, SRM Institute of Sciences and Technology, Chennai	Targeting bacterial biofilm - The role of sortase inhibitor in preventing S. aureus infection

Details of technical reports published

Sl. No.	Roll No.	Student Name	Title of the Report
1	21MBGE49	Venu Sai C	Isolation and Identification of Bacillus licheniformis Endobacteria from the Hyphae of Rhizopus sp.
2	21MBGE15	Hannah Lijo	Isolation, Characterization, and Identification of Streptomyces scabiei from Soil
3	23BTBC25	Siddhartha Debgoswami	Approach to Isolating and Identifying Micrococcus luteus
4	23BTGE21	Anu K Rapheal	Decoding Probiotics: Species Authentication Using 16S and ITS Gene Sequencing
5	23MSBC21	Ritikha Sharma	Plant Leaves and Their Secret Residents: A Study of Endophytic Bacteria
6	23BTGE23	Aravind Rao	Motorbike Microbiome: A Study of Bacterial Species on Riders' Touchpoints
7	22BTBC27	Tanvi Loharuka	Tracking Salmonella enterica: A Reverse Taxonomy Approach in Sewage Screening

Co-curricular achievements in external programmes (Inter-fests, competitions)

Sl. No.	Date of the Event	Title of Fest	Host Inst. and Venue	Regional / state / national	Overall trophy details (winner / runner)	Total number of Prizes won by students
1.	17/09/24	Jeevotsav 2024	Christ University, Bengaluru	State	Winners	17
2.	07/10/24	Wild 14.0	St. Joseph's University, Bengaluru	State	Winners	16

Student Co-ordinators from the Department of Life Sciences

Student Council Members

Member
Rishika Sai Yerramalli - 23MSBT37

Joint Secretary
Mayank Bharti - 22BTGE78

Student Office Bearers

Life Science Club
Preston Fernandez - 22BTBC21
Vanshika - 22MBGE45

Environment Club
Tarun Kumar M. - 22BTBC28
Rishika Bhattacharya - 22BOBT13

Karnataka Civil Defence Corps
Jovita Mathew - 22BTBC36

Debating Society
Avni Madan - 22BTGE16

Kristu Jayanti Dance Academy
Ben Anthony K. V. - 22BTBC10

International Students Forum
Shruthi B - 22BTBC38

Youth Red Cross
Joyel Geevarghese- 22MBGE22

Kristu Jayanti Centre for Indian Knowledge System
Avinandan Majumder - 22MBGE47

Theater Club
Phalguni Mohapatra - 22MBGE32

Women Empowerment Club
Sheba Ebenezer A - 22BTBC24

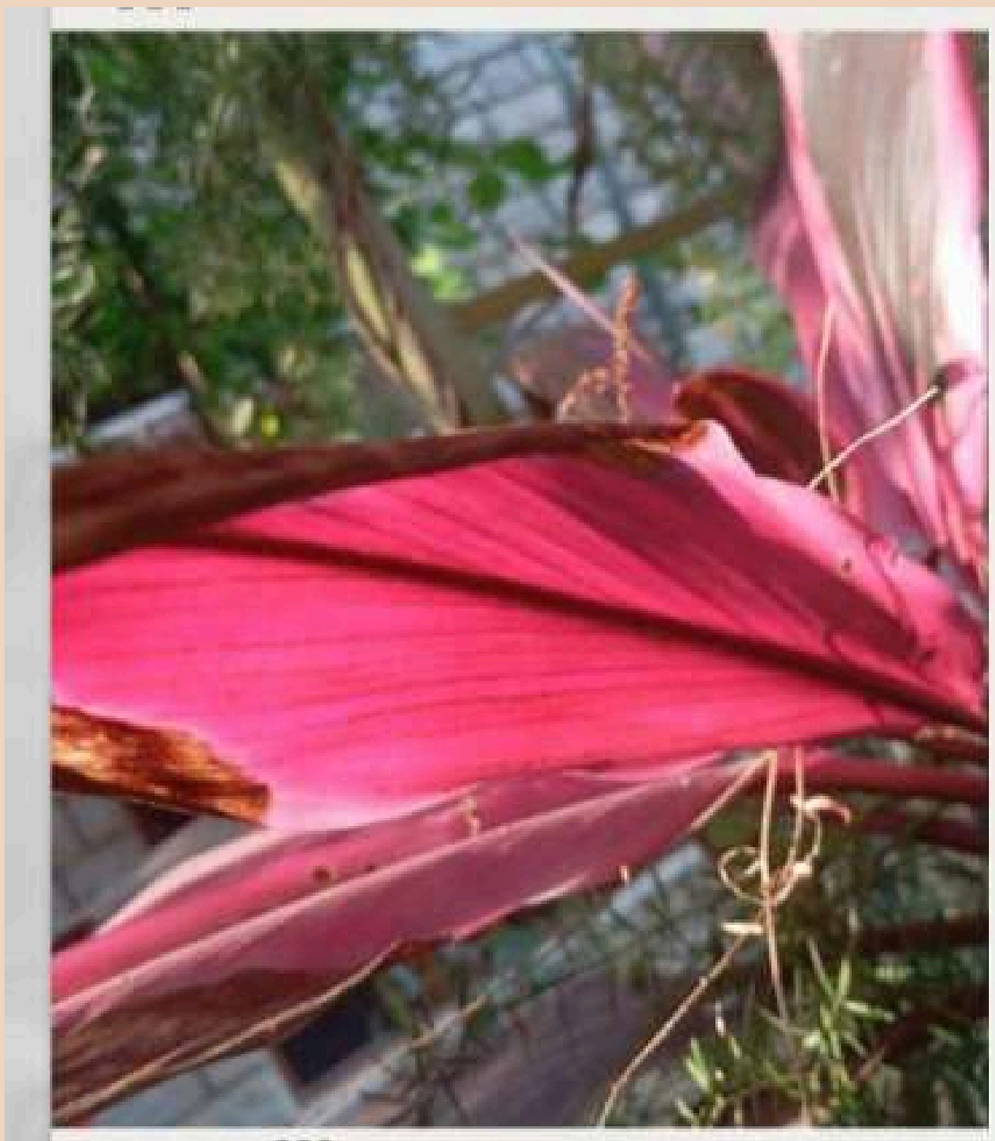
Faculty achievements 2024-2025

Details of Awards and Recognitions

Sl. No.	Name of the Faculty	Name of the award	Awarding Agency
1	Dr. Indira M.N.	Certificate of Appreciation	WWF- India
2	Dr. Deepak P	Foundation Certificate for Mentoring Projects for Impact	TOOOPLE
3	Dr. Priya Josson Akkara	World Record Certificate	World Records Union
4	Dr.Ashok D	Research Excellence Award	Pondicherry University of Agricultural Sciences
5	Dr. M. Sonia Angeline	LMS Award-Innovative practice in KJLMS	Kristu Jayanti College, Bangalore
6	Dr Jagadisha T V	SWACHHITA HI SEVA-2024	Ministry of Housing and Urban Affairs, GoI
7	Dr. Elcey C. Daniel	Research Excellence Award-Platinum Category	Kristu Jayanti College, Bengaluru
8	Dr. Dileep Francis	Research Excellence Award-Platinum Category	Kristu Jayanti College, Bengaluru
9	Dr.Shinomol George K	Research Excellence Award-Platinum Category	Kristu Jayanti College, Bengaluru
10	Dr. Deepak P	Research Excellence Award-Platinum Category	Kristu Jayanti College, Bengaluru
11	Dr. Prasanna Kumar C	Research Excellence Award-Platinum Category	Kristu Jayanti College, Bengaluru
12	Dr. Nathiya T	Research Excellence Award-Platinum Category	Kristu Jayanti College, Bengaluru
13	Dr. M. Sonia Angeline	Research Excellence Award-Gold Category	Kristu Jayanti College, Bengaluru
14	Dr. Challaraj Emmanuel E S	Research Excellence Award-Gold Category	Kristu Jayanti College, Bengaluru

Details of Awards and Recognitions

Sl. No.	Name of the Faculty	Name of the award	Awarding Agency
15	Dr.Sangeetha Menon	Research Excellence Award-Gold Category	Kristu Jayanti College, Bengaluru
16	Dr.Arpita Mishra	Research Excellence Award-Gold Category	Kristu Jayanti College, Bengaluru
17	Fr. Deepu Joy	Research Excellence Award 2024- Silver Category	Kristu Jayanti College, Bengaluru
18	Dr. Vijayanand S	Research Excellence Award 2024- Silver Category	Kristu Jayanti College, Bengaluru
19	Dr. Priya Josson Akkara	Research Excellence Award 2024- Silver Category	Kristu Jayanti College, Bengaluru
20	Dr. Saraswathi	Research Excellence Award 2024- Silver Category	Kristu Jayanti College, Bengaluru
21	Dr. Malathi R	Research Excellence Award 2024- Silver Category	Kristu Jayanti College, Bangalore
22	Dr. Sriram T	Research Excellence Award 2024- Silver Category	Kristu Jayanti College, Bengaluru
23	Dr. C M Reena Josephine	Research Excellence Award 2024- Silver Category	Kristu Jayanti College, Bengaluru
24	Dr. Ashok D	Research Excellence Award 2024- Silver Category	Kristu Jayanti College, Bengaluru
25	Ms. Kushbu R	Research Excellence Award 2024- Silver Category	Kristu Jayanti College, Bengaluru
26	Dr. Priya Josson Akkara	Climber Certificate (Climbing summit of Sydney Harbour Bridge)	Bridge Climb Sydney



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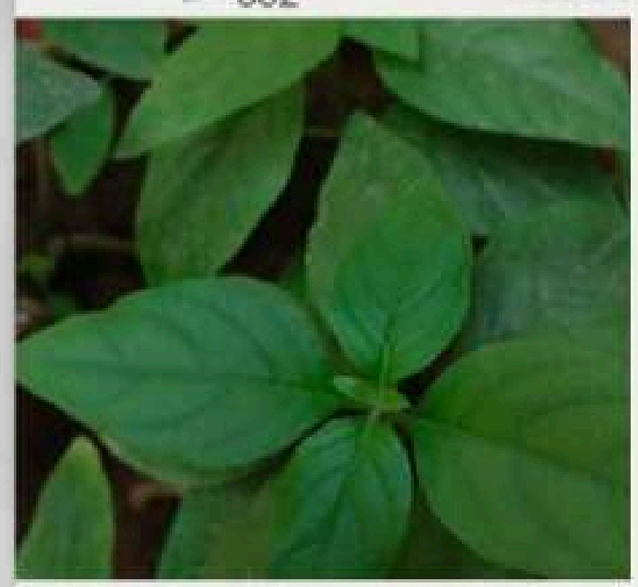

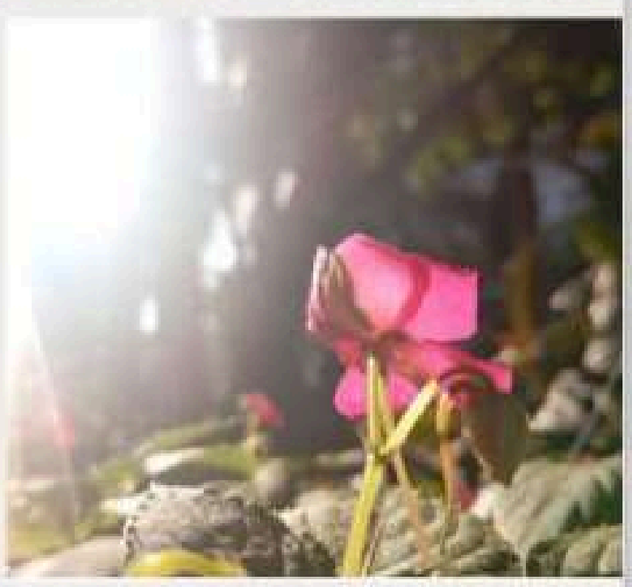

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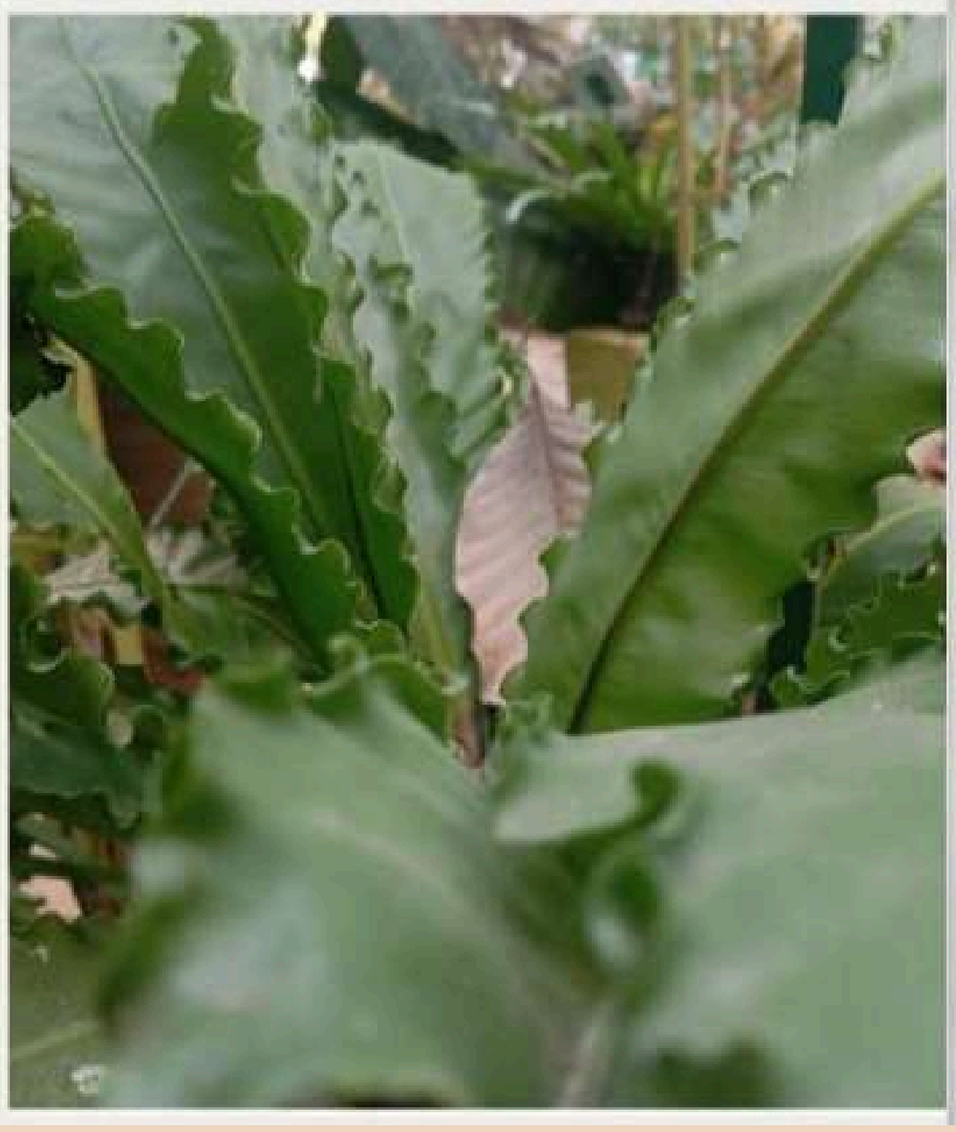

Medicinal Garden
Maintained by Department of Life Sciences
Kristu Jayanti College , Autonomous

Kristu Jayanti College, Autonomous
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