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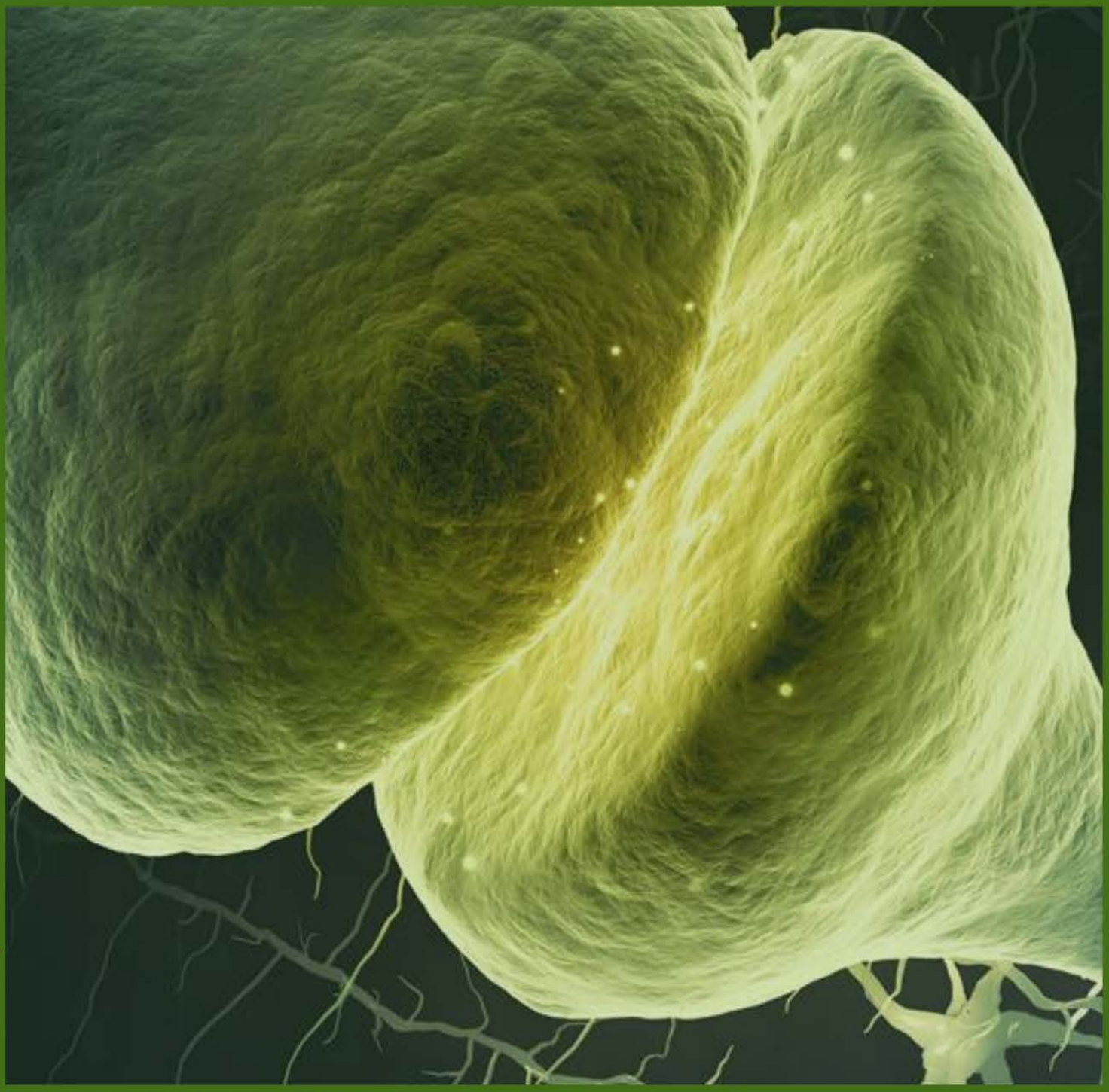
SYNAPSE

ANNUAL NEWS LETTER



JULY 2022 | VOLUME 7

DEPARTMENT OF LIFE SCIENCES

FOREWORD

Life Sciences offers potential of enormous benefits such as addressing global problems like climate change, an aging society, food security, energy security and infectious diseases, to name just a few. There are so many exciting things happening, thanks to the rapid advances in Life Sciences.

Researchers in this arena are striving hard for better understanding of cells, multi-cells, tissues, organs, organisms, and even communities of organisms and ultimately to develop better biotechnological applications. The genome editing of living organisms, can enhance bio-based chemicals production, increase food production and maintain a better nutritional value, or also could manufacture organs for transplant. Metabolic engineering and synthetic biology that are advancing very rapidly as well has led to the production of fuels and materials from renewable biomass.

Amazing developments in healthcare and the medical sector such as stem-cell therapy, ICT-integrated biotechnology have helped in addressing many health challenges. Biotechnology, an integrated discipline of Biochemistry, Genetics, Microbiology etc., will become as common as having a cellphone or going online. There is going to be an even larger number of many life sciences related companies, both big and small, along with an increasing number of venture companies. So by 2030, it will be a realistic to say that technology in life sciences will become a part of our life, from drugs, medicine and therapeutics to environment friendly chemicals, fuels and materials.

The vision of the department of Life Sciences, Kristu Jayanti College is to provide quality education and research with the primary aim of holistic development of every student. The education mission of the Department of Life Sciences is to organize and teach basic and applied life sciences in the curriculum. Our hope is for a learning community that engages students in learning that is relevant for the 21st century and provides them the skills to be critical and ethical thinkers capable of independent and lifelong learning.

EDITORIAL COLUMN

'Synapse'- an annual newsletter of the Department of Life Sciences, Kristu Jayanti College is a collection of articles and thoughts penned by the students of the Department. The students have tried to communicate new updates in the research areas of Life Sciences.

It is a matter of delight that this useful collection of highly informative articles from our students conjures up the current and continued efforts in research as there are still many areas to be explored. We hope that the newsletter will answer many questions pertaining to technological advances in the field of Life Sciences. This newsletter also provides insight on the departmental activities and achievements of students and faculty.

FACULTY EDITORS

Dr. M. Sonia Angeline

Dr. Indira M.N.

STUDENT EDITOR

Ms. Devayani B. Pandey

VI B.Sc. BBB

PRINCIPAL'S MESSAGE

I am immensely happy to note that the department of Life Sciences is bringing out its annual newsletter 'Synapse' for the academic year 2021-22. The department has been actively involved in conducting many activities over the years in creating opportunities for students and faculty in their academic development.

During the path in the preparation of Synapse, I am certain that the creativity and the inquisitiveness of the students' would have been enkindled.

I wish the editorial team the very best.

Articles

CRISPR GENE TECHNOLOGY IN THE FIELD OF CANCER

AASRIITHA
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Cancer is a disease in which the body's cells grow uncontrollably and spread throughout the body. CRISPR Cas-9-mediated genome editing technology is used in the treatment of cancer.

Clustered regularly interspaced short palindromic repeats (CRISPR) is a genetic engineering tool which uses sequence of DNA and its protein to change the base pairs of the gene. This tool provides ways to insert, correct and remove the faulty genes in a particular manner. Some of the applications of this technology is to treat- Lung cancer, breast cancer, etc.

LUNG CANCER : Creating single directed RNA and Cas-9 protein, distributing them to cancer cells by various methods. Single directed RNA along with the lungs mutated epidermal growth factor receptor makes a complementary match which cleaves with Cas-9 protein which reduces the progression of cancer. Manipulating the expression of ligand-receptors on lymphocytic cells. The CRISPR-Cas-9 inactivates the expression of cancer receptors on the lymphocytes which reduces the contact between the tumor cells and its ligand receptors which reduces the progression of cancer.

BREAST CANCER: CRISPR is delivered by the synthetic polymer system to the breast cancer cells which restores the expression of two genes-MASPIN and CCN6 as these genes are not active and their gene expression is reduced .This synthetic polymer system was able to switch –on or increase the gene expression of these genes which led to reduced tumor growth.

OVARIAN CANCER: It is the major cause of deaths among women and the most common one of the female reproductive system. Only one-third of the females survive this disease .Using CRISPR -LNP's the survival rate has increased by 80%. Normal lipid nanoparticle based deliver system that carries messenger RNA encoding the CRISPR enzyme CAS 9 which targets cancer. The CAS 9 enzyme acts as a molecular scissors, cuts the cells DNA strands and neutralises the cancer and prevents it from replicating. This system is called as CRISPR-LNP's. The CRISPR -LPN's targets a gene called PLK1 coated with antibodies which codes for EGFR protein that is expressed on the surface of ovarian tumors. These antibodies helps in guiding

the LNP and cause the disruption of the PLK1 gene and stops the cell cycle and kills growing cells.

CRISPR development combined with its versatility and ease of use have already left a mark in the field of molecular genetics. CRISPR-CAS 9 genome engineering technology has provided an invaluable tool to accelerate biomedical research. CRISPR is an important tool for fight against the cancer. Additionally, CRISPR -CAS 9 is used to generate new clinical therapies and is also used in the laboratory to model cancers for better understanding of the cancer behaviour.

APPLICATIONS AND LIMITATIONS OF CRISPR GENE TECHNOLOGY: It can be used in engineering oncolytic viruses and in cancer therapy and has the ability to edit genes in model organisms and human beings. It plays an important role in development of complete genomic study for cancer patients and used to resolve mutations and bring about site-specific therapeutic genes in humans cells. On the other hand, It is difficult to deliver the CRISPR or the Cas-9 material to mature cells in large number. It is not completely efficient and does not ensure complete genome editing activity.

THE FERMI PARADOX

SHISHIR S NAIR
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We have heard these words somewhere, whether in sci-fi movies, video games, or even a Vsauce video, but what do these words actually mean? And what's the consequences of learning such a concept for us as a species? Well, this article tells you all you need to know.

It all starts with an Italian mathematician named Enrico Fermi. He was the one who designed the nuclear reactors, the so-called "architect of the nuclear age". Needless to say he was pretty smart, excelling in both theoretical and experimental physics, not to mention his various contributions to nuclear, and particle and quantum physics.

He also invented the topic of today, The Fermi Paradox. His fascination with this topic was born during a conversation he had with Edward Teller, Herbert York and Emil Konopinski, other famous physicists at the time in the summer of 1950. His question was if there are many planets in the universe that have similar conditions for intelligent life, then why are the cosmos quiet? All in all the paradox asks us the question of "where are the aliens?"

So what is this based on, well on two things, scale and probabilities, the milky way contains at least 200-400 billion stars and even if one percent of them have conditions for the formation of intelligent life, we would have seen them by now. It also argues that intelligent life tend to colonize and make their presence known, and if we had 13.8 billion years, life in the cosmos should be teeming. There should even be a sufficiently advanced civilization that tries to contact us, but all we notice is silence. The fermi paradox also considers the Drake equation, which calculates the probability for life to form in our galaxy. However, this equation does suffer from over estimating its probabilities.

One way to explain the paradox, is by theorizing the existence of a so called “Great Filter”, a filter all life must pass through in order to survive. This brings up some grim scenarios for our kind. On the optimistic side, we might be the only ones who did pass this filter, maybe the complex processes and conditions for life to occur here are not as common as we might think. Maybe life is rare, and molecules and conditions should be exactly the way we had it here, for life to form. The development of photosynthesis could also be a filter, oxygen and oxygen consuming plants, as far as we know only developed here on earth. Looking at all these filters to pass through, we might be the few lucky ones who did pass them.

On the pessimistic side, we might not be the lucky ones, as we have much more difficult filters left to pass through, one which destroyed advanced civilizations that arose before us. One such filter could be self-annihilation, maybe intelligent life became so militarily advanced, that it lead to their own destruction, like how we have nuclear warheads in our own cosmic household, maybe the use of such weapons, lead to their demise. Another filter could be natural extinction events, like an asteroid that killed the dinosaurs, horribly virulent and severe diseases or even sentient AI that destroyed its own creators.

Point is, we are going through these filters and there will be more to come, we might not be a special civilization after all and all the things that killed the others, might kill us too. This gives us some existential crises, who knows what if the aliens in the universe are so alien that we can't even detect them, there are many reasons as to why this place is so lonely. So let’s hope the best for our species and hope to make an impact on this universe, whether a small one or a big one, a bad one or a great one, all in all the Fermi Paradox, along with its existentialism gives us this sort of optimistic nihilism, a reason to create our own purpose.

ASTOUNDING SCIENCE FACTS!

ETHAN CUNNINGHAM
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1. If you were to begin reciting the order of the ATCGs in your DNA tomorrow morning, at a rate of 100 each minute, 57 years would pass before you reached the end of the chain.
2. We are all 99.9% alike.
3. The remaining one per cent control our inherited personal traits from our parents.
4. About one in every 4 million lobsters is born with a rare genetic abnormality that turns it blue.
5. One single group of 55 chimpanzees in geographical area of West Africa has twice the genetic variability of all humans combined.
6. There's a alteration that causes your bones to become very dense. One person who suffered from this had a bone density that was eight times on top of the common male; he started to sink just like a stone when he tried to swim and once came out of a car accident without any fracture.
7. Humans are born without bacteria, and the first bacteria is acquired during parturition through the birth canal.
8. Through biotechnology, it's possible to convert greenhouse gas like CO2 into proteins, which may be a great process to counter the results of global warming.
9. Spider dragline silk is incredibly strong and versatile, but impossible to practically mass produce with spiders -- they're just too territorial. Researchers at the University of Wyoming solved the matter by inserting the silk gene from spiders into more docile creatures: goats. These special dairy animals produce milk containing long, long strands of spider silk, which is then harvested from the milk with a spool in large quantities. The goats are left happy and unharmed. They were called spider-goats by the media
10. The gross social and environmental benefits of biotechnologically modified crops can not be ignored. In 2011 alone their use reduced CO2 emissions by 23.1 billion kilograms, or the equivalent of removing 10.2 million cars from the world's roads. 108.7 million hectares of land has been saved and 15 million rural farmers and their families have been lifted out of poverty

TRUFFLES: HIDDEN GEMS OF THE FUNGI KINGDOM

IGNATIUS RAYMOND PETER
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Tuber melanosporum (Black truffle)

Tuber magnatum (White truffle)

Tuber melanosporum/Tuber magnatum more commonly known as the black/white truffles are close cousins to the mushroom family and belong to the kingdom Fungi. These are hypogeous (underground) fungi which live in symbiosis with the host plant's roots like Oak, Hazel and Pine etc. to complete their life cycle. Such a symbiotic relationship between fungi and roots of the host plant (superficially associated) is called Ectomycorrhizae. These edible fungi are extremely prized and valued due to their rareness, unique aroma, short shelf life and plethora of benefits. Truffles are used in culinary and gourmet food due to their unique aroma and flavour (described as musky, earthy and garlicky). They are great contributors to the umami sense of taste similar to the taste provided by Monosodium glutamate. Truffles have a short shelf life due to which they tend to lose their flavour and aroma very soon…Hence, they are expensive and highly valued, for example the rarest Italian white truffles cost as much as $4000 per Kilogram. A chocolate confectionery also called "Truffles" gets its name from this fungus due to its close resemblance in structure. Recent developments in research have led to the identification of some bio-active components like Phenolics, Terpenoids, Anandamides and Ergosterols etc. in truffle fungus that are known to possess anti-tumor, anti-oxidant, anti-bacterial and anti-inflammatory properties. Apart from this, truffles are a great source of nutrition as they are rich in essential vitamins and minerals. They are rich in carbohydrates, proteins and fatty acids. They also contain micro-nutrients like vitamin-C, Phosphorus, Sodium, Magnesium and Calcium. They are usually found in Europe, Asia, North Africa and North America. Truffles are extremely difficult to be found underground. Truffle hunters use the aid of truffle dogs (*Lagotto romagnolo*) and female pigs due to their excellent sense of smell to find them. Moreover the truffle fungi contain Androstenol, a sex hormone found in the saliva of male pigs also, which enables female pigs to detect them easily.

TWO PIG HEARTS WERE SUCCESSFULLY TRANSPLANTED INTO BRAIN-DEAD PEOPLE

DEEPA
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In the press conference held on 12th July, surgeons at NYU Langone Health in New York City announced that pig hearts were replaced in two brain dead patients and was in working condition for 3 days. The patients were kept alive using the ventilators as the transplanted heart was being monitored. The feat helps the researchers to start preparation for further clinical trials of pig-to-heart transplants, which might gradually increase the success rate. In the mid June 72 year old Vietnam veteran Lawrence Kelly was transplanted by pig's heart reported to have heart problems. The second patient received the heart on June 6th. Both the patients were monitored for 72 hrs before removing the ventilators. For those 3 days the hearts kept regulating the blow flow in the body successfully. The surgeons found that the pig's heart was small for Kelly's chest size. Therefore the blood vessels were resized to match with the heart's size still the blood flow was not perfect. An echocardiogram, shows a genetically modified pig heart beating after transplantation inside the chest of a brain-dead patient on ventilator. The heart worked for three days until the patient was taken off the ventilators.

Last year at NYU another Lagone Health team transplanted the pig's kidney to a brain dead women and was monitored on life support. The initial pig to human heart transplant after the genetic modification was done in January. The heart was transplanted into 57 old year David Bennet, who survived for about two months on the successful functioning of the pig's heart before dying of cardiac failure. Also all his other organs where genetically modified to avoid immediate rejection. It's unclear why Bennet's new heart ultimately failed.

Transplanting organs into brain dead patients gives more space for research and study which is nearly impossible to try it on living patients. Next the team plans on doing longer transplants in brain dead patients to determine the functioning of the pig's heart in human body.

BUTTERFLY "TAILS" MIGHT BE PART OF AN ESCAPE TACTIC

NEHAA.R
VI B. Sc. BBG

The tail-like extensions on the tail wings of a butterfly may help to divert the predator birds away from attacking the butterfly's head and abdomen. These eye-catching wing extensions break off easily in the beaks of the predator birds.

These extensions are more than just style for some butterflies, these break-away parts which help them survive hungry predators, as the new data suggest. It acts like a decoy to predators from grabbing the butterfly's head or abdomen; it also explains why such wing extensions are developed in different species of moths and butterflies.

Birds are known to attack the head shaped pattern son wings or eyespots of the butterfly and some of the scientists wondered if the birds might also target the wing tails. Their information also suggest those tails distract birds away from the prey's vulnerable body parts and because their tail tear off easily, the attacked butterflies can escape , it is also seen in lizards , they break –away tails that allow

So they did an experiment on them by collecting sail swallowtail butterflies near Ariege, France. They are found throughout Europe and Asia. On their wings above the tails of butterfly are blue and orange splotches as they stand in contrast to yellow stripes covering the wings.

Among the 138 swallowtails collected, 65 –not quite half of them- had at least one damaged tail. When the researchers looked at all 130 of the wings in this group, they found more than 8 in every 10 of the wings had damaged tails. This suggests predators target the eye-catching structures.

HELICASE ENZYME AND IT'S SIGNIFICANCE

ASWIN V.
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Replication is one of the important events in our cell. In molecular biology or cell biology DNA replication is the process by which the genetic material is duplicated. DNA replication occurs in all living organisms acting as the most essential part of biological inheritance. DNA replication involves series of steps and it is well and precisely monitored without occurring any chances of error. Initiation, elongation and termination is the main three steps in DNA replication. Also the formation of Replication fork is another important event and in this particular shape different enzymes comes to play and replication is achieved.

Different specific enzymes are coordinated and comes to play in replication event .One such important enzyme is helicases. Helicase is a class of enzyme especially the DNA Helicase which helps in unwinding of double stranded DNA and facilities replication. It was first identified in E.coli in 1971 but interestingly the very first eukaryotic DNA helicase was identified in 1978.This particular enzyme is universally present in all living organisms no matter they are prokaryotes or eukaryotes. In humans there are 25 numbers of helicase, in plants almost 8 helicase are there and about bacteriophage and viruses, have 6 and 12 helicase respectively.

The structure of helicase varies with species to species and the molecular weight of DNA helicase is 300 kDa. Some of them are hexameric, some are monomeric or can be dimeric also. However all the helicase poses some conserved sequence motifs in its activation site or core. These are involved in ATP binding, activation, hydrolysis etc. The mechanism of action of helicase starts with recognising the dsDNA strand. Also they require only a short stretch of the ssDNA for performing the unwinding during in vitro experiments. They can also be nicknamed as rotating engine that move forward to perform its activity. Helicase moves forward at the rate of one nucleotide per hydrolysis reaction and the activity varies from enzymes to enzymes, some of them are bidirectional or can be unidirectional also.

ReBCD is one type of helicase enzyme that perform action in both the direction while another example of helicase is RecB which perform action unidirectionally. Different motif present in the core of enzyme help in processing the ATP, which converts to ADP and release energy that can be used by them. Our's hexameric helicase has a central holo part in which the DNA binding motif is present. Some common motifs among different organisms are Walker A, Walker B, Motif lll, Motif IV etc. Once the DNA enter the holo part the motifs Walker A and Walker B starts hydrolyse ATP to discharge energy which in turn break the hydrogen bond by spinning and moves ahead for another set of reaction by utilising the energy by the next series of hydrolysis and hence they move further in this manner.

Helicases are mainly classified into two and they are DNA Helicase and RNA Helicases. DNA helicase is an ATP dependent catalytic enzyme which unwind the dsDNA for providing leading and lagging strand, while RNA Helicase help in destabilizing the RNA secondary structure, RNA splicing, promotes ribosome assembly etc. Now talking about the functions of helicase; unwinding the ds nucleic acid as major function, during translation they break the hydrogen bond between DNA-RNA hybrids. They also help in splicing, chromatin

remodelling, and termination of translation, in case of DNA repair the helicase unwinds the dsDNA for repairing damaged DNA strands etc. So we can say that along with other enzymes like primase, RNA polymerases, topoisomerases, helicase enzyme is also an important and significant enzyme because only if unwinding happens the further steps can go ahead and replication can be achieved.

SRY DELETION

YAJUSHI YASHITHA VINNAKOTA
VI B. SC. BBG

SRY is Sex-determining region Y protein which is present on the Y chromosome. This protein leads to development of the male reproductive system. The sex-determining region Y protein produced from this gene acts as a transcription factor which implies it binds to specific regions of DNA and helps control the activity of particular genes. This protein starts processes that cause a fetus to develop male gonads (testes) and stop the development of female reproductive structures.

Health conditions associated with SRY deletion:

Swyer Syndrome: Mutations within the SRY deletion has been found in about 15% of people with Swyer syndrome also referred as 46, XY complete gonadal dysgenesis or 46, XY pure gonadal dysgenesis. This syndrome affects sex development. Individuals have a chromosome pattern that of a male (46, XY), but develop female sex characteristics. This syndrome prevents the SRY protein formation or the formation of non-functional protein which happens due to mutation. Without functional sex-determining region Y protein, a fetus won't develop testes but will develop a uterus and fallopian tubes, despite having an X and a Y chromosome. **46, XX Testicular Disorder and other disorders:** In most people with 46, XX testicular disorder of sex development the condition results from an abnormal exchange of genetic material (translocation) between the Y chromosome and another chromosome, mostly the X chromosome. This exchange occurs as a random event during the formation of sperm cells within the affected person's father. The SRY gene is misplaced, nearly always onto an X chromosome in this disorder. A fetus with an X chromosome that carries the SRY gene will develop male sex characteristics despite not having a Y chromosome. Translocations that misplace the SRY gene onto an X chromosome cause about 10 percent of cases of a condition called ovotesticular disorder of sex development. Individuals with this condition have a female-

typical chromosome pattern 46, XX karyotype and tissue from both female and male reproductive organs. **Screening of SRY deletion:** SRY deletion is screened by FISH technique also referred to as Fluorescence In-situ Hybridization, which is maybe a cytogenetic technique that uses fluorescent probe that binds to only those parts of the chromosome with a high degree of sequence complementarity. The DNA probe and also the target DNA are denatured and the probe is also allowed to hybridize with the target. The fluorescent tag in then detected with a fluorescent microscope.

THE FUTURE OF ORGAN TRANSPLANTS IN HUMAN

NISHANTH S
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Now a days lots of people are suffering with chronic disease but who may ultimately require organ transplantation in the treatment of their condition, yet these organs are in short supply. Xenotransplant may represent one solution. The possibility of using pig organs in humans could improve mortality rates for condition such as cardiomyopathy, chronic obstructive pulmonary disease, liver cirrhosis and polycystic kidney disease etc. Xenotransplantation is transplantation of organs, cells, or tissues between species for example from pigs to non-human primates or humans. WHO defines xenotransplantation as any procedure that involves the transplantation, implantation or infusion into human recipient of either

i) live-cells, tissues, or organs from a non-human animal source; or
ii) human body fluids, cells, tissues or organs that have had ex vivo contact with live non- human animal cells, tissues or organs.

Recent times clinicians are turning to this emerging science due to the shortage of organs by this transplant method we can reduce the transplant waiting lists. First documented human kidney transplant was completed in 1933 in soviet -union but the transplanted kidney never produce urine unfortunately patient died two days later. Further attempts made in 1960s when an adult female received a chimpanzee kidney and she survived for nine months. Then first heart xenotransplant was carried out in 1964 but the patient died two hours later. In 1984 a neonate infant with hypoplastic left heart syndrome received a baboon heart and survived for 20 days (Lu, T. et al (2020). Now recently surgeons at university of Alabama at Birmingham reported that for the first time they successfully transplanted kidneys from a genetically modified pig into the abdomen of 57- years' old brain-dead man. The kidney functioned and produced urine for three days.

THE FUTURE: While xenotransplantation has been studied for many years the European consortium, which generates data to progress xenotransplantation towards human clinical trials, is also examining ways to cure Parkinson's disease. Research is also underway into bioengineered livers and 3D organ printing, an emerging concept in tissue engineering. As the organ is printed it is also impregnated with human cells creating a collagen scaffold for use in constructing functional tissue and organs *in vitro.*

The number of human organs available for transplantation is nowhere near sufficient to meet the ever increasing demand by patient's worldwide. I hope this type transplantation has potential to increase organ supply and reduce waitlist mortality for critically ill people who require organ transplants. It is hoped that improvements in gene editing technology may lead to successful genetic manipulation in pigs, removing the risk of organ rejection so that the first clinical trials of xenotransplantation in humans can begin, increasing longevity and improving quality of life in people who suffer from chronic disease across the globe.

MICROBES IN ENVIRONMENTAL MANAGEMENT

ANNETTE D. MATHEW
IV B. Sc. MBG

Human beings are highly inquisitive by nature. This curiosity about the world around them and the science behind the working of various is what led to many amazing discoveries and inventions. One such discovery was the existence of microorganisms, by Anton Van Leeuwenhoek. This discovery of living beings on every surface surrounding us, till then unknown to us, was intriguing and exciting. They have been enthusiastically studied ever since.

But some inventions which have contributed to making our lives easier have done so at a great cost: the environment. Environmental pollution and degradation is one of the greatest concerns today. There is much discussion and debate on the best ways to preserve and save our environment. But the actions being taken up are not enough to meet the need of the hour. Fortunately, some microbes have been doing this for millions of years. We can exploit these special abilities of our invisible friends, microorganisms for more efficient management of our environment.

Microorganisms, invisible to the naked eye, have existed for millions of years and are thought to be the earliest living forms. Though extensive studies have been carried out to determine their ultrastructure, genetic composition and other features, they continue to surprise us. New species and modifications on previously discovered ones provide a wide scope for studies and

research. Their ability to thrive in environments uninhabitable for other life forms is helpful has been widely studied and exploited in various fields. The role of microbes in environmental problems and their solutions are also part of these studies.

The use of microbes to clean up pollutants in the environment is called bioremediation. Since they are naturally present in the environment, this happens naturally. But if exogenous organisms are deliberately introduced into an environment for this purpose by humans, it is called bio augmentation. Though it is a relatively new field of study, it is developing fast and gaining more and more acclaim.

One of the most studied organisms is *Pseudomonas*, a genera of Proteobacteria, for their abilities to degrade various compounds that are recalcitrant to other bacterial species, thus producing secondary metabolites and biopolymers, making these strains useful in medicine, industries, and environment (Anaya et. al, 2019).

Out of the *Pseudomonas* genera, *Pseudomonas aeruginosa* is a widely studies species. They are found in soil, and could be highly pathogenic to humans, especially in case of a comprised immune system. But their ubiquitous nature exposes them to various recalcitrant polymers, especially fertilizers in soils and industrial effluents in water. Over time, they develop the ability to degrade these polymers into harmless or less toxic forms. One of the most widely researched properties of *Pseudomonas aeruginosa* is their ability to degrade and detoxify both onshore and offshore crude oil spills.

Crude oil spills can prove detrimental to the ecosystem. They could cause irreparable damage to the aquatic life in an offshore oil spill, and may even cause a fire. Onshore oil spills could result in contamination of underground water and food sources, thus directly affecting our health. Though remedies for oil spills include physical, chemical and photo degradation, bioremediation is the most preferred remedy. This is largely due to the eco friendliness, affordability and effectiveness. Other remediation methods leave secondary residues, which could be potentially more toxic than the original hydrocarbons. Bioremediation solves this problem by completely detoxifying and degrading the hydrocarbons.

Pseudomonas aeruginosa degrades the complex hydrocarbons in crude oils by releasing a bio surfactant that reduces their molecular weight to a suitably lower form, where it can easily utilize it. In a study conducted in desert oil spills (*Ali, N., Dashti, N., Khanafer,. M et al, 2020*), it was found that the organisms belonging to or related to the genera

Nocardioides (especially *N. deserti*), *Dietzia* (especially *D. papillomatosis*), *Microbacterium, Micrococcus, Arthrobacter, Cellulomonas,* Gordonia also contributed a great deal in the degradation of hydrocarbons in the soil.

When these organisms utilize hydrocarbons and other pollutants, over time these compounds are found within their cells, and are called xenobiotic. A xenobiotic is defined as any unusual chemical compound found within an organism since it is not expected to be present naturally.

Air pollution is another cause of ever increasing concern. Of late, we have been hearing a lot about the exponential increase in greenhouse gas emissions and its drastic effects on climate. Some of the said effects are already manifesting as unpredictable fluctuations in the weather pattern and melting ice caps. This pollution can also be combated, to an extent with the help of microbes.

The only known bio remedial method for the control of air pollution to date is the use of bio filters, in a process called biofiltration. Biofiltration involves the passage of polluted air from industries or other sources over a replaceable culture medium of microorganisms, which convert the pollutants in the air to harmless products like carbon dioxide, water and salts. The microorganisms used could be bacteria, actinomycetes or fungi. The ability of these organisms to form biofilms in order to decontaminate the air depends on various factors such as the availability of nutrients, moisture, and optimal temperature and pH. When the contaminated air is introduced into the filter material the distribution of existing microbial populations will generally shift towards strains that metabolize the target pollutants. Usually the acclimation will take about ten days for common pollutants. If compounds are less biodegradable and suitable microorganisms are less likely to be initially present in the filter material, the acclimation period can be reduced by inoculation with an appropriate culture.

Regardless of the multifarious uses of microorganisms, we have a responsibility towards the environment which sustains us. Each one of us has to do our bit, however small, towards sustaining the environment and preventing its further degradation.

Curricular and Co-Curricular Events

Sl.No.	Date	Title of the event organized	Name of the Resource Person(s) with designation	Type of Event**
1.	14/2/2022	Bioventura	**Mr. Bijesh Manikoth** Associate Professor Drug Safety and Phramacovigilance Hanmi Pharmaceuticals, South Korea	Intra-collegiate PG Fest
2.	9/2/2022	Connoessiur	**Ms. Kuppulakshmi** Global Head, Zoho	Intra-collegiate UG Fest
3.	5/3/2022	Plexus (Commemorating the work and Life of Dr.Arthur Kornberg)	**Dr. Ganesh Nagaraju** Professor Department of Biochemistry Indian Institute of Sciences, Bangalore	Quiz
4.	12/4/2022	Bioaura	**Dr. Ranjit Nair** Head Operations, Cliniserve Pvt. Ltd. Hyderabad	Inter-collegiate Bio-Fest
5.	4/4/2022	Sargotsav	**Ms. Shirley Mathew** Artist and Art consultant, MKF Museum of Art, Bengaluru.	Inter Departmental PG Fest

Sl. No.	Date	Title of the event organized	Name of the Resource Person(s) with designation	Type of Event
1.	10/2/2022	Vignana Vicintana	**Dr. Arunkumar Dhayalan,** Associate Professor Department of Biotechnology, School of Life Sciences, Pondicherry University, Pondicherry. **Dr. Priya Josson,** Assistant Professor, Department of Life Sciences, Kristu Jayanti College (Autonomous), Bengaluru. **Dr. Sreekumar H**, Research Scientist, Vitalsense Pvt. Ltd., Bengaluru **Ms. Eliel Salome Zahire**, IV Semester M. Sc. Microbiology – Kristu Jayanti College.	Research Colloquium
2.	1/4/2022 – 2/4/2022	Evolving Paradigms in Biotechnology : Combating Contemporary Challenges	**Dr. K. P Mohanakumar** Director, Inter University Centre for Biomedical Research & Super Speciality Hospital, Mahatma Gandhi University, Kerala	International Conference

Student Achievements

Sl. No.	Date of the Event	Title of Fest	Host Inst. and Venue	Name of the Competition	Student Name.	Prizes won
1.	9/8/2021 – 15/7/2021	Azadika Amrit Mahotsav	Kristu Jayanti College, Autonomous, Bangalore	Photography	Mr. Blesson Varghese	-
2.	13/2/2022	Microbia 2022	Department of Microbiology, S.I.W.S, N. R. Swamy College of Commerce and Economics & Smt. Thirumalai College of Science in collaboration with Microbiologist Society, India.	Zoom Card	Mohammed Ayaaz	2nd Prize
3.	13/2/2022	Intercollegiate Fest Microbia 2022	M.R. Swamy College of Commerce and Economics & Smt. Thirumalai College of Science, Mumbai	-	Mr. Mohammed Ayaaz	Participant
4.	13/02/2022	Intercollegiate Fest "Microbia 2022"	N.R Swamy College of Commerce and Economoics and Smt. Thirumalai College of Science	Brain Booster	SkandaAthreyaDutt	1st Prize
5.	13/02/2022	Intercollegiate Fest "Microbia 2022"	N.R Swamy College of Commerce and Economoics and Smt. Thirumalai College of Science	Flip the card	SkandaAthreyaDutt	2nd Prize
6.	22/02/2002	Sarvamanyavidu Vijnana	Karnataka Science and Technology Academy in an association of VigyanPrasar, Department of Science and Technology	Science Quiz	SkandaAthreyaDutt	1st Prize
7.	8/4/2022 – 9/4/2022	Hexis	Ramaiah University of Applied Sciences, Bangalore	Tug of Wits	Mr. Mohammed Ayaaz Ms. Saqueena Thapa Ms. Rudrangsh Ms. Nancy Sharma	First Prize
8.	8/4/2022 – 9/4/2022	Hexis	Ramaiah University of Applied Sciences, Bangalore	Invictus	Mr. Ananthu Vinu	First Prize
9.	8/4/2022 – 9/4/2022	Hexis	Ramaiah University of Applied Sciences, Bangalore	Invictus	Ms. Nancy Sharma	First Prize
10.	8/4/2022 – 9/4/2022	Hexis	Ramaiah University of Applied Sciences, Bangalore	Twist N' Jam	Mr. Vishesh Vaid- Mr. Gyan Prakash-	2nd Place

Student Publications

Sl. No.	Date of the Event	Reg. No.	Name of the Student	Title of the Programme & Venue	Title of Paper Published
1.	7/7/2021	19LS1A1010	Ms. Gimaya Gilbert	Published in International Journal of Science and Research. **ISSN:** 2319 – 7064 **Paper ID:** SR21626231002	Article on "An Overview on The 10 Cellular Hallmarks of Cancer"
2.	7/7/2021	19LS1A1009	Ms. Christina Rose George	Published in International Journal of Science and Research. **ISSN:** 2319 – 7064 **Paper ID:** SR21626231002	Article on "An Overview on The 10 Cellular Hallmarks of Cancer"
3.	7/7/2021	19LS1A1007	Mr. Blesson Varghese	Published in International Journal of Science and Research. **ISSN:** 2319 – 7064 **Paper ID:** SR21626231002	Article on "An Overview on The 10 Cellular Hallmarks of Cancer"
4.	3/7/2021	19LS1A1005	Ms. Angela Saji	**Published Book chapter: in Book Entitled:** Compendium of "Research insights of Life Science students" (ISBN: 978-81-947154-5-0) Volume – 2; Year - 2020 Chapter – 235, Page: 583 – 584.	Nano Drug Delivery

Sl. No.	Date of the Event	Reg. No.	Name of the Student	Title of the Programme & Venue	Title of Paper Published
5.	14/3/2022	20LS5A1008	Mr. Aswin	Compendium of "RESEARCH INSIGHTS OF LIFE SCIENCE STUDENTS" (ISBN: 978-93-91342- 27-2) Sector - Biotechnology Volume – 3; Year - 2021 **Chapter** – 222, Page: 612 – 617	Neurospora - A crucial fungi in genetic study
6.	14/3/2022	20LS5A1008	Mr. Aswin	Compendium of "RESEARCH INSIGHTS OF LIFE SCIENCE STUDENTS" (ISBN: 978-93-91342- 27-2) Sector - Biochemistry Volume – 3; Year - 2021 **Chapter** – 192, Page: 532 - 534	PIWI-interacting RNA- an important Non-coding RNA
7.	28/02/2022	19LS1A1035	Nehaa R.	-	Article on CRISPR gene technology in the field of cancer
8.	28/02/2022	19LS1A1045	Aashritha	-	Article on CRISPR gene technology in the field of cancer

Faculty as Resource Persons

Sl. No.	Date of the Event	Name of the Faculty	Level	Nature of Programme	Title of the Programme &Venue / Organizer	Title of the session
1.	6/8/2021	Dr. Priya Jossan Akkara	State	Workshop	Extension Activity – Sharing of Knowledge organized by Viswa Vidyapreeth school, Bangalore	Biogas Generation and Applications
2.	16/9/2021	Dr.Reena Josephine	National	Webinar	PGPR as Bioinoculants: Road map to Commercialization for sustainable Agriculture organized by Rathinavel college of Arts and Sciences, Trichy.	PGPR as Bioinoculants: Road map to Commercialization for sustainable Agriculture
3.	20/09/2021 to 22/09/2021	Dr.Sangeetha Menon	State	Seminar	Invited talk by St. Vincent Pallotti school, Bengaluru.	Gadget/ Gaming addiction and parenting in pandemic by St. Vincent Pallotti school, Bengaluru
4.	24/9/2021	Dr. Dileep Francis	State	Webinar	Protein Legand - Docking using Antidoc Vina organized by Karnataka College of Pharmacy, Bangalore.	Protein Legand - Docking using Antidoc Vina
5.	20/4/2022	Dr. Calistus Jude A.L.	National	Webinar	Invited Talk, Organized by PG and Research Department of Zoology, Govt. Arts College, Coimbatore	Embryo Transfer Technology and IVF in Cattle

Faculty Publications

Sl. No.	Name	Title of the Book	Details of Publisher	Month, Year of publication, ISBN No	DOI / ISBN No.
1.	Dr.S.Vijayanand	A Potential inhibitor for enzymatic browning of *Solanum melongena*	**Book:** Darshan Publishers, Tamilnadu, India	June 2021	ISBN: 978-81-947071-5-8

Articles / Book Chapter

Sl. No.	Name	Title of the Article	Details of Publisher	Month, Year of publication, ISSN No	Article URL
1.	Dr.U.Sivagamasundari	A Comparative Study On The Bioadsorption Of *Punica granatum* Peel And Its Activated Charcoal.	Kristu Jayanti Journal of core and applied Biology Volume 1, Issue1, June 2021	July 2021	https://www.kristujayantijournal.com/index.php/ijls/issue/view/94
2.	Dr. Sangeetha Menon	Preliminary Investigation On The In Vitro Antibacterial Activity Of Ethanolic Extract & Essential Oil Of *Aloe Vera* And *Opuntia Dillenii* On Human Bacterial Pathogens	Kristu Jayanti Journal of core and applied Biology Volume 1, Issue1, June 2021	July 2021	https://www.kristujayantijournal.com/index.php/ijls/issue/view/94
3.	Dr. M. Sonia Angeline	Comparative Study Of Averrhoa Bilimbi, Ricinus Communis And Saraca Asoca Leaf Extracts On Dandruff Causing Fungus And Bacterial Strains	Kristu Jayanti Journal of core and applied Biology Volume 1, Issue1, July 2021	July 2021	https://www.kristujayantijournal.com/index.php/ijls/issue/view/94
4.	Dr.Swetha Sharma and Dr.Dileep Francis	Association of demographic details with the onset of precancerous lesions in bengaluru population	Kristu Jayanti Journal of core and applied BiologyVolume 1, Issue1, July 2021	July 2021	https://www.kristujayantijournal.com/index.php/ijls/issue/view/94

Sl. No.	Name	Title of the Article	Details of Publisher	Month, Year of publication, ISSN No	Article URL
5.	Mr. Don Caerio	Acid digestion method for extraction of diatoms in drowning cases: a review	Kristu Jayanti Journal of core and applied Biology Volume 1, Issue1, July 2021	July 2021	https://www.kristujayantijournal.com/index.php/ijls/issue/view/94
6.	Dr. Shayani Ghosh	A simplified approach for determination of urinary ethyl glucuronide by gas chromatography–mass spectrometry	Springer Publication	August 2021 ISSN: 2093-3371	https://doi.org/10.1186/s40543-021-00290-6
7.	Dr.S.Vijayanand	Extraction, characterization and inhibition of polyphenol oxidase in *Solanum melongena*	International Journal of Pharmaceutical Research and Sciences	August 2021 E-ISSN: 0975-8232	http://doi.org/10.13040/IJPSR.0975-8232.12(8).4292-01
8.	Dr. Sivagamasundari.U	Book: Innovations in Life Sciences Chapter 15 Plant Microbe interaction and soil health	JPS Scientific Publications, Tamil Nadu, India.	ISBN: 978-81-951323-6-2 First Edition; Volume – 1; 2021 Chapter – 5, Page: 42 - 51	-
9.	Dr. M. Sonia Angeline Dr. U.Sivagamasundari Dr. Esther Shibha R	Insights on Career Women Breaking the Stereotype by Equalizing Work and Life. with	-Published in Virtual National Conference on " Women in Leadership " Conducted on March 8th 2021 as conference proceedings	September 2021 ISBN number: 978-81-953853-3-1	-
10.	Dr. Reena Josephine	Plant Growth Ameliorating and Rhizosphere Competent Native Acinetobacter pittii Strain F2 5 from the Rhizosphere of *Zea mays* L.	Agricultural Research Communication Centre	27-09-2021, 03678245, 0976058X	https://arccjournals.com/journal/indian-journal-of-agricultural-research/A-5822
11.	Dr. Sangeetha Menon	Growth and nutritional indices of oyster mushroom (*Pleurotus ostreatus*) on different substrates	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.27

Sl. No.	Name	Title of the Article	Details of Publisher	Month, Year of publication, ISSN No	Article URL
12.	Dr. Calistus Jude A.L.	A Study on the Cytotoxicity of *Plectranthus amboinicus* and *Bacopa monnieri* stem extracts on lung cancer cell line.	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.31
13.	Dr. Esther Shoba R,	1) A study on impact of medicinal plants *Polyalthia longifolia* and *Bacopa monnieri* with reference to acne treatment. 2) Identification, Isolation and Characterization of Poly-Hydroxy Butyrate (PHB) Producing Bacteria, and Extraction of the PHB Granules	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.32 https://doi.org/10.5530/ctbp.2021.3s.51
14.	Dr. U. Sivagamasundari. Dr. Hanumanthappa B Nayak Dr. Elcey C.D.	Amelioration of farm land soil through the application of formulated microbial bio-fertilizer consortium	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.33
15.	Dr. Reena Josephine C.M.	Rhizosphere competent *Pseudomonas indoloxydans* (F3-47) as a plant growth promoter and enhancer of *Zea mays* l. under greenhouse and field trials	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.34
16.	Dr. Sonia Angeline M Dr. Emmanuel C ES,	Antimicrobial and Antioxidant activity of Fermented Bamboo Shoot *Dendrocalamus hamiltonii*	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.36
17.	Dr. Sonia Angeline M Dr. Vijayanand S, Dr. Priya Josson Akkara	Water quality analysis of ground water from locations in North Bangalore	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.37
18.	Dr. Hanumantappa B	Anti-inflammatory attributes using protein denaturation by saturated	Current Trends in Biotechnology and Pharmacy	October 2021	https://doi.org/10.5530/ctbp.2021.3s.38

Sl. No.	Name	Title of the Article	Details of Publisher	Month, Year of publication, ISSN No	Article URL
		fatty acid (decanoic acid) isolated and identified from *Tridax procumbens*		SSN 0973-8916 (Print), 2230-7303 (Online)	
19.	Dr. Indira M.N.	1. Growth Response of *in vitro* regenerated *Drymaria cordata* (L.) Willd. ex Roem. & Schult. to inoculation with Arbuscular Mycorrhizal fungi. 2. Extraction of dyes from plant sources and their application on cotton and wool using mordants	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.39 https://doi.org/10.5530/ctbp.2021.3s.46
20.	Dr. Manikandan Kathirvel	Green mediated synthesis of silver nanoparticles using *Ipomoea quamoclit* to explore the potential antimicrobial activity against human pathogens	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.42
21.	Dr. Sriram T	Green synthesis of silver nanoparticles and its effect on the growth of *Zea mays* L.	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.43
22.	Dr. U. Sivagamasundari.	1. Effect of bacterial endophytes - *Azospirillum brasilense* and *Pseudomonas fluorescens* on growth and yield of Brinjal *var. Annamalai* in field trial. 2. Survey on crop varieties and agricultural practice of Karnataka	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.44 https://doi.org/10.5530/ctbp.2021.3s.49
23.	Dr. S. Vijayanand	1. Bioactive potential and pharmacological activity of Psidium *guajava*	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print),	https://doi.org/10.5530/ctbp.2021.3s.50

Sl. No.	Name	Title of the Article	Details of Publisher	Month, Year of publication, ISSN No	Article URL
		2. Green Synthesis of Silver Nanoparticles using Colacasia Escullenta, Abutilon Indicum and Muntinga Calabura		2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.53
24.	Ms. Kushbu	Comparative analytics of urine sample reported with urinary tract infection	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.40
25.	Dr. P. Roopa	Production and characterization of bioactive peptides by purified protease isolated from Bacillus Sp. MTCC 9558	Current Trends in Biotechnology and Pharmacy	October 2021 SSN 0973-8916 (Print), 2230-7303 (Online)	https://doi.org/10.5530/ctbp.2021.3s.35
26.	Dr. Sangeetha Menon	Plant growth promotional studies of novel PGPR strains isolated from the rhizosphere of *Neolamarckia cadamba* (Roxb.) Bosser plantations in Narasipuram, Tamil Nadu	Research Journal of Chemistry and Environment	January 2022	-
27.	Dr.S. Vijayanand	Extraction and optimization of lipase using *Aspergillus niger* by solid state fermentation	International Journal of Biology, Pharmacy and applied Sciences	February 2022 ISSN: 2277–4998	https://doi.org/10.31032/IJBPAS/2022/11.2.5871
28.	Dr. Shyani Ghosh	Urinalysis based assessment of compliance and drug use patterns in patients prescribed tramadol: A cross-sectional study from a tertiary care centre	Asian Journal of Psychiatry	March 2022	https://www.sciencedirect.com/science/article/abs/pii/S1876201820007788?via%3Dihub
29.	Mrs. Kushbu	Hormones and its Stimulants	Compendium of "Research Insights Of Life Science Students" (ISBN: 978-93-91342-27-2) Volume – 3; Year - 2021 Chapter – 197,	March 2022	-

Sl. No.	Name	Title of the Article	Details of Publisher	Month, Year of publication, ISSN No	Article URL
			Page: 545 - 549 197		
30.	Dr. Shinomol George	Understanding Mechanism underlying genes Regulating the production of Biosurfactant	Elsevier Book Chapter 35 – Green Sustainable process for Chemical and Environmental Engineering and Science	March 2022	-
31.	Mrs. Kushbu	Biodegradability of Microplastics	Compendium of "Research Insights Of Life Science Students" (ISBN: 978-93-91342-27-2) Title: BIODEGRADABILITY OF MACRO PLASTICS Sector - Microbiology Volume – 3; Chapter – 35, Page: 92 - 97 35	March 2022 JPS Publishers	-
32.	Dr. Challaraj Emmnauel	A Preliminary study on recovery of Lanthanides from Panambur beach (Mangalore) washings using *Bacillus aerius*	International Journal of Biology, Pharmacy and Biological Sciences	March 2022	https://doi.org/10.31032/IJBPAS/2021/11.8.6297
33.	Dr. Elcey C.D	Iron oxide nanoparticles mediated hyperthermia on cancer cell lines.	IOP Conf. Series: Materials Science and Engineering	May 2021 doi:10.1088/1757-899X/1233/1/012009	https://iopscience.iop.org/article/10.1088/1757-899X/1233/1/012009
34.	Dr. Shinomol George	**Book:** Advanced applications of Micro and Nano clay **Book Chapter 5:** Chitosan – HalloysiteNanocompunds for scaffolds for Tissue Engineering.	Materials Research Forum LLC, U.S.A	May 2022 Vol. 15 ISBN: 978-1-64490-191-5	DOI: https://doi.org/10.21741/9781644901915-5
35.	Mr.Ashok D	Spatial and Temporal Evaluation of Heavy metals on Biotic and Abiotic components at Kolar Gold Fields Gold Ore Tailings	International Journal of Life Sciences	June 2022 (ISSN: 2277-193x)	http://dx.doi.org/10.13140/RG.2.2.11598.33600
36.	Dr. Indira M.N.	Influence of Glomus species on enhancement of primary and secondary	Medicinal Plants-International Journal Of Phytomedicines	June 2022	doi : 10.5958/0975-

Sl. No.	Name	Title of the Article	Details of Publisher	Month, Year of publication, ISSN No	Article URL
		metabolites in in vitro regenerated *Drymaria cordata.*	and Related Industries.14 (2): 233-239.		6892.2022.00026.0

PATENT PUBLISHED

Title: Methods and composition for improving and obtaining useful plant traits using internet of thing.

Faculty: Dr. Sonia Angeline, Dr. Sivagamasundari.U, Dr. Esther Shoba, Dr. Priya Jossan Akkara

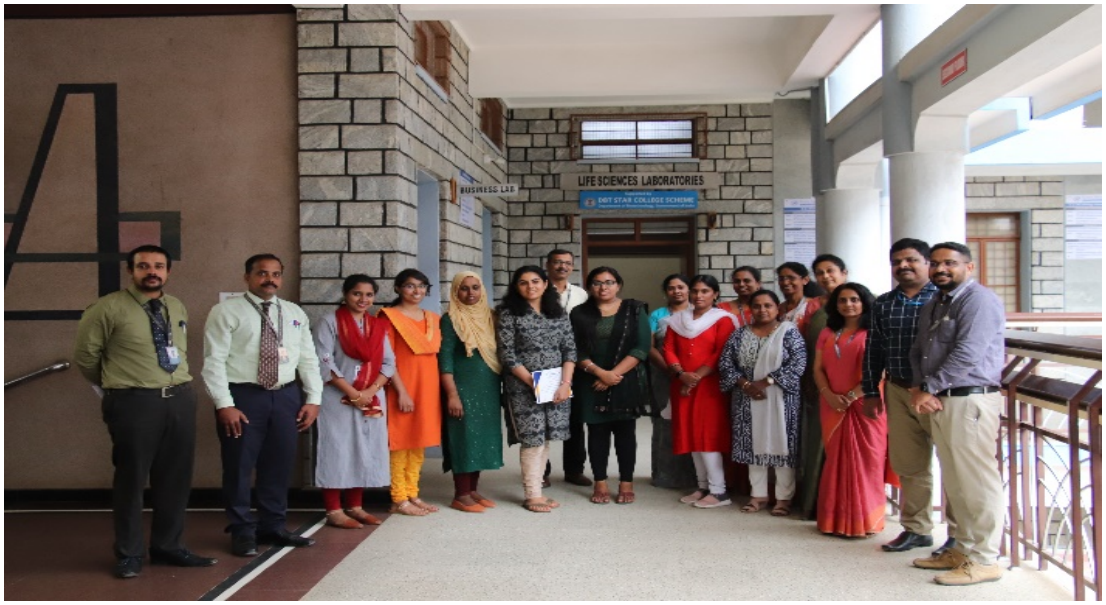
Date: September 2021

Awards and Recognition

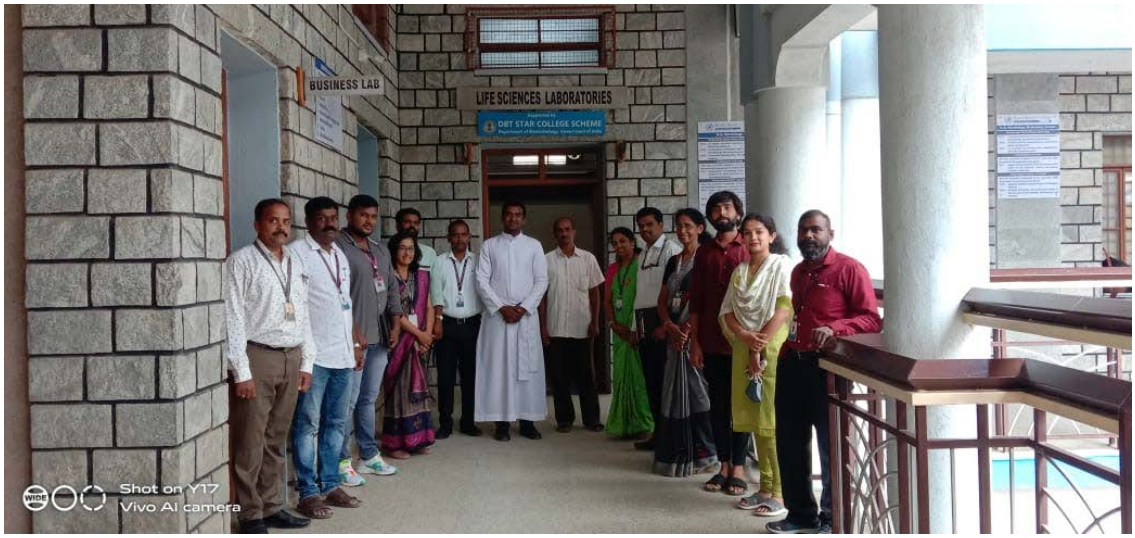
Faculty Involved– Dr. Priya Josson Akkara and Dr. Indira M. N.

DBT STAR College scheme Initiatives

To prioritize and enhance the practical skills as part of the curriculum, the Department of Life Sciences, Kristu Jayanti College conducted an Hands on Training on '**Essential Techniques in Biotechnology' for secondary and higher secondary biology teachers**" on 21th June 2022, the first of its kind organized under the canopy of DBT STAR College scheme to reach out to the Secondary and higher secondary biology teachers. The motive of the training programme was to make the teachers familiar with the latest technology, and enhance the practical skillsets. The training witnessed the participants from seven different institutions across Bangalore. The training was done by in-house faculty members on techniques such as chromatography, Isolation of DNA., Gel Electrophoresis and Polymerase Chain Reaction.



The department also conducted training for the lab technicians where they were trained how to use regular and sophisticated lab equipment's and maintain stock and inventory. This programme was conducted on 22nd June 2022.



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