

# Ruellia

The Departmental annual E-magazine

Vol II | 2024 Issue



THE DEPARTMENT OF BOTANY

# RUELLIA

*The departmental annual E-magazine*

VOL. 2



Department of Botany

*Chandernagore college*

*Constituent College of University of Burdwan*

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# From the Desk of the EDITOR



It gives me immense pleasure and a feeling of accomplishment to know that our students of Botany Honors are going to publish the second volume of the e-magazine "Ruellia". I feel honored as a HEAD OF THE DEPARTMENT OF BOTANY where all the students and teachers are giving their best in a harmonious environment. Our Botany family has proved their excellence in indoor and outdoor activities. We have already published a wall magazine 'Gloriosa' in our department. I feel proud for the students who have achieved high standards in academics and various co-curricular activities. The practice of writing for magazines will certainly enhance their perfection in future.

I express my heartfelt gratitude and congratulate the members of the Editorial board who have contributed to the smooth and successful publication of the E-magazine.

A handwritten signature in black ink, appearing to be 'S. S. S.' with a stylized flourish above it.

Head  
Department of Botany  
Chandernagore College



Sanna '24

# From the Desk of the Student EDITOR



Welcome to the second issue of *Ruellia*, the e-magazine of the Department of Botany at Chandernagore College. We are thrilled to embark on this journey of knowledge sharing, scientific discovery, and academic excellence with our readers. Named after the resilient and vibrant genus *Ruellia*, our magazine symbolizes the relentless pursuit of growth, adaptability, and beauty inherent in the botanical world. Our mission with *Ruellia* is to provide a platform that not only highlights the latest research and developments in plant sciences but also fosters a deeper understanding and appreciation of the natural world among our readers.

At the Department of Botany, Chandernagore College, we believe that education extends beyond the classroom. It is about cultivating curiosity, nurturing critical thinking, and fostering a lifelong passion for learning. *Ruellia* embodies these principles, serving as a conduit for knowledge dissemination and intellectual growth. In this issue, we spotlight several groundbreaking studies conducted by our talented faculty and students. From examining the adaptive strategies of local flora in response to climate change to investigating the medicinal properties of indigenous plants, these articles reflect the diverse and dynamic research landscape at Chandernagore College. Additionally, we present a series of interviews with people outside the botanical multiverse as we collaborate on eminent up and coming photography enthusiasts, students of different schools around Chandernagore, and much more. We also teamed up with student entrepreneurs to accommodate their inputs for the benefits of the publication of *Ruellia*. We look forward to your feedback, contributions, and continued support in making *Ruellia* a vibrant and enriching publication.

Together, let us celebrate the beauty, complexity, and significance of the botanical world and beyond.

A handwritten signature in black ink that reads "Avik Manna".

Avik Manna

Student Editor  
*Ruellia* Vol II, June issue  
Department of Botany  
Chandernagore College



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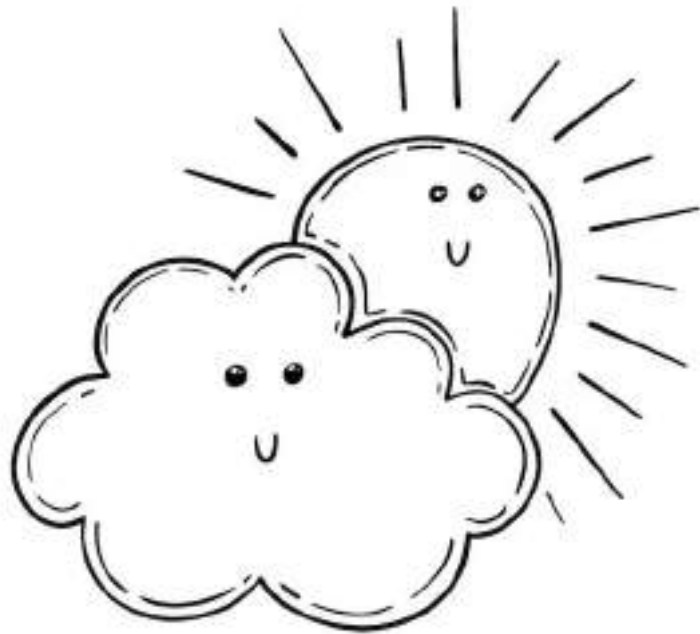
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*Inspire and Ignite*





# 1

## Chapter

## Plant Department At Its Pearl Jubilee: 30 NOT OUT

M. Magloire Barthelet, a Jesuit priest, founded *St. Mary's Institution* in 1862. The institution has evolved throughout the course of time, becoming *École Publique de Garçons*, *College Duplex*, *College de Bussy* to today's *Chandernagore College*. The institution is a rich historical testimony to a vibrant cultural milieu, academic excellence and active participation in the Indian freedom movement. This was Asia's only educational institute that was held closed for two long decades owing to the increase of revolutionary nationalist activity during the freedom movement.



*The heritage building*



*The new administrative building*

In 1961 this heritage college received the affiliation to teach Biology in I.Sc. Course. Gradually it received its subsequent upgradation to teach B.Sc. course in 1981 and is continuing ever since. The Honours course in Botany was introduced in 1994.

2024 marks the pearl jubilee year of the Botany department.

# 2

## Chapter

## Woman Who Didn't Quit- Dr. Janaki Ammal

At a time when most Indian women were not allowed to complete high school, Janaki Ammal became the first Indian woman to receive a Ph.D. in botany in the United States (1931). Her research work was on "Chromosome Studies in *Nicandra Physalodes*.

She later made her way back to India in 1932, when she took a position as a Professor of Botany at the Maharaja's College of Science in Trivandrum. She remained a science volunteer there until 1934. She joined Charles Alfred Barber's team at the Sugarcane Breeding Institute in Coimbatore in 1934 as a geneticist.



India produced sugar cane, but it wasn't as sweet as the imported *Saccharum officinarum* kind. The institute trusted Ammal's cytogenetics skills to lead the initiative, which aimed to boost India's native sugarcane crop.

Ammal carried out a number of crossings, setting the groundwork for subsequent cross-breeding studies in India that progressively produced superior local sugarcane cultivars with higher sweetness and more environment adaptation. Her research also aided in the analysis of India's sugarcane varieties' geographic distribution.

Ammal is referred to as the

*'woman who sweetened India's sugar cane'*



Her work was recognised by Jawaharlal Nehru, India's first Prime Minister. She returned to India in the early 1950s, and was appointed as the first director of the Central Botanical Laboratory of the Government of India at Lucknow.

In addition to her outstanding contributions to the area of plant science, Ammal became a vocal advocate for the preservation of India's native plant biodiversity.

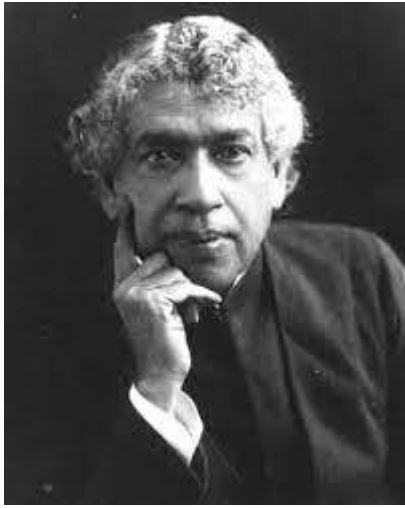
Despite all of her accomplishments, Dr. Ammal experienced caste and gender harassment all of her life. The tale of her perseverance in the face of overwhelming adversity will motivate every science enthusiast.

# 3

## Chapter

## Inspire and Ignite

### The Man Who Listened To Plants- Sir Jagadish Chandra Bose



Bose was a member of the Unitarian Brahmo fraternity. Brahmoism was established on the foundations of Advaita Vedanta, The idea that everything is one is fundamental to it. Bose discovers a connection between human existence and plants as a result of his search for unification. He foresaw that plants would experience pain just like people and animals would.

In January 1897, Sir J.C. Bose presented his wireless millimeter wave (microwave) experiments to the Royal Institution in London. This comes before Marconi's wireless experiment, for which he was given the Nobel Prize.

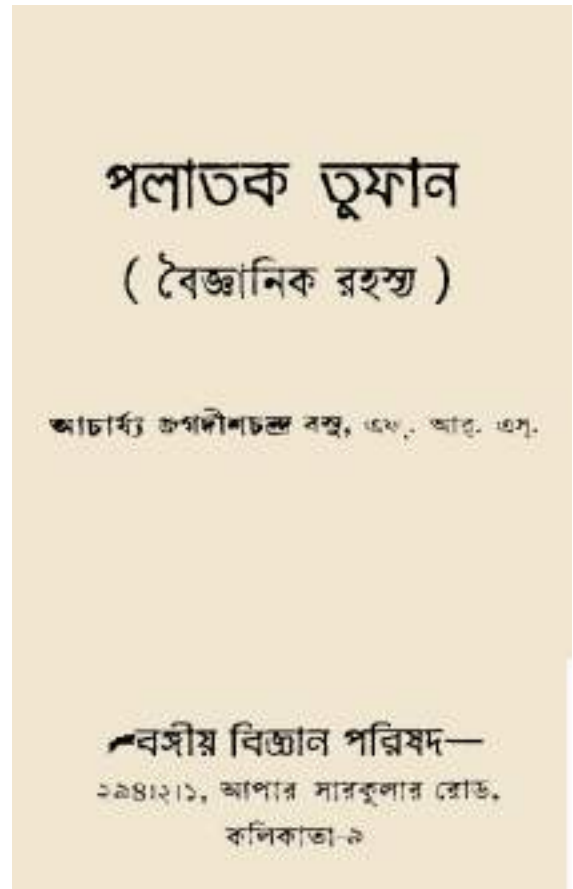
In 1904, he became the first Asian to receive a US patent. Bose, together with the renowned mathematician Ramanujan were the first Asian members of the Royal Societies in London.

The IEEE has named Bose

### The father of wireless and radio communication

The IEEE recognized his work as the oldest "milestone achievement" from Asia. The Indian Botanic Garden at Shibpur was named after him in his honour. He has a lunar crater named after him as well.

Acharya Bose was not only a leading scientist but also a great story teller. He is recognised as the father of bengali science fiction.



# *Scientific articles*



# 4

## Chapter

## MEDICINAL PLANTS OF BENGAL

### Introduction:

A medicinal plant is any plant in which one or more of its organs contains substances that can be used for therapeutic purposes. Bengal has a large number of medicinal and aromatic plants that is due to varied climatic conditions from tropical savanna in the southern parts to humid subtropical in the north.

### Medicinal plants with their therapeutic uses:



**Justicia adhatoda** commonly known **Vasaka** in Bengal is native to Asia. Adathoda means 'untouched by goats' in Tamil. The name derives from the fact that animals like goats do not eat this plant due to its extreme bitter taste. Vasicine, adhatodine are the active ingredients found on the plant. It is used to treat **bronchitis**.



**Ocimum tenuiflorum**, commonly known as **tulsi** is an aromatic perennial plant in the family Lamiaceae. Tulsi contains active compounds like eugenol, linalool and ocimene. Tulsi's has a broad-spectrum antimicrobial activity. It also acts as a mild diuretic & detoxifying agent which helps in lowering the uric acid levels in the body.



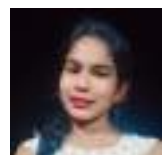
**Catharanthus roseus**, commonly known as **nayantara** is a perennial flowering plant in the family Apocynaceae. Vinblastine (VLB) found in the leaves is used to treat Hodgkin's disease. Vincristine (VCR) found in the leaves is used to treat acute leukemia, Wilms tumors in children, and breast cancer. Ajmalicine found in the roots is used to treat hypertension.



**Hygrophila auriculata** is a herbaceous, medicinal plant in the acanthus family that grows in marshy places around ponds. The name kulekhara comes from the word 'kokilaksha' which means "eyes like the Indian cuckoo bird". The leaves contains kulerron which is the primary component of kulekhara and is considered an effective antidote for **iron deficiency**.

### Conclusion:

There is a massive number of medicinal plants in our state due to the diverse climatic and edaphic factors. A lot of them are still unexplored.



Sumi Biswas, Sem-II  
23-BSCGEN-BOTA-0012

## 5

## Chapter

## FUNGI: PLANT OR ANIMAL?

### Introduction:

Fungi are achlorophyllous, eukaryotic, heterotrophic organisms that grow in various habitats especially in humid environment. They are neither plants nor animals, but they have some specific characters that distinguish them from plants and animals. They belong to a different kingdom known as **Fungi**.

### Relationship with plants:

Plants are eukaryotic, autotrophic organisms. They have photosynthetic pigment the chlorophyll, for this they produce their own food through photosynthesis. But in case of fungi, they lack chlorophyll, so they are not able to synthesize their own food. So they perform heterotrophic mode of nutrition. Another main difference is, the cell wall of plants made up of cellulose, but in fungi, the cell wall is made up of chitin.

Unlike plants, fungi used **glycogen** as storage food material. **But they share some characteristics with some plants include-**

1. the presence of vacuole
2. organelle in cell
3. They also produce spores in their life cycle.
4. Like plants, in fungi, biosynthesis of terpenes occur using mevalonic acid and pyrophosphate as precursors.
5. Like plants fungi can be used as food and medicine

### Relationship with animals:

Fungi are closely related to animals. Like animals, they are achlorophyllous organisms. They exhibit heterotrophic mode of nutrition like animals. Chitin which is the major component of fungal cell wall, is present in some insects.

Like animals, in fungi, the storage food material is glycogen. Fungi also share some other characteristics with animals such as-

1. similarity in the structure of histone to be, disk like mitochondria cisternae.
2. Like animals, the fungal mitochondrial DNA codon UGA codes for amino acid tryptophan.
3. In fungi, small subunit ribosomal RNA gene and entire mitochondrial genome is closely similar to animals.

But animals are different from fungi because animal cells have cell membrane rather than cell wall and animals ingest food while fungi absorb their food.

### Conclusion:

Considering above all, we can say that fungi are more closely related to animals than plants. But some scientists recent find that monophyll of choanoflagellate indicates that fungi are different from animals. They have their own specific characters.



Basundhara Bhar, Sem-II  
23-BSC-BOTA-0014

## 6

## Chapter

## ROLE OF BACTERIA IN MEDICINES, INDUSTRIES AND AGRICULTURE

### Introduction:

Despite being perceived as harmful pathogens, bacteria have played a crucial role in various industries. Several industries like medicine, food and agriculture have undergone a major revolution with the introduction of bacteria. With its both beneficial and adverse traits, bacteria have greatly fostered the growth of these industries in either way.

### Role of Bacteria in Medicine:

Bacteria play an essential role in medicine, greatly impacting areas like probiotics, antibiotics and vaccine development. *Lactobacillus* and *Bifidobacterium* promote gut health and also help in improving the immunity system.



*Lactobacillus* bacteria

Some antibiotics like Streptomycin, Actinomycin-C act on gram-negative bacteria and prevent their growth. Bacteria are also vital in bioremediation, research, diagnostics, and fermentation, underscoring their multifaceted importance in advancing medical science and improving health outcomes.

### Role of Bacteria in Industry and Agriculture

Bacteria play a pivotal role in various industries, significantly contributing to food fermentation, alcoholic beverages, biofertilizers, and biotechnology. They are vital for antibiotic, enzyme, and biofuel production. *Bacillus* produces enzymes like amylase and protease, which are necessary for detergent, food processing, and textile. *Clostridium acetobutylicum* is involved in the production of biofuels like butanol and acetone, contributing to renewable energy sources. *Rhizobium* bacteria form symbiotic relationships with legume roots, converting atmospheric nitrogen into ammonia to enhance soil fertility. *E. coli*, due to its rapid growth, is helpful in the production of recombinant proteins, including insulin.



*E. coli*

### Conclusion:

So we can conclude that bacteria are essential across various fields like agriculture, food, and medicine. They have a wide range of contributions, starting from promoting health through antibiotics and probiotics to facilitating renewable energy and sustainable agriculture.



Hritika Pandey, Sem-II  
BSC-BOTA-0020

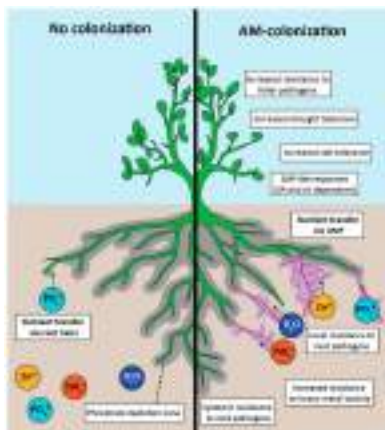
# 7

## Chapter

### VAM: THE FERTILIZER OF FUTURE

#### Introduction:

Mycorrhiza is the product of a symbiotic association between a fungus and plant root. The two main types of mycorrhizae are ectomycorrhizae and endomycorrhizae. About 10% of plant families have ectomycorrhizal relationships. It comprise a Hartig net of hyphae. Endomycorrhizae are present in more than 80% of plant families, including greenhouse and crop plant. In an arbuscular type endomycorrhiza, the symbiotic fungus reaches the cortical cells of the roots of a vascular plant to produce arbuscules. Only members of the division Glomeromycota can produce arbuscular mycorrhizas. These mycorrhizal associations produced by Glomeromycotan fungi are known as arbuscular mycorrhizas, or vesicular-arbuscular mycorrhizas (formerly also endomycorrhizas or endotrophic mycorrhizas) and are abbreviated as VAM.



#### Usage in agriculture:

This fungus has excellent symbiotic features that can be used in agriculture, such as-

**Phytoremediation-** VAM biofertilizer can be used for enhancing the fertility of the abandoned lands and can make them cultivable again. This is called an ecological restoration project.

**Phosphorus Fertilizer-** The ability to dissolve the phosphates available in the soil and fixate them to provide them to the plants makes this fungus a natural phosphorus fertilizer. This ability enhances the harvest in all possible ways. It also enhances the percentage of other trace elements necessary for the growth of host plants.

**Warding off Root Diseases-** As this fungus colonizes in the roots of the plants, it also forms a shield against various other infectious diseases affecting the plant's growth.

#### Conclusion:

Chemical fertilizers, when used excessively or improperly, can degrade soil quality over time. However, the introduction of VAM into the farming system can help restore and improve soil health. The mycorrhizal fungi increase the organic matter content, soil aggregation, and water-holding capacity, boosting soil fertility and creating an optimal environment for plant growth. As a result, the soil retains more nutrients and becomes less susceptible to erosion, benefiting crop productivity in the long run. Integrating VAM with chemical fertilizers represents a promising approach to maximize crop yields while promoting sustainable agriculture. By harnessing the advantages of both VAM and chemical fertilizers, farmers can optimize nutrient availability, reduce chemical inputs, improve soil health, and enhance crop stress tolerance. As we strive for a more efficient and environmentally conscious agricultural sector in India, combining these two methods offers a practical and effective strategy for achieving sustainable farming practices and securing food production for future generations.



Papiya Adhikary, Sem-II  
23-BSCGEN-BOTA-007



# 8

## Chapter

# ANTIOXIDANTS AS POTENT ANTI-AGEING

### Introduction

The rapidly ageing population has led to high attention in the field of anti-ageing. Antioxidants turn out to be one of the methods to reduce aging and risk of disease.

### Ageing and Anti-ageing

Ageing is a significant risk factor for developing various diseases as chronic conditions become increasingly common. Body has a balance between oxidants, antioxidants and oxygen-free radicals. Imbalance leading to excess free radicals ultimately results in cell damage and aging. Anti-ageing conversely, is slow down, stoppage or reduction of ageing and related diseases. Oxygen-free radicals, produced by metabolism or radiation, tobacco and alcohol, were advanced by Denham Harman to be the cause of aging.



Figure: Effects of free radical



Figure: Dr. Denham Harman

### Antioxidants and their role in anti-ageing

Antioxidants are scavengers of oxygen-free radicals, exerting a substantial influence on the elimination of oxygen-free radicals from the body. They prevent cardiac and neurodegenerative disorders additionally cancers and

various age-related diseases. A review in 2021 showed the lower levels of Vitamin E in persons suffering from vitiligo, atopic dermatitis and acne. Diverse therapeutic approaches have been proposed fostering healthy ageing and retarding the ageing process both internally and externally.

Antioxidants include Vitamin A, C and E, carotenoids and several polyphenols including silymarin from milk thistle, epicatechin from green tea, and curcumin from turmeric showing their effects on skin. A report of 2017 shows the importance of Vitamin C for skin. Rich source of Vitamin C comprises citrus fruits, tamarind, tomatoes and so on. Traditional methods are gaining attention as natural approaches are preferred over chemical products nowadays. Some such traditional methods use turmeric, neem, aloe vera, rice-water and so on. Neem leaf contains azadirachtin and nimbin as antioxidants helping acne treatment, detoxification, as well as increasing immunity. Besides curcumin, Vitamin C and B in turmeric helps reduce heart diseases and diabetes.



### Conclusion

Antioxidants play a noteworthy role to maintain a healthy life. Their protective role continues to be studied worldwide. To replenish antioxidants, a balanced diet is preferred besides drinking plenty of water.



Suyesha Samanta, Sem-II  
23-BSCGEN-BOTA-0001

# MANGROVE FOREST AS A BUFFER AGAINST STORM SURGE FLOODING

## Introduction:

The South 24 Parganas district accounts for 2,083.82 sq km, 41.74 % of India's total mangrove cover. One of the most captivating species in this ecosystem isn't just the Bengal tiger, chital deer, wild pig or even macaque monkey. Rather, it is the tree that all these species rely on for shelter, *Heritiera fomes*, natively known as **Sundari**. According to Hogarth (2015), among the recognized mangrove species there are about 70 species in 20 genera from 16 families that constitute the "true mangroves". Coastal mangroves outperform terrestrial forests in their capacity to hold greenhouse gasses, storing up to four times more CO<sub>2</sub> than other tropical rainforests. This stretch of sunken trees also acts as a natural coastal defense against violent storm surges and floods.

## Impact :

Mangrove ecosystems protect land and people from the storm surges, from wind, from erosion of soil in the following ways

1. Mangroves have extended prop-roots which stabilize the soil and protect land from strong tidal waves.
2. Mangroves also reduce the wind speed, by attenuating the energy of the wind while passing through the dense tree cover. They act as natural buffers between the land and the sea.
3. Mangroves safeguard low-lying land near coasts by checking excess salt deposition from storm surges and flooding.

The uniqueness of Sundarban mangroves primarily lies in its ability to absorb the storm steam through the impenetrably thick cluster of prop-roots, extricating the cyclone of its severest effects. Parts of the islands, where the mangrove cover is less, have been found to be affected badly by the cyclones, whereas the eastern peripheries with a dense cover usually suffer lesser devastation.

## Initiatives taken to protect mangrove forest:

**Government initiatives:** In 2020, the heavy damage to the Sundarbans mangroves from cyclone Amphan prompted West Bengal government to announce a mega plantation drive of five crore mangroves under the **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)**

**Chandernagore college initiative:** The college is working on a project with Purbasha Eco-Helpline Society, led by the "Mangrove Man" Umashankar Mandal, through which mangrove saplings from the islands of Sundarban have been planted on the bank of River Hugli to prevent soil erosion.



## Conclusion:

With such an essential role to play in our shared planet, it is vital to protect the mangrove forest. Unfortunately, this ecosystem was also declared a UNESCO World Heritage Site and is now one of the World's Natural Wonders.



Marshal Hansda, Sem-II  
23-BSC BOTA-006

# 10

Chapter

## THE ABOMINABLE MYSTERY OF FLOWERING PLANTS

### Introduction:

In 1953, Oparin and Haldane proved the theory of chemogenesis which stated that atmospheric conditions of the earth led to the formation of organic molecules from inorganic molecules. Once the first life came into existence, they started to evolve in different ways and forms. This laid a stepping stone to the theory of evolution. Plant evolution has played a critical role in shaping the world we know today. There is no doubt that our planet would be fundamentally different without the emergence and evolution of the plant kingdom. The evolution of plants has resulted in a wide range of complexity, from the earliest algal mats of unicellular archaeplastida evolved through endosymbiosis through multicellular marine and freshwater green algae to spore-bearing terrestrial bryophytes, lycopods, ferns and eventually to the complex seed-bearing gymnosperms and angiosperms (flowering plants) of today.

### Darwin's abominable mystery:

While many of the earliest groups continue to thrive, as exemplified by red and green algae in marine environments, more recently derived groups have displaced previously ecologically dominant ones; for example, the ascendance of flowering plants over gymnosperms in terrestrial environments. But the sudden appearance and rapid domination of angiosperms has no explanation. This seems to violate the 'slow and gradual changes' theory of evolution. More than one-hundred years ago, Darwin called the origin of angiosperms an "abominable mystery". Angiosperms appeared rather suddenly in the fossil record, with no obvious ancestors for a period of about 80 to 90 million years prior to their appearance. Several theories suggest different patterns of origin in these groups of plants. No definitive answer has yet been found.

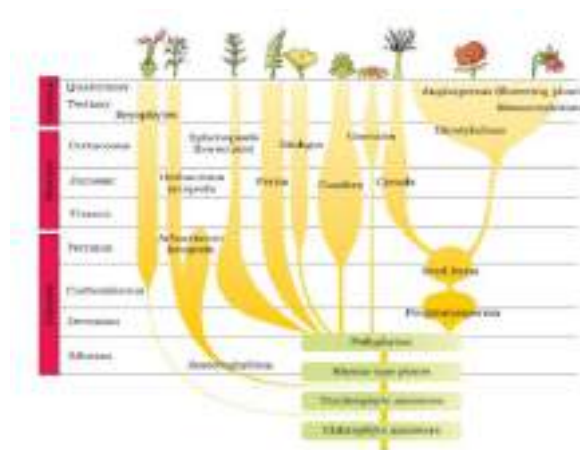


Figure : A sketch of the evolution of plant forms through geological periods

### Conclusion:

With the molecular analyses indicating that angiosperms are not closely related to any other extant seed plant group, information from fossils might provide the only basis for reconstructing their origin. Evidence for the origin of angiosperms has always been somewhat elusive and up until the early 1980s it was often speculated that the lack of fossil evidence was due to an upland origin of the angiosperms (i.e. woody magnolia-like shrubs growing some distance from water).



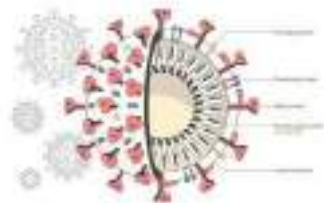
Tarpan Biswas, Sem-II  
23-BSC-BOTA-0012

## THE NEXT APOCALYPSE: FROM COVID-19 TO DISEASE X

### Introduction:

Pandemics occur when an illness spreads rapidly across the world. Several pandemics preceding the COVID-19 have occurred throughout history, including three flu pandemics during the 20th century.

Structurally, coronaviruses are characterized by an **unusually large RNA genome and club-like glycoprotein spikes** that project from the surface of its envelope. These spikes result in a characteristic ultrastructure appearance resembling the **solar corona**, giving rise to the name “**coronavirus**”.



### COVID-19 in India:

The first case of COVID-19 was detected in India in the southern state of Kerala on 30th January 2020 and was a medical student who had returned from Wuhan. There have been a total 68 days of complete lockdown across the nation in four phases and more than a year of gradual unlock. India developed four indigenous Vaccines in just two years.

1. **ZyCoV-D**- World's 1st and India's indigenously developed DNA Vaccine,
2. **CORBEVAX™**- India's first protein subunit vaccine
3. **GEMCOVAC™-19**- World's 1st and India's indigenously developed mRNA vaccine
4. **INCOVACC**- World's 1st and India's indigenously developed intranasal COVID-19 Vaccine.

Not only was India producing enough vaccines for domestic use, but it was able to export nearly 66 million doses of vaccines, under the Vaccine Maitri Programme to 95 countries. Over 100 million doses were sent to neighbouring countries such as Nepal, Myanmar, Bangladesh, and Iran.

### Disease X

The COVID-19 pandemic wasn't the first to devastate the world and it won't be the last. Disease X is a placeholder name that was adopted by the World Health Organization (WHO) in February 2018 on their shortlist of blueprint priority diseases to represent a hypothetical, unknown pathogen that could cause a future pandemic. Scientists believe it is likely to come from zoonotic transmission which is an animal virus that jumps to humans.

### The shield for doomsday:

The following strategies are already being taken worldwide in preparation for Disease X:

1. Reducing the risk of spillover and the consequent introduction and spread of a new disease in humans;
2. Improving disease surveillance in humans and animals.
3. strengthening research programs to shorten the time lag between the development and production of medical countermeasures.
4. Developing international protocols to ensure fair distribution and global coverage of drugs and vaccines

### Conclusion:

The leading cause of climate change is increasing the risk of pandemics occurring. While emergence is a random event both in time and place, staying equipped with measures based on pre-existing knowledge and well-planned execution will not only uplift the overall health of a nation but also provide an edge to recover at a faster rate in case of any such 'health apocalypse'.



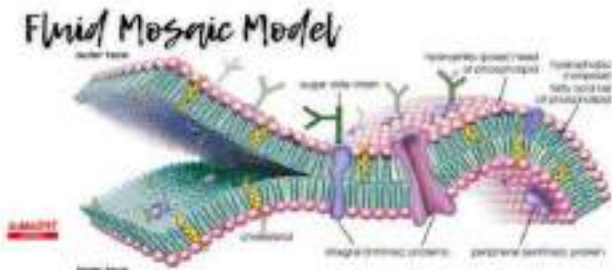
# 12

Chapter

## FLUID MOSAIC MODEL

### Introduction:

The Fluid Mosaic model was proposed by S. J Singer and Garth L. Nicolson. In this model, they explain the structure of plasma membrane where the cell membrane is a bilayer semifluid organization of phospholipid molecules within which protein molecules are arranged like a mosaic. In the lipid layer, cholesterol, glycolipids, gangliosides etc are embedded. The lipid molecules are always switching between themselves in this organization called Flip-flop movement. The main three components of plasma membrane are phospholipid, protein and carbohydrate.



### Phospholipid:

Phospholipid is the main component of plasma membrane. The inner ends of phospholipid layers are hydrophobic and nonpolar and the opposite outer layers are hydrophilic and polar. The phospholipid molecules are attached to glycerol molecules by covalent bond. The cholesterol is embedded in phospholipid, helps the membrane to retain the fluidity.

### Protein:

Another main component of plasma membrane is protein. There are two types of proteins found in plasma membrane.

1. **Peripheral Protein:-** These types of protein are located outside and inside the cell membrane. The outer protein binds to oligosaccharide to form glycoprotein. They carry the signals from one segment of plasma membrane and transfer it to another segment.

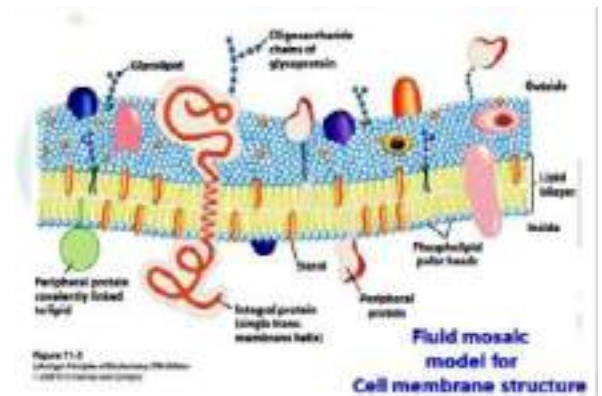
2. **Integral Protein:-** These types of proteins are embedded inside the plasma membrane. These proteins are porous and allow the movement of molecules and ions through these pores.

### Carbohydrate:

Carbohydrates are also main component of plasma membrane. They are located on the outside of the cell membrane where they attached to protein or lipid.

### Conclusion:

Though this model has some changes over time, but this is the best model for the structure of plasma membrane and currently this model has gained the most recognition.



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## MYSTERIOUS PLANTS ACROSS THE GLOBE

### Introduction:

The total number of plant species in this world is about 391,000. Some plants provide beautiful and fragrant flowers while some plants have stunning foliage. Then there are certain plants that look strange, weird, and sometimes scary. There is a certain mystery around these plants and that's why they grab people's attention more.

### Mysterious plants:



The alien leaves (*Welwitschia mirabilis*) is one of world's most resistant plant. With a sturdy stem, two leaves, and roots, there is nothing else like it. The leaves can grow to resemble something out of a science fiction novel.



The 37 species in the genus Lithops, known as **living stones** (*Lithops marmorata*) have remarkable camouflage. They only have a few very bulbous and grey-brown leaves. They look exactly like stones and can blend perfectly in the rock environment.



**Rafflesia** (*Rafflesia arnoldii*) is the biggest individually produced flower in the world. Its blossoms only last three days to a week. The hideous smell that it produces attracts pollinating insects to it to help perpetuate the species.



The **Great Banyan tree** (*Ficus benghalensis*) is in the Acharya Jagadish Chandra Bose Indian Botanic Garden in Shibpur, Howrah for more than 250 years. In 1989, the Guinness Book of World Records declared it to be the largest tree specimen on the planet. The main trunk of the tree died and had to be removed in 1925, but it still stands today.

### Conclusion:

There are hundreds, if not thousands of strange plants that inhabit the flora of our planet, These plants have such a weird, yet daunting aspect and look more supernatural than natural. While most of these modifications are plant's own adaptation to survive, some driving forces are still unknown.



## PLANT BASED VACCINES: A NOVEL APPROACH TO COST EFFECTIVE IMMUNIZATION

### Introduction:

Since the initial comprehension of vaccination by Jenner and Pasteur, vaccines for human use have been conventionally developed by the production of (1) microbial pathogens or (2) pathogen proteins in mammalian and insect cells, which are then inactivated and/or purified for final formulations, and, very recently, (3) by using RNA or DNA. Another approach for antigen production is the use of plants as biofactories, which was initially proposed approximately three decades ago. In this period of time, the laboratory-assayed vaccines have reached clinical application. At present, influenza and COVID-19 plant-made vaccines have reached Phase 3 clinical trials, and their results are promising to carry them to commercialization.

Methods for genetic plant transformation have been developed to produce heterologous proteins in plant cells in the last 30 years. Initially, plants were genetically engineered by *Agrobacterium*-mediated nuclear transformation and later by chloroplast via the biolistic method. These fundamental methods established the developmental basis for a wide number of transformation procedures that nowadays are applied for different designs of vaccines produced in plants and microalgae. An attractive approach is the design and production of virus-like particles (VLPs) in plants as subunit vaccines. This strategy has been useful to produce plant VLPs to fight against infectious diseases even at the industrial scale.

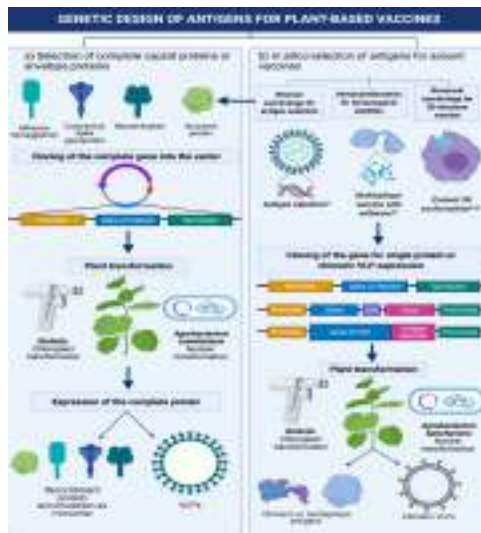
On the other hand, antigen selection is a key issue for plant-made vaccines. Experimental antigens—for which protective efficacy has been demonstrated at the preclinical or clinical level—have been selected to be produced in plants as a potential low-cost platform option. Additionally, antigens can also be selected by immunoinformatics (in silico) approaches such as reverse vaccinology, using computational servers and software that predicts the potential immunogenicity of a given pathogen protein.

This review describes the elemental basis of antigen in silico design, plant transformation methods, recent VLP developments, and the most advanced vaccines produced in plant cells.

### Genetic Antigen Design for Subunit Vaccine Development:

Subunit vaccines (SUV) arise from recombinant DNA and genetic engineering, which provide the opportunity to specifically select one or more immune protective antigens and produce them in another organism. Thus, the rapid growth of genomic information in database banks and the possibility of sequencing complete genomes allows the use of bioinformatics tools to quickly explore whether a certain protein pathogen has potential for use as an SUV. These bioinformatic tools can be based on (a) reverse vaccinology (RV), to evaluate the characteristics of multiple antigens of a given genome; (b) immune informatics, for the selection of immunogenic peptides from selected antigens; and (c) structural vaccinology, for searching for the best three-dimensional conformations of the vaccine protein. Immuno-informatics is applied to select the most probable immunogenic peptides to design multiple epitope vaccines. The software to be used can be directed to searching for

(a) a cellular response by the affinity of peptides to the major histocompatibility complex I (MHC I, specific for cytotoxic T lymphocytes (CTL) or (b) a humoral response by affinity to specific B lymphocytes combining with selected peptides with affinity to the major histocompatibility complex type II. Structural vaccinology is used once the epitopes have been selected to organize them in the best way for a correct three-dimensional conformation with the best immunogenic properties for conformational and linear epitopes, which implies estimating tertiary structure.



**Plant Genetic Engineering Transformation Methods for Subunit Vaccine Production:**

**Stable Nuclear Transformation**

Plant cell nuclear transformation was developed four decades ago and has been mainly achieved by *Agrobacterium tumefaciens* transfection. In this method, the DNA containing the transcriptional unit (promoter-gene (antigen)-terminator) for protein expression is cloned in a binary plasmid, commonly pBI121 and pCambia. Then, a plasmid containing the transcriptional unit of the antigen is introduced into *A. tumefaciens*, usually by electroporation. Next, *agrobacterium* containing plasmids is co-cultured with plant leaf or stem fragments, followed by a complete transgenic plant regeneration through organogenesis or embryogenesis processes. Finally, transgenes and proteins can be detected in fully regenerated plants to confirm genetic transformation and antigen expression. Initially, the model plant *Nicotiana tabacum* was the main plant used for vaccine production. Currently, many other plants have been considered for vaccine production, some of which have advantages for oral vaccine formulation, such as lettuce and carrots. In *agrobacterium*-mediated nuclear transformation, plasmids contain a fragment between the T borders (right and left) that is genetically recombined with the nuclear genome upon delivery. This fragment harbours a gene that codes for a trait of antibiotic resistance to select transformed cells.

**Transient Nuclear Transformation**

The transient nuclear expression approach is considered when transformed plant cells must be maintained for a short period (two to 10 days). In this case, transgene integration into the nuclear genome is not forced by the antibiotic selection. However, many gene copies are delivered into the nucleus and are capable of producing messenger RNA for high recombinant protein production. One of the most known viral vectors used in transient expression was developed using elements of the RNA of the Tobacco mosaic virus (TMV). Currently, a wide repertoire of viral vector types is available, and practically any type of virus could be used to design an expression vector. Recently, the Bamboo mosaic virus was used as viral vector to produce Japanese Encephalitis Virus antigens in plants. Viral vectors based on plant Gemini viruses have been widely used for protein production of biopharmaceutical interest. The mechanism of rolling circle replication allows replicon delivery (copies of transgenes) and can be designed to produce more than one protein in plant cells. Notably, the specific ability of each virus to evade plant immune systems and replicate into the plant cells determines the success of the viral vector in achieving high antigen production.

**Chloroplast Transformation**

Chloroplast transformation was the first genetic modification of a green cell, performed approximately three decades ago. Initially, the transformation was conducted to create antibiotic-resistant cells. Chloroplast transformation was first achieved through biolistic procedures, where gold or tungsten microparticles (~10 μm) are coated with genetic material containing minimal gene expression units and then projected into the target cells for transformation. Once in the cell, DNA molecules can be integrated into the chloroplast genome through DNA recombination mechanisms. Other plastid organelles have been transformed, such as chromoplasts (plastids in fruits) and those in tubers. Currently, antigen production in the chloroplast has advantages including higher recombinant protein production than that of stable nuclear transformation, which is determined by the copy number of chloroplast genomes in a given plant. Thus, the chloroplast could be used to



produce proteins for subunit vaccines. However, the chloroplast does not have post-translational modification machinery, which is a disadvantage when a post-translational modified protein is necessary for vaccine production.

## Main Plants Used as Bio-factories in Vaccine Production:

Plant species or specific tissues in a particular plant for commercial recombinant protein production has considerable variability. Several plants, including potato, corn, rice, and soybean, among others, have been used to produce recombinant proteins, including the Hepatitis B vaccine produced in lettuce. However, tobacco and alfalfa have been commonly used because of their high biomass and seed yield and short life cycle. Seed can be attractive because of their stability in long storage periods compared to other plant materials.

Biosciences have seed-based recombinant production systems. Proteins of different molecular weights have been expressed in plant seeds, and attempts have been made to develop vaccines in seeds. For example, the Hepatitis B virus (HBV) surface antigen (HBsAg) SS1 was produced in rice using the seed-specific Glub-4 promoter. Moreover, mice immunized with this vaccine prototype produced specific antibodies against both S and preS1 epitopes, demonstrating the potential of rice-derived SS1 antigen as an alternative HBV vaccine for Hepatitis B disease, transgenic potatoes also have been demonstrated to be an excellent expression system.



*Nicotiana tabacum*

Among the antigens produced in potatoes, the enterotoxigenic *Escherichia coli* (ETEC) labile toxin B-subunit (LTB), and the Norwalk virus capsid protein (NVCP) were promising candidates in clinical trials. Remarkably, the administration of corn seed-made LTB in clinical trials demonstrated similar outcomes to those of the potato study. Another interesting crop used for vaccine production are tomatoes, which have been genetically modified to produce a rabies vaccine.

An important aspect when producing vaccines in plants is the containment of transgenes. In this arena, Murphy has reviewed diverse strategies for biocontainment of transgenes, of which the main ones are using male sterility in transgenic plants, inducible and transient expression systems, and plant cell cultures instead of whole plants.

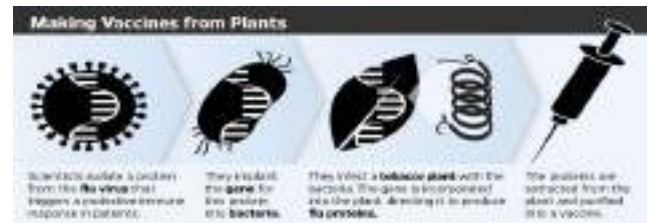
A key topic of plant-based vaccines is the possibility of direct oral delivery. In this aspect, when the vaccine is ingested orally, the antigens are expected to be protected from acids and enzymes in the stomach via bio-encapsulation because human digestive enzymes are incapable of breaking down glycosidic bonds in carbohydrates that make up the plant cell wall. However, when intact plant cells containing the vaccine reach the small intestine, commensal microbes digest the cell wall releasing the antigens. When antigens are fused with suitable transmucosal adjuvants (e.g.- cholera toxin non-toxic subunit B (CTB)), they are delivered more efficiently to the immune or circulatory system.

The edible crops mostly used for generating plant-based vaccines have several advantages when compared with the same products made with other plant species. For example, in tobacco (*Nicotiana tabacum*) plants, the antigen needs to be subsequently purified before being tested, and this process can represent almost 80% of the total vaccine production cost. Moreover, if the vaccine is maintained in lyophilized conditions, cold chain facilities would not be needed to stock and deliver the respective plant material, meaning greater cost efficiency compared to conventional mammalian or fermentation-based vaccines

## Plant Vaccines Today and Perspectives Recently:

Ward et al. described Phase 3, (NCT03321968) of a quadrivalent, recombinant, virus-like particle (VLP) influenza vaccine produced in plants. This platform is based on transient protein expression in *Nicotiana* sp. and yields VLPs bearing hemagglutinin (HA) protein trimers that are combined in a quadrivalent vaccine (QVLP). These authors showed 96.3% efficacy, since a lot-to-lot study was carried out just prior to two pivotal placebo-controlled efficacy trials of the same plant-derived QVLP vaccine~23,000 adult subjects \_ 18 years of age, and supported earlier findings of the safety profile and immunogenicity of the plant-derived QVLP, demonstrating the consistency with which it can be produced. Although several vaccines against COVID-19 have been already delivered, different companies are developing plant-made vaccines and some of them are in process of clinical trials. On the other hand, Medicago (Quebec, Canada), a biopharmaceutical company, recently announced an FDA-approved Co-VLP plant-derived vaccine against COVID-19 administered alone or with AS03 or CpG1018 adjuvants from the GSK Company (Brentford, Middlesex, UK). In the preliminary study, the co-primary outcomes were short-term tolerability/safety and immunogenicity of Co VLP formulations assessed by neutralizing antibody (NA b) and cellular responses. Secondary outcomes in this study included safety and immunogenicity assessments up to 12 months after vaccination. Especially in COVID vaccines, Kumar et al. have reviewed the main companies that are working on developing plant-made vaccine platforms. Medicago and Kentucky Bio-Processing Inc (Owensboro, KY, USA) have proceeded to the most advanced clinical trials.

These examples highlight that plant-made vaccine platforms are a reliable commercial option in the 21st century. Research groups around the globe are mainly working on a major challenge: increasing protein yields. Nevertheless, some specific commercial niches are being covered by plants, such as glucocerebrosidase against Gaucher's disease. La ere et al. questioned why a commercial plant-produced vaccine had not been made after two decades of plant vaccine development.



## Conclusions:

Plant-based vaccination is evolving. Improvements and innovations to plant biotechnology platforms have been made by incorporating immunoinformatics tools, genetic engineering methods, and strategies for high yield recombinant vaccine production. Firstly, most of the immunoinformatics tools are free of charge and offer excellent opportunities for novel vaccine designs. In the near future, artificial intelligence will be the central motor for predicting reliable antigens and epitopes for subunit vaccine design. Secondly, it is envisaged that genetic engineering tools can be improved for transient expression as an approach to increase protein yields, with special focus on organic nanoparticles called VLPs to fight against viral diseases. Thirdly, with the fact that industry is involved in the current pandemic challenge and a plant-made vaccine against COVID-19 is now available, new investment for this biotechnological platform could expand in the following years. Future efforts should be directed to moving the experimental success of other plant-made vaccines to clinical applications.



Potential plant based edible vaccine



# FROM THE CURTAINS OF CIRCULATION TO THE TRANSCRIPT OF TRANSPIRATION

## Introduction:

In the intricate theatre of life, the interplay of biological processes shapes the narrative of existence. The journey from the heart's rhythmic circulation to the delicate whisper of transpiration in leaves unfolds a story of interconnected systems, each vital to sustaining life. This exploration delves into the dynamic world of physiological mechanisms, uncovering how the movement of blood and the exchange of gases not only maintain the vitality of organisms but also reveal the profound harmony of nature's design. Join us as we lift the curtains on circulation and unravel the transcript of transpiration, discovering the wonders that lie within these essential functions.

## “Principles of Pulse and Pathways”-Circulation:

The cells of higher organisms are organised and perform specialised functions which causes the transportation of materials between them, very much important. Materials like oxygen simple foods and hormones must be carried in and carbon dioxide and excretory wastes must be removed from our body. These distributions are mostly essential for metabolic functions in the body which is known as circulation.

Circulation is the process of transportation of essential minerals and metabolic wastes to different parts of the body through a fluid medium. Water blood and lymph are the medium of transport in plants and animals. The transported elements are water, absorbed foods, vitamins, minerals, hormones, dissolved gases like oxygen and carbon dioxide, and other secretory and excretory substances. Circulation is divided by the nature of conductance, and are hence divided into OPEN and CLOSE type of circulations.

The circulation in which blood flows from the heart to the body cavity (haemocoel) through the blood vessels and then directly to both the tissue cells for exchange of materials and then blood again returns back to heart through the blood vessels by the way of sinus. This kind of circulation is referred as open circulation which is found in cockroach.

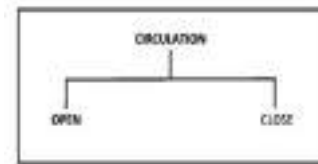


Figure 1: Types of Circulation

The pattern of circulation in which blood always flows through the heart and blood vessels and never enters body cavity. This kind of circulation is very much organised which can be found in many organism which is termed as closed circulation.

## “The Elixir of Circulation” Blood And “Its Regulatory Artifact”:

Heart Blood, often referred to as the "elixir of life," is a vital fluid that courses through the veins and arteries of all vertebrates, performing essential functions that sustain life. This complex fluid is not merely a carrier of nutrients and oxygen; it is a dynamic, multifunctional tissue that plays a pivotal role in maintaining homeostasis, immunity, and overall health. The composition of bloods is mainly sited as the following:

**Red Blood Cells (Erythrocytes)** are responsible for transporting oxygen from the lungs to the rest of the body and returning carbon dioxide for exhalation. **White Blood Cells (Leukocytes)** are crucial components of the immune system, defending the body against infections and foreign invaders



**Platelets (Thrombocytes)** are essential for blood clotting; platelets help prevent excessive bleeding when injuries occur. **Plasma** is the liquid portion of blood, plasma carries nutrients, hormones, and waste products. It also contains proteins like albumin, fibrinogen, and globulins, which have various roles, including maintaining blood pressure and volume, clotting, and immune responses. Blood serves as a transport medium, delivering oxygen and nutrients to tissues and organs, while carrying away waste products like carbon dioxide and urea. This ensures cells receive the necessary components for energy production and metabolic processes. Through its composition, blood helps regulate body temperature, pH levels, and fluid balance. It distributes heat generated by metabolic processes and carries it to the skin for dissipation. Blood's immune components, primarily white blood cells, detect and destroy pathogens. Additionally, blood clotting mechanisms protect against blood loss from injuries.

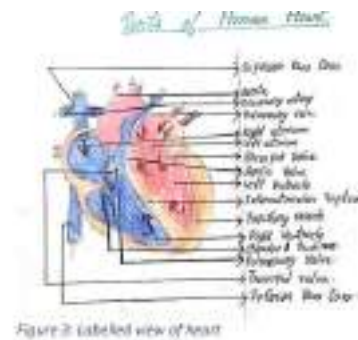
The heart, often described as the **"regulatory artifact"** of the circulatory system, is a remarkable organ responsible for maintaining the continuous flow of blood throughout the body. This muscular organ operates tirelessly, ensuring that oxygen-rich blood reaches every cell while facilitating the return of deoxygenated blood for reoxygenation. The heart consists of four chambers two atria and two ventricles. The atria receive blood, while the ventricles pump it out. Heart valves ensure unidirectional blood flow, preventing backflow and maintaining efficient circulation. These include the tricuspid, pulmonary, mitral, and aortic valves. The thick muscular wall of the heart, particularly in the ventricles, provides the force necessary to pump blood through the circulatory system. It is called myocardium.

The heart's rhythmic contractions are regulated by its intrinsic electrical system, consisting of the sinoatrial (SA) node, atrioventricular (AV) node, and Purkinje fibres. This system coordinates the timing of contractions, ensuring efficient blood flow.

**Systemic Circulation:** The left side of the heart pumps oxygenated blood into the systemic circulation, delivering it to the entire body.

**Pulmonary Circulation:** The right side of the heart pumps deoxygenated blood into the pulmonary circulation, where it receives oxygen in the lungs.

The heart adapts to varying demands through mechanisms like increased heart rate and stroke volume during exercise. It responds to signals from the nervous system and hormones, adjusting its output to maintain blood pressure and meet the body's needs.



The synergy between blood and the heart exemplifies a finely tuned biological system. Blood, with its diverse and vital functions, is propelled by the heart's rhythmic contractions, ensuring the sustenance and protection of the organism. Together, they form an essential partnership that underlies the intricate dance of life, reflecting the elegance and complexity of the human body.

## "Foundations of Foliar Fluid Flow"- Transpiration :

Transpiration is a fundamental physiological process in plants, involving the movement of water from the roots, through the plant, and out through the leaves. This process, often termed "foliar fluid flow," plays a critical role in plant health and ecosystem functioning. Water is absorbed from the soil through the roots. This is facilitated by root hairs, which increase the surface area for absorption. Once inside the roots, water moves upwards through the xylem vessels due to capillary action, cohesion, and adhesion forces, creating a continuous column of water. Tiny pores on the leaf surface, called stomata, open and close to regulate water loss and gas exchange. Guard cells control the opening of stomata. Water evaporates from the moist cell walls within the leaf and diffuses out through the stomata into the atmosphere. Transpiration has a cooling effect on the plant, much like sweating in humans. As water evaporates from the leaf surface, it removes heat, preventing overheating and maintaining optimal temperatures for enzymatic activities. The upward flow of water in the xylem also carries essential nutrients from the soil to various parts of the plant, supporting growth and development. Transpiration helps maintain turgor pressure in cells, which is crucial for maintaining the plant's structural integrity and facilitating growth and expansion of cells.

By opening the stomata for transpiration, plants also enable the exchange of gases. Carbon dioxide enters the leaves for photosynthesis, and oxygen, a byproduct of photosynthesis, is released into the atmosphere.

There are few factors that affects transpiration. Most factors are in direct proportional relation to that of rate of transpiration. Just like higher light intensity increases the rate of transpiration as stomata open wider for photosynthesis. Again, elevated temperatures increase the rate of evaporation from leaf surfaces (Fig:4). Also, wind removes the boundary layer of saturated air around the leaf, enhancing transpiration rates (Fig:6). But some do relate to the rate of transpiration inversely like, Lower humidity levels outside the leaf create a steeper concentration gradient, accelerating transpiration (Fig:5).

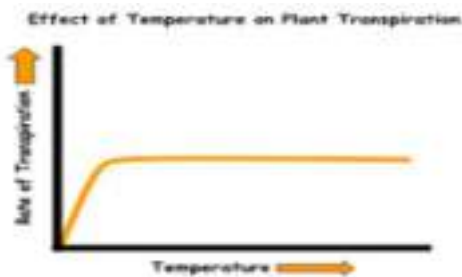


Figure 4: Graph of Temperature vs Rate of transpiration

Some internal factors also are contributed for the transpiration rate like larger leaves have more stomata and thus higher transpiration rates. The number and arrangement of stomata also influence how much water is lost. A thicker cuticle reduces water loss by providing a barrier to evaporation.

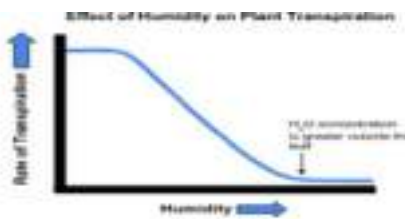


Figure 5: Graph of Humidity vs Rate of transpiration

Transpiration is a key component of the water cycle, contributing to the return of water to the atmosphere and influencing weather patterns and climate. By drawing water from the soil, transpiration can influence soil moisture levels, affecting the availability of water for other organisms and plants.

The movement of water and nutrients through transpiration supports biogeochemical cycles, which are vital for sustaining life on Earth.



Figure 6: Graph of Wind Velocity vs Rate of transpiration

Understanding the foundations of foliar fluid flow, or transpiration, reveals the intricate balance plants maintain to thrive. This process not only sustains the individual plant but also plays a critical role in broader ecological and climatic systems. By comprehending how transpiration works and the factors affecting it, we can better appreciate the sophisticated mechanisms plants use to survive and support life on our planet.

### "A Necessary Evil"-Transpiration:

Transpiration is often described as a "necessary evil" in the botanical world. While it plays a crucial role in plant physiology and overall ecosystem dynamics, it also presents significant challenges and potential downsides for plants, especially under stressful environmental conditions. Its dual nature provides and indicates the flaw in it being the circulation of plants. Transpiration helps in the movement of water and nutrients from the roots to other parts of the plant by a pulling force, known as the transpiration pull. It also helps regulate the temperature of plants by dissipating excess heat. As water evaporates from the plant's surface, it cools down the plant tissues. Transpiration facilitates the uptake of essential nutrients from the soil through the roots. As water evaporates from the leaves, it creates a suction force that allows carbon dioxide to enter the leaf stomata. It also maintains the turgidity and rigidity of plant cells, which is necessary for structural support. Transpiration leads to the loss of water from plant tissues into the atmosphere. In arid or drought-prone regions, excessive transpiration can strain water resources and contribute to water stress for plants, making them more susceptible to wilting and damage. Along with water, transpiration can result in the loss of dissolved essential nutrients from the plant. In situations where water availability is limited, plants may need to allocate more energy towards transpiration, diverting resources from other essential processes such as growth and reproduction. Sometimes, the regulation of stomatal openings can become inefficient, resulting in excessive water loss without corresponding benefits.

## "Analysis of the Assets of Adaptation"-Transpiration

Transpiration is a fundamental process that has evolved over millions of years, allowing plants to adapt to various environmental conditions. This evolutionary journey reflects the intricate balance plants maintain between acquiring carbon dioxide for photosynthesis and minimizing water loss. Here, we explore the key evolutionary adaptations and mechanisms that plants have developed to optimize transpiration. Early land plants, such as bryophytes (mosses and liverworts), had limited control over water loss and gas exchange. The evolution of stomata in vascular plants marked a significant advancement, allowing better regulation of these processes. Stomata are microscopic pores found on the surfaces of leaves and stems, controlled by guard cells that can open and close in response to environmental cues. The evolution of guard cells enabled plants to regulate transpiration more efficiently. Guard cells swell with water to open the stomata and shrink to close them, thus controlling water loss and gas exchange. Advanced plants have developed complex signalling pathways that allow stomata to respond to light, carbon dioxide levels, and internal water status, optimizing their function under varying conditions.

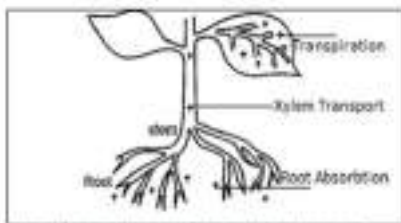


Figure 7. Transpiration and pathway of water in a plant

Many plants evolved a waxy cuticle layer on the surface of leaves and stems to reduce water loss while still allowing for gas exchange. Plants in arid environments often have smaller or needle-like leaves to minimize water loss. Some desert plants have reduced leaves to spines, with photosynthesis occurring in the stems. Some plants have evolved mechanisms to alter the orientation of their leaves to reduce direct exposure to sunlight, thereby decreasing water loss due to transpiration. Leaf positioning can also change with environmental conditions. For example, certain plants fold their leaves during the hottest part of the day to minimize water loss. **Crassulacean Acid Metabolism (CAM)** plants, such as cacti and succulents, open their stomata at night to minimize water loss. They store carbon dioxide as malic acid and use it for photosynthesis during the day when the stomata are closed.

C4 plants, like maize and sugarcane, have specialized leaf anatomy that allows them to concentrate carbon dioxide in specific cells, reducing the need to keep stomata open as long and thus conserving water. Some deep-rooted plants can move water from deeper soil layers to the surface, where it can be utilized by shallow roots and neighbouring plants. This adaptation helps maintain hydration and supports transpiration during dry periods. Plants in arid regions have evolved various physiological responses to drought, such as accumulating **Osmoprotectants** (compounds that protect cells from stress) and developing deeper or more extensive root systems to access water from deeper soil layers. Some plants have evolved mutualistic relationships with mycorrhizal fungi, which enhance water and nutrient uptake, thereby supporting transpiration and overall plant health. Epiphytic plants, which grow on other plants, have developed specialized adaptations like **trichomes** (hair-like structures) to absorb water from the air, allowing them to thrive in environments where water is not consistently available.

## "Elements of Evolution"- Circulation (Structure of Heart):

The heart is a central pumping station of circulatory system which transports blood throughout our bodily contractions and relaxation. It is made up of cardiac muscles which work rhythmically. In the early days of evolution, the heart was structured as a two chambered organ. It consisted of one auricle and one ventricle. This kind of heart is currently found in fishes where the heart pumps blood around the body in a single loop stationing amidst the gills heart and tissues, then back to heart completing the circle. Then the evolutionary stages evolved the heart into three chambered organ, consisting of two auricles and one ventricle. Here double circulation takes place from right auricle to ventricle and then to the gills/lungs and simultaneously, the left auricle sends oxygenated blood to the ventricle where it mixes with the deoxygenated blood and that mixture is then transported into the body. It is seen in Amphibia.

The next evolution leads to the development of **incomplete septum** as seen in hearts of reptiles. Crocodile being an exception to this consisting of a complete septum and a four chambered heart. The mixture of blood is limited, but cannot be fully avoided. The final discovered evolution leads to the completion of septum, dividing the ventricles in left and right segments. In Figure8, the evolution is shown by a series of linear headed arrows.

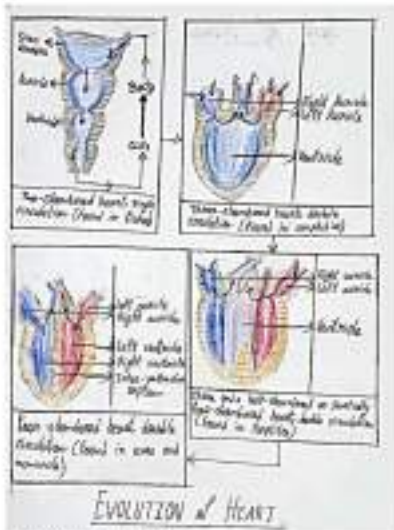


Figure 8: Evolution of heart

The **systemic circulation** and **pulmonary circulation** are collectively called **double circulation**. The circulation which occurs between heart and tissues is called systemic circulation where oxygenated blood flows to all parts of the body from the left ventricle and deoxygenated blood flows from various parts of the body to right atrium. The pulmonary circulation takes place where the deoxygenated blood flows from right ventricle to the lungs through pulmonary artery for oxygenation and then the oxygenated blood flows from lungs to the left atrium through the pulmonary vein.

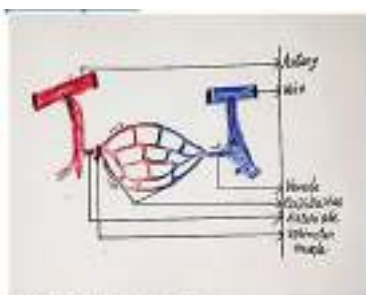


Figure 9: Arteries, veins and capillaries

**“Curtains and Transcript”- Conclusions:**

Transpiration and circulation are fundamental processes in the plant and animal kingdoms, respectively, showcasing the intricate systems developed to sustain life. In plants, transpiration involves the movement of water from roots to leaves and its subsequent evaporation into the atmosphere. This process not only facilitates nutrient transport and temperature regulation but also plays a critical role in the water cycle, influencing weather patterns and climate. Furthermore, transpiration helps maintain turgor pressure within cells, enabling plants to remain upright and structurally stable. In animals, the circulatory system, driven by the heart, transports blood, nutrients, oxygen, and waste products throughout the body. This ensures that cells receive the necessary components for energy production, growth, and repair, while removing metabolic wastes. The circulatory system also plays a crucial role in immune response and thermoregulation, highlighting its multifaceted importance. Both systems demonstrate the remarkable adaptations organisms have evolved to thrive in diverse environments, ensuring survival and optimal functioning. From a professional perspective, understanding these processes is crucial for advancements in fields like agriculture, medicine, and environmental science. In agriculture, insights into transpiration can inform irrigation practices, water management strategies, and the development of **drought resistant crops**, enhancing food security in the face of climate change. For instance, selecting crop varieties with efficient water use can significantly reduce water consumption and increase yield. In medicine, knowledge of circulation is essential for diagnosing and treating cardiovascular diseases, which are among the leading causes of mortality worldwide. Advances in cardiovascular research have led to better management of conditions like hypertension, heart attacks, and strokes.

Environmental scientists study these systems to better understand their roles in ecosystem dynamics and climate regulation. By applying this knowledge, professionals can develop innovative solutions to address global challenges related to food production, health, and environmental sustainability, such as creating more resilient agricultural systems or developing new medical therapies.

Philosophically, **the interplay between circulation and transpiration invites reflection on the interconnectedness of life.**

These processes, though different in mechanism and context, underscore a universal principle: the necessity of balance and flow in sustaining life. Just as the heart and the xylem channels tirelessly support the organism, so too must we recognize and maintain the delicate balances within our ecosystems and societies. This holistic perspective encourages us to appreciate the complexity and beauty of life, fostering a deeper respect for the natural world and a commitment to nurturing it for future generations. **The harmony observed in natural processes serves as a metaphor for the interdependence seen in human communities, reminding us of the importance of cooperation, sustainability, and mindful stewardship of our environment.** Embracing these principles can guide us toward a more sustainable and harmonious existence, both with nature and within our societies.

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*professors' insights*

# 16

## Chapter

Dr. Chiranjit Mukherjee is immensely loved by students for his amazing skills to explain every tough concepts in simple language. Sir's main interest lies in the fields of Cell Biology Plant Molecular Genetics, Plant Biotechnology and Plant Secondary Metabolism. Professor Mukherjee has completed his PhD from IIT KGP. In this article, Sir will dive into his preparatory days and guide you on how to prepare for competitive exams for higher studies.



## COMPETITIVE EXAMS: FROM COMPETITION TO COMPLETION

-Dr. Chiranjit Mukherjee

Before starting the topic I would like to express my feelings about the present status of many bright young beautiful minds as described by Prof. Balasubramanian.



According to Prof. A. Balasubramanian, Former Dean, Faculty of Science & Technology, University of Mysore.

Now, the solution is not easy but at the same time not too difficult also. Students need to overcome this turmoil condition through their efforts. Sometimes some quotes may help them to win the situation.



### What is Competitive Exam?

If we want a discussion on competitive examinations, we should know the meaning of any examinations first.

Examinations are conducted to assess a person by their knowledge and ability. Examination can be of two types:

1. Qualifying Examination.
2. Competitive Examination.

Qualifying exams are conducted to assess certain kinds of abilities and skills that are being earned by well-defined courses. Competitive exams are being conducted to get entry into the professional world.

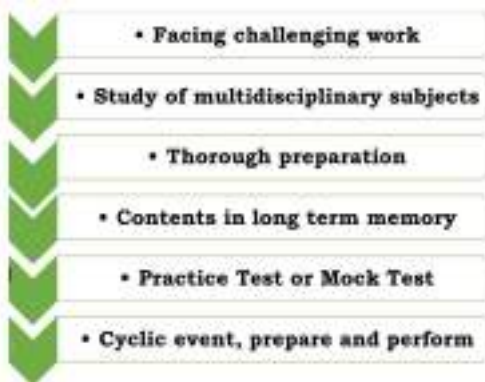
Competitive exams are the main machinery to select eligible candidates for any elite institution or company. This exam is alternatively called as Entrance Exam. There are always more aspirants than the assigned seats in the Entrance Test and it is inevitable to select the most deserving candidates. This is mainly to evaluate the candidate's quantitative aptitude, logical reasoning, verbal reasoning, intelligence quotient, and lateral thinking abilities.

## How to tackle?



According to Prof. G. Subramanian, Former Head, Faculty of Science & Technology, University of Mysore.

## Components of Competitive domain:



## How to Manage?



## What to Do?



## Ending: beginning for all aspirants

Most importantly, success is not just a term, it is like the endless failures that a painter has to embrace to create his one masterpiece. So, make friendship with patience and perseverance. Don't think of your journey as a whole but keep thinking of it on a daily basis. Make practicing your habit and include it in your daily routine.

Remember, your baby step is the most crucial thing in order to make the biggest leap possible, so don't overwhelm by looking at the destination but focus on each stair.



# 17

## Chapter

Dr. Swadesh Sarkar is famous among students for his amazing skills in performing practicals. Sir's main interest lies in the fields of Mycology, Plant Pathology, Molecular Biology, Genetics, Ecology, Phytogeography, Gymnosperms and Embryology of angiosperms. In this article, Sir will guide you on how to excel in performing practicals.



## PRACTICALITY OF PRACTICALS

-Dr. Swadesh Sarkar

### Introduction:

Practical work in biology is crucial for several reasons. It allows students to apply theoretical knowledge gained in lectures and textbooks to real-life situations, promoting a deeper understanding of biological concepts. Practical work also helps develop essential scientific skills, such as critical thinking, problem-solving, experimental design, data analysis, and communication.



**Students can apply these following methods in their preparatory phase, to enhance their practical skills.**

**1. Concept Clarity:** Memorising one or two experiments might be okay but memorising all the experiments in the syllabus might lead to a disaster. Therefore, students must try to understand the concept behind the experiment. Once you are familiar with the conceptual base,

you would be able to understand the principle and put it down well. This will also help you answer the viva voce questions correctly and confidently.

**2. Procedure/ Methodology:** Procedure is very important for any experiment. Each step is important and should not be missed. Therefore, students must try to make sure that they have read through the all experiment methodologies well. While going through each experiment procedure, students should try to recall how they did it in their classes. In case you are not able to recall well, you can even refer to online experiment tutorial videos which will help you recall it. Once you recall how you had performed the experiment earlier, you will be able to smoothly write it down without any hard work to memorise it by heart.



**3. Diagram practise:** Not everyone is good at drawing diagrams, examiners know it. So do not worry about drawing perfect looking artistic diagrams. All you need to do is draw clean and correct figures representing all essential materials, procedures and products. For example, your diagram of a section of a leaf should contain the important details, like the epidermis, stomatal pores, cuticular layers, meristematic zone and so on. You will be evaluated based on the information illustrated and not the fine art skills. Thus, practise drawing neat diagrams in the given time can prove very useful.



**4. Prepare your senses:** Our cognitive abilities and all our senses work best when well rested. Performing well in practical exams is very important and stressing over it or going sleepless in the exam hall will not help you score more. It will only hamper your performance. Not being well rested and calm can lead you to make silly mistakes and lose marks. Therefore, students must get full sleep, eat healthy and go into the examination hall with confidence of performing well and trusting themselves.



### Conclusion:

As it is quoted in Bhagabata Geeta:

कर्मण्येवाधिकारस्ते मा फलेषु कदाचन।  
मा कर्मफलहेतुर्भूर्मा ते सङ्गोऽस्त्वकर्मणि॥  
2.47॥

Only your perseverance and focus are the Secret of Success.

# 18

## Chapter

Dr. Anubhab Laha is famous among students for his amazing strategies to score better in university exams. Dr. Laha has received the prestigious gold medal in both of his bachelor's and master's degrees. Being a student of core science, we often feel lost and nervous before our university exams as to what to revise and how to revise. In this article, sir will guide the students on how to prepare for the university exams and how to score well. Sir's main interest lies in the field of bioinformatics. Allergy Cell biology and microbiology And Immunology



## UNIVERSITY EXAMINATION: THE KEYSTONE OF ACADEMIC MASTERY

*-Dr. Anubhab Laha*

University examinations have long been a fundamental component of higher education, serving as a critical measure of a student's understanding and proficiency in their chosen field of study. These assessments are designed to evaluate the depth of knowledge, analytical skills, and ability to apply theoretical concepts to practical scenarios. Despite ongoing debates about their efficacy and fairness, university examinations remain a cornerstone of academic evaluation, offering both opportunities and challenges to students and educators alike. University examinations are a crucial part of the academic experience, and they come in various formats, including essay examinations and multiple choice examinations.

### The Purpose of University Examinations:

The primary purpose of university examinations is to assess students' grasp of course material. They provide a structured opportunity for students to demonstrate their learning and comprehension of the subjects studied over a semester or academic year. Examinations are designed to measure various cognitive skills, including recall, analysis, synthesis, and application of knowledge. This multifaceted evaluation helps ensure that students not only memorize information but also understand and can utilize it in real-world contexts.

Examinations also serve as a feedback mechanism for both students and instructors. For students, exam results can highlight areas of strength and pinpoint topics that require further study, guiding their future learning efforts. For instructors, exam performance can reveal the effectiveness of their teaching methods and indicate whether adjustments are needed to improve comprehension and engagement.

### Types of University Examinations

University examinations come in various forms, each with distinct advantages and challenges. Common types include:

- 1. Written Examinations:** These are the most traditional form of assessment, encompassing multiple-choice questions, short answers, and essays. Written examinations are effective in testing a broad range of knowledge and can be administered to large groups of students simultaneously.
- 2. Oral Examinations:** Oral examinations involve face-to-face interactions between students and examiners. They test a student's ability to articulate their knowledge clearly and respond to questions on the spot, which can be particularly valuable in fields requiring strong communication skills.

**3. Practical Examinations:** Common in disciplines like the sciences, and engineering, the practical examinations assess students' abilities to perform specific tasks or experiments. These examinations are crucial for evaluating hands-on skills and real world problem-solving abilities.

**4. Take-Home Examinations and Assignments:** These assessments allow students to complete examinations outside the classroom, often with access to resources. They encourage in-depth research and critical thinking but also raise concerns about academic integrity.

## The Impact of Examinations on Students

Examinations can have a significant impact on students' academic and personal lives. The pressure to perform well can lead to stress and anxiety, which may affect mental health and overall well-being. The high stakes associated with university examinations often compel students to prioritize studying over other aspects of life, sometimes leading to an unhealthy balance. However, examinations also have positive effects. They can motivate students to consolidate their learning and engage deeply with course material. The process of preparing for examinations fosters discipline, time management, and a systematic approach to studying—skills that are valuable beyond the academic realm.

## Challenges and Criticisms

Despite their widespread use, university examinations are not without criticism. One major concern is that examinations may not always accurately reflect a student's abilities or potential. Factors such as exam anxiety, time constraints, and the pressure to perform can negatively impact performance, leading to results that do not truly represent a student's understanding or skills. Moreover, examinations often emphasize note memorization rather than critical thinking and creativity. This can lead to a narrow focus on passing examinations rather than fostering a genuine interest in learning and intellectual curiosity. Critics argue that alternative assessment methods, such as continuous assessment, project-based learning, and collaborative work, can provide a more holistic evaluation of student abilities.

## Strategies for Success in University Examinations

Success in university examinations requires a combination of effective study habits, time management, and mental preparedness. Here are several strategies that can help students excel in their university examinations:



### **I] Cultivate Good Study Habits**

**a. Organize Your Study Schedule:** Create a detailed study plan that outlines what subjects or topics you need to cover and allocate specific times for each. Break your study sessions into manageable chunks and spread them out over weeks or months rather than cramming at the last minute.

**b. Prioritize Your Work:** Identify the subjects or topics that you find most challenging and tackle them first. Spend more time on areas where you need the most improvement while ensuring you also review other subjects.

**c. Set Rewards:** Motivate yourself with small rewards after completing study sessions or achieving specific goals.

### **II] Avoid Cramming**

**a. Plan Ahead:** Don't wait until the last minute. Instead of cramming, allocate time throughout the semester to study.

**b. Quality Over Quantity:** Focus on understanding concepts rather than rote memorization. Cramming is counterproductive and increases stress.

**c. Consistent Effort:** Regularly review your notes, complete homework assignments, and create your own study guides.

**d. Stay Prepared Throughout the Semester:** Keep up with readings and assignments from the beginning of the course. Attend lectures and take thorough notes. Participate in discussion sections to absorb material better.

## **III] Active Learning Techniques**

**a. Summarize and Teach:** Summarize the material in your own words and try to explain it to someone else. Reinforcing your understanding through teaching is an effective strategy.

**b. Use Multiple Resources:** Don't rely solely on lecture notes. Use textbooks, online resources, videos, and study groups to get different perspectives on the material.

**c. Practice Problems:** For subjects that involve problem-solving (e.g., mathematics, physics), practice as many problems as possible. This will assist you in comprehending how concepts are applied.

**d. Create Flashcards:** Flashcards are useful for memorizing key concepts, terms, and definitions. Use them for quick reviews and self-testing.

## **IV] Effective Note-Taking**

**a. Take Clear and Organized Notes:** During lectures, take notes in a way that makes sense to you and is easy to review later. Use headings, bullet points, and highlight key information.

**b. Review and Revise:** Regularly review your notes to reinforce your memory. Revise and update them to include additional insights or clarifications.

## **V] Time Management**

**a. Set Goals and Deadlines:** Break your study plan into smaller tasks with specific goals and deadlines. This approach makes the workload feel more manageable and helps you stay on track.

**b. Prevent Procrastination:** Adhere to your study plan and stay away from distractions. Use tools like timers or apps to help you focus on your study sessions without interruptions.

## **VI] Practice Past Papers**

**a. Understand Exam Format:** Familiarize yourself with the format and types of questions that are typically asked in your examinations. Practice with past papers to get a sense of the style and difficulty of the questions.

**b. Timed Practice:** Simulate exam conditions by timing yourself while doing past papers. This will allow you to manage your time more effectively during the exam.

## **VII] Take Care of Your Health**

**a. Get Enough Sleep:** Adequate sleep is crucial for memory consolidation and cognitive function. Aim for 7-9 hours of sleep per night, especially before examinations.

**b. Eat Healthy:** To maintain steady energy levels, stick to a balanced diet. Steer clear of sweets and caffeine excess as these might cause energy dumps.

**c. Exercise Regularly:** Physical activity can reduce stress, improve concentration, and boost overall well-being. Incorporate regular exercise into your routine.

## **VIII] Manage Stress and Anxiety**

**a. Mindfulness and Relaxation Techniques:** Practice mindfulness, meditation, or deep-breathing exercises to manage stress and anxiety. These techniques can help you stay calm and focused during your studies and examinations.

**b. Remain Positive:** Have faith in your own abilities to succeed and keep an optimistic outlook. Positive self-talk and visualization can boost your confidence.

**c. Seek Support:** If you're feeling overwhelmed, talk to friends, family, or a counselor. Sometimes, sharing your concerns can lighten the mental load and provide new perspectives on managing stress.

## **IX] Prepare the Night Before:**

**a. Organize Materials:** Gather everything you need for the test the night before. This reduces stress on the test day.

**b. Get Adequate Sleep:** Prioritize sleep to think clearly during the exam and manage stress better.

**c. Visualize the Material:** Create mental images or diagrams related to the content. Visualization aids memory retention.

**d. Take Frequent Breaks:** Breaks help maintain focus and prevent mental fatigue. Use methods such as the Pomodoro technique, which involves 25 minutes of concentrated study time interspersed with a 5-minute rest.

**e. Say "no":** Visiting friends before the break can be tempting but try to limit your social activities before finals. Even though interacting with others helps reduce stress, cramming in last-minute study sessions can be quite taxing. Don't allow other factors



to interfere with your study regimen.

## **XI Exam Day Strategies**

**a. Stay hydrated:** Bring a bottle of water to the exam. If it's really hot, and especially if it's a long paper, up it to a 750ml bottle! Make sure to put it in the fridge the night before so it's nice and cool for exam day.

**b. Arrive Early:** Arrive at the exam venue early to settle in and reduce anxiety. Make sure you have all the necessary materials (e.g., pens, calculators, ID).

**c. Read Instructions Carefully:** Take a few minutes to read the instructions and questions carefully before you start. Ensure you understand what is required for each question.

**d. Time Management During the Exam:** Allocate time for each question based on its marks. Don't spend too much time on one question; if you're stuck, move on and come back if you have time.

**e. Review Your Answer:** If time permits, review your answers to check for any mistakes or incomplete responses.

By implementing these strategies, students can enhance their preparation and performance in university examinations, leading to academic success and greater confidence in their abilities. Remember, university examinations are not just about regurgitating information; they test your ability to think critically, synthesize knowledge, and communicate

effectively. With proper preparation and a clear approach, you can excel in university Examinations!

## **Managing Time Effectively During University Examinations**

Managing time effectively during university examinations is crucial for maximizing performance and ensuring that you can answer all questions to the best of your ability. Here are several strategies to help you manage your time efficiently during examinations:



## **I Before the Exam**

**a. Understand the Exam Format:** Familiarize yourself with the format of the exam, including the number and types of questions (e.g., multiple-choice, short answer, essays) and their respective marks.

**b. Plan Your Time Allocation:** Based on the total exam duration and the marks assigned to each question, plan how much time you can spend on each section or question. Typically, allocate more time to questions that carry more marks.

## **II Practice Time Management**

**a. Simulate Exam Conditions:** Practice answering past exam papers under timed conditions. This will help you get used to managing your time and reduce anxiety on the actual exam day.

**b. Self-Timing:** While studying, time yourself answering individual questions or sections to improve your speed and efficiency.

**c. Be Flexible and Realistic:** You might not be able to do everything you planned to achieve in a given day due to unanticipated situations or other reasons. Have self-compassion when things don't go as planned. Be honest with yourself about your ability to complete tasks and leave extra time in your calendar, timetable, and priority list if you're not sure. This may lessen impediments and possible conflict. Effective time management involves more than just adhering to a strict routine; it also involves allowing room for flexibility.

## **III At the Start of the Exam**

**a. Read All Instructions Carefully:** Spend the first few minutes reading the exam instructions and all the questions thoroughly.

**b. Read All Questions First:** As soon as you receive the question paper, take a moment to read all the questions thoroughly. Verify that you comprehend the questions posed by each one. This helps you understand the scope of the exam and plan your approach.

**c. Create a Quick Plan for your Answers in the First 5 Minutes:** Use the initial five minutes of your exam time to read the entire question paper carefully. Identify the questions you feel confident about and those that require more thought. Quickly jot down a rough plan on how you will allocate your time. This plan should include the order in which you will answer the questions and the time you will spend on each one.

Planning your answers upfront prevents confusion later on.

**d. Buffer Time:** Reserve a few minutes at the end for reviewing and revising your answers.

#### IV] While Answering Questions

**a. Start with Easier Questions:** Begin with the questions you find easiest or are most confident about. This will help build your confidence and ensure you secure those marks quickly.

**b. Stick to Your Time Allocation:** Keep an eye on the clock and stick to your planned time allocation for each question. If you exceed the time limit for a particular question, move on to the next one and come back to it if you have time at the end.

**c. Use a Watch or Clock:** Use a wristwatch or a clock to monitor your time. Divide the total time by the number of questions to ensure you're staying on track.

#### V] Handling Difficult Questions

**a. Avoid Being Stuck:** If you come across a challenging question, try not to linger on it for too long. Make a quick note to return to it later and move on to other questions.

**b. Answer What You Can:** Even if you're unsure about a question, write down what you know. Partial answers can still earn you marks.

#### VI] Writing Efficiently

**a. Be Concise:** For essay and short answer questions, be clear and concise. Stick to the point and avoid unnecessary details. This will save time and make your answers easier to read.

**b. Use Bullet Points:** Where appropriate, use bullet points or numbered lists to organize your answers. This can help you convey information quickly and clearly.

**c. Before you require new scripts, request them:** Waiting for the invigilator to hand you the additional answer scripts during an exam can be very annoying. While you are writing on the last sheet, raise your hand if you think you will need extra paper in the next few minutes.

**d. Avoid leaving the exam room early:** It is tempting to get out of the exam room as soon as possible. But fight against it! Reread your response sheet while seated. Verify if you have answered all the questions. Verify the spelling and rephrase any confusing terms. You can get higher marks in the last few minutes, for sure !

**e. If you make a mistake:** If you have given the incorrect answers, misunderstood the questions, or committed any other error, do not become alarmed! Rather, type the updated or different response in bullet points. Put down as much information as you can. Underline the keywords in your answer.

#### VII] Review and Edit

**a. Leave Time for Review:** Try to finish answering all questions with some time left at the end for review. Use this time to check for any mistakes, incomplete answers, or questions you may have skipped.

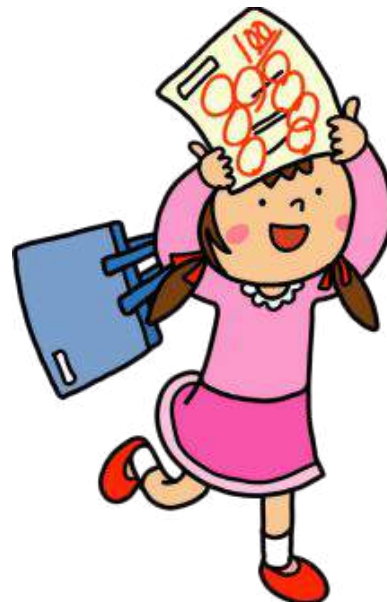
**b. Proofread Your Answers:** Look for any errors in spelling, grammar, or calculations. Ensure your answers are as clear and accurate as possible.

#### VIII] Stay Calm and Focused

**a. Stay Calm:** If you start to feel anxious, take a few deep breaths to calm yourself. Staying calm will help you think more clearly and manage your time better.

**b. Stay Focused:** Concentrate on the task at hand. Avoid looking around or getting distracted by other students.

**Effective time management during university examinations can significantly impact your performance and outcomes. By planning ahead, staying organized, and practicing these strategies, you can ensure that you allocate your time wisely, reduce stress, and improve your chances of success. Good luck with your examinations!**



### **The Future of University Examinations**

The landscape of university examinations is evolving, influenced by technological advancements and changing educational philosophies. Online examinations and digital assessment tools are becoming increasingly prevalent, offering greater flexibility and accessibility. These tools can provide immediate feedback, adaptive testing, and a more personalized assessment experience. In addition, there is a growing emphasis on integrating formative assessments that support ongoing learning rather than solely relying on high-stakes examinations. This approach aims to create a more balanced and supportive educational environment, where assessments are used as tools for learning rather than merely measures of performance.

### **Conclusion**

University examinations are a vital aspect of higher education, serving as a key indicator of academic proficiency and a catalyst for student learning. While they present certain challenges and face valid criticisms, examinations remain an important tool for measuring knowledge, skills, and readiness for professional life. As education continues to evolve, so too will the methods of assessment, striving to create more effective, fair, and holistic ways to evaluate student learning and achievement.

Remember, success in examinations isn't just about memorization—it's about understanding, critical thinking, and effective preparation. Best of luck!

## 19

## Chapter

## Ph.D. JOURNEY: DEBUNKING MYTHS, FACING REALITIES, AND OVERCOMING CHALLENGES

-Dr. Anubhab Laha

Pursuing a Ph.D. is often seen through a lens of prestige and scholarly achievement. However, this journey is also fraught with misconceptions and grounded in various realities that shape the experiences of doctoral candidates. Understanding these myths and the actual landscape of Ph.D. studies can provide a clearer picture of what aspiring researchers can expect.



### Why Pursue a Ph.D.?

1. **Intellectual Growth:** A Ph.D. allows deep exploration of a subject, fostering intellectual growth.
2. **Research Skills:** Develop critical research skills, including data analysis, problem-solving, and hypothesis testing.
3. **Career Advancement:** A Ph.D. enhances career prospects, especially in academia and research-oriented roles.
4. **Contribution to Knowledge:** Contribute to existing knowledge by publishing research papers and dissertations.
5. **Passion and Curiosity:** Pursue your passion and curiosity in a structured Environment.

### The Realities of Obtaining a Ph.D.

Aspiring Ph.D. students face a variety of challenges during their research journey, from funding and infrastructure issues to administrative hurdles and mental health concerns. By proactively addressing these complications through strategic planning,

effective time management, and seeking support from available resources, students can navigate their doctoral studies more successfully. Institutions also have a crucial role in creating a supportive environment that fosters high-quality research and the well-being of their Ph.D. Scholars.



**A. Rigorous and Time-Consuming:** The journey to a Ph.D. is long and demanding, often taking 4-6 years or more to complete. It involves extensive research, coursework, comprehensive exams, and the completion of a dissertation. Time management and sustained effort are essential.

**B. Variable Quality of Supervision:** The quality of mentorship can significantly impact the Ph.D. experience. Effective guidance and support from supervisors are crucial, but not all Ph.D. candidates receive adequate mentorship. Building a good relationship with advisors and seeking multiple mentors can be beneficial.

**C. Funding Challenges:** Securing funding is a common challenge for Ph.D. students. Scholarships, fellowships, and assistantships are available but competitive. Financial stability can influence the ability to focus on research, and lack of funding can prolong the duration of the Ph.D.

**D. Research Infrastructure:** Access to research facilities and resources varies widely between institutions. Top-tier universities typically offer better infrastructure, but many students face limitations in terms of lab space, equipment, and access to academic journals.

**E. Mental Health Concerns:** The Ph.D. journey can be stressful, leading to mental health issues such as anxiety and depression. The pressure to publish, meet deadlines, and uncertainty about future careers can impact well-being. Awareness and support services are improving, but challenges remain.

**F. Administrative and Bureaucratic Hurdles:** Ph.D. students often encounter administrative and bureaucratic challenges, including complex regulations, extensive paperwork, and slow administrative processes. These hurdles can cause delays and add to the overall stress.

**G. Need for Self-Motivation and Discipline:** Ph.D. candidates must be highly self-motivated and disciplined. Unlike structured undergraduate programs, Ph.D. research requires setting personal goals, managing time effectively, and maintaining momentum independently.

The journey to obtaining a Ph.D. is both challenging and rewarding, filled with misconceptions and grounded realities. Dispelling the myths and understanding the true nature of doctoral studies can help aspiring research scholars prepare better and navigate their academic paths with realistic expectations. While the road is arduous, the skills, knowledge, and experiences gained through a Ph.D. program are invaluable and can lead to diverse and fulfilling career opportunities.

The Impact of the Challenges Faced while Pursuing a Ph.D. is often seen as the pinnacle of academic achievement, but the journey is surrounded by numerous challenges. Understanding these challenges and the corresponding impacts can help aspiring research scholars make informed decisions about their educational paths.

## **II. Work-Life Balance:**

**Challenge-** Balancing research, coursework, teaching responsibilities (if any), and personal life can be overwhelming.

**Impact-** Stress, burnout, and health issues may arise if students don't manage their time effectively.

## **III. High Expectations and Pressure:**

**Challenge-** Ph.D. students often face high expectations from themselves, their families, and their academic institutions.

**Impact-** The pressure to publish, present at conferences, and meet deadlines can lead to anxiety and self-doubt.

## **IV. Isolation and Loneliness:**

**Challenge-** The solitary nature of research can make Ph.D. students feel isolated.

**Impact-** Loneliness can affect mental health and motivation.

## **V. Lack of Mentorship and Guidance:**

**Challenge-** Some students struggle to find effective mentors who provide consistent support and guidance.

**Impact-** Without proper mentorship, students may feel directionless or encounter roadblocks in their research.

## **VI. Bureaucratic Hurdles:**

**Challenge-** Dealing with administrative processes, paperwork, and university regulations can be frustrating.

**Impact-** Time spent navigating bureaucracy takes away from valuable research hours.

## **VII. Publishing Pressure:**

**Challenge-** The pressure to publish in reputed journals is immense.

**Impact-** Students may rush to publish without ensuring the quality of their work.

## **VIII. Inadequate Infrastructure and Facilities:**

**Challenge-** Some universities lack state-of-the-art facilities, libraries, and research resources.

**Impact-** Limited access to resources affects the depth and breadth of research.

## **IX. Job Market Uncertainty:**

**Challenge-** Uncertainty about job prospects after completing a Ph.D.

**Impact-** Students may worry about finding suitable academic positions or transitioning to industry roles.

*Remember, while these challenges exist, proactive strategies, support networks, and resilience can help Ph.D. students overcome them and thrive in their academic journey. Ways to Overcome the Complications Faced During Research Work by Aspiring Ph.D. Students*

Aspiring Ph.D. students often encounter several challenges during their research journey. Understanding these complications and adopting effective strategies to overcome them can significantly enhance their doctoral experience and outcomes.



## **[1] Funding Issues:**

**Complication-** Securing adequate funding is a major challenge. Many Ph.D. students struggle with insufficient financial support, which can impact their ability to focus on research. Funding can, at times, be insecure. It has been known, for example, for funding to be reduced while still in the middle of the PhD. There can be delays in disbursement of fellowships.

**Solution-** This is a precarious position to be left in and it can be extremely stressful to secure new funding. Supervisors ought to be available to assist with this, ideally. They are available to provide advice, thus one should never hesitate to ask them. However, it's also advised that students keep a small amount of cash on hand in case of emergencies. Students should actively seek scholarships, fellowships, and grants from governmental and non-governmental organizations. Additionally, they can explore teaching or research assistantships within their institutions. Budget wisely and plan for contingencies. Networking and collaborating on funded projects with established researchers can also provide financial support.

## **[2] Isolation:**

**Complication-** Ph.D. researchers often work independently, which can lead to feelings of isolation.

**Solution-** Attend seminars, workshops, and conferences. Collaborate with peers, join research groups, and participate in academic discussions. Networking helps combat isolation.

## **[3] Work-Life Balance:**

**Complication-** It sometimes seems like PhD students are expected to study all the time; to be in the office every weekend and to work late every day. Many Ph.D. students work long hours, affecting their work-life balance.

**Solution-** Set boundaries. To perform at your best, you also need time for friends, family, and hobbies. Allocate time for research, personal life, and relaxation. Regular breaks and hobbies are essential for maintaining balance. Cultural events, frequent exercise, and a strong social life will all be enjoyable and stimulating. And, they're likely to make you happier. Even though you might not think about —happinessll when considering your goals for studying, you surely deserve some now and then.

## **[4] Academic Coursework:**

**Complication-** Balancing coursework and research can be demanding.

**Solution-** Organize your schedule. Prioritize research tasks while fulfilling coursework requirements. Seek guidance from professors when needed.

## **[5] Inadequate Research Infrastructure**

**Complication-** Access to modern research facilities and resources is limited in many institutions. This can hinder the quality and scope of research.

**Solution-** Students should utilize available resources efficiently and seek collaborations with other institutions that have better facilities. Applying for grants specifically aimed at improving infrastructure and leveraging online databases and libraries can also help mitigate this issue.

## **[6] Bureaucratic and Administrative Hurdles:**

**Complication-** Navigating through bureaucratic processes, including lengthy paperwork, rigid regulations, and slow administrative responses, can delay research progress.

**Solution-** Staying well-organized and maintaining good communication with administrative staff can help manage these challenges. Building relationships with faculty and staff members can expedite processes. Keeping thorough records of all communications and documentation is also advisable.

## **[7] Lack of Effective Mentorship:**

**Complication-** Inconsistent or inadequate supervision can leave students without the necessary guidance and support, affecting the quality and direction of their research. Some students encounter delays in completing their research due to problems with their guides. Improper guidance or conflicts with supervisors can hinder progress.

**Solution-** Maintain open communication with your guide. Seek clarity on expectations, research goals, and milestones. Regular meetings can help address issues promptly. Proactively seeking feedback and maintaining regular communication with supervisors can improve the mentorship experience. Students should also seek additional mentors or advisors who can provide diverse perspectives and guidance.

## **[8] Limited Access to Current Literature:**

**Complication-** Access to the latest research papers and academic journals is often restricted due to subscription costs.

**Solution-** Utilizing open-access journals and repositories, inter-library loan services, and institutional subscriptions can help access necessary literature. Networking with researchers from institutions with better access and using platforms like ResearchGate and Academia.edu to request copies of papers directly from authors are also effective strategies.

## **[9] Balancing Research with Teaching Responsibilities:**

**Complication-** Many Ph.D. students have to juggle their research work with teaching duties, which can be time-consuming and exhausting.

**Solution-** Effective time management and prioritizing tasks are crucial. Creating a balanced schedule that allocates specific times for research, teaching, and personal activities can help maintain productivity. Delegating tasks and seeking support from peers can also alleviate the workload.

## **[10] Mental Health Challenges:**

**Complication-** Academic pressure, uncertainty about the future, and stress associated with Ph.D. studies can lead to mental health issues such as anxiety and depression.

**Solution-** Prioritize self-care. Engage in physical activity, practice mindfulness, and seek professional counseling if needed. Connecting with fellow Ph.D. students can also provide emotional support.

Maintaining a healthy work-life balance, engaging in regular physical activity, and practicing mindfulness or relaxation techniques can help manage stress. Seeking support from counseling services, peers, and mentors is also important. Institutions should be proactive in providing mental health resources and creating a supportive environment.

## **[11] Research Integrity and Ethical Issues:**

**Complication-** Ensuring research integrity and adhering to ethical standards can be challenging, particularly in environments where these practices are not strictly enforced.

**Solution-** Familiarizing oneself with ethical guidelines and best practices in research is essential. Attending workshops and seminars on research ethics, and seeking advice from experienced researchers can help maintain high standards of integrity. Institutions should also provide clear policies and support for ethical research practices.

**Remember that perseverance, resilience, and seeking support are crucial during your Ph.D. journey. Every obstacle presents a chance for development and education.**

## **Myths Surrounding Ph.D.**

### **[1] Ph.D. is Only for Academics:**

**Myth-** One prevalent myth is that a Ph.D. is solely for those who wish to pursue a career in academia.

**Reality-** While a significant number of Ph.D. graduates do end up in academic roles, a doctorate also opens doors to various sectors including industry, government, and non-profit organizations. Ph.D.s contribute to various fields—industry, policy-making, and innovation. Ph.D. holders are valued for their advanced research skills, critical thinking, and expertise in specialized fields, making them suitable for roles in research and development, consulting, policy making, and more.

### **[2] Quality of Relationship with Ph.D. Guides:**

**Myth-** Many assume that the relationship between Ph.D. students and their guides is always positive and supportive.

**Reality-** There have been reports of limited bonding and negative relationships between Ph.D. students and their guides. Some students may struggle to establish a strong connection with their guides, affecting their overall experience.

### **[3] Ph.D. Guarantees a High-Paying Job:**

**Myth-** Completing a Ph.D. ensures a high-paying, prestigious job immediately after graduation. Many believe that obtaining a Ph.D. guarantees a lucrative career.

**Reality-** While a doctorate can enhance career prospects, it does not automatically lead to high-paying jobs. The job market for Ph.D. holders is competitive, and salaries can vary widely depending on the field of study, industry, and geographic location. Academia often offers modest compensation compared to industry positions, and the availability of high-paying jobs may be limited to certain fields.

### **[4] Only Geniuses Pursue PhDs:**

**Myth-** Another myth is that only exceptionally intelligent individuals can pursue a Ph.D.

**Reality-** While intellectual capability is important, the qualities that truly matter are perseverance, curiosity, and dedication. The Ph.D. journey is rigorous and demands sustained effort and commitment, but it is within reach for anyone with a strong interest in research and the ability to work independently. Success in a Ph.D. program relies more on perseverance, dedication, and hard work rather than sheer intelligence. The ability to conduct sustained, independent research and the resilience to overcome setbacks are crucial attributes.

### **[5] Ph.D. Research is Always Groundbreaking:**

**Myth-** Ph.D. research must result in groundbreaking discoveries to be considered successful. There is a common misconception that Ph.D. research must always result in groundbreaking discoveries.

**Reality-** While some Ph.D. projects do lead to significant advancements, many contribute incrementally to existing knowledge. The value of a Ph.D. lies in the development of research skills and the ability to conduct independent, systematic inquiry, even if the results are not revolutionary.

### **[6] Ph.D. involves Endless Research:**

**Myth-** Many believe that a Ph.D. involves endless research with no end in sight.

**Reality-** While research is a significant part, a Ph.D. program also includes coursework, seminars, and skill development.

### **[7] Lack of Career Prospects:**

**Myth-** Some think that a Ph.D. limits career options. Many PhD students worry not only about their current projects but also about their future.

There is no assurance that obtaining a PhD would result in a desired career in the current uncertain employment market, despite the fierce competition for academic posts.

**Reality-** A Ph.D. opens doors to academia, industry, research, consulting, and entrepreneurship. It's about specialized knowledge and critical thinking. Empirical evidence suggests that obtaining a PhD significantly boosts one's chances of being awarded one. Additionally, it raises your chances of receiving a raise and having a more fulfilling career. It makes sense to get started on the job hunt as soon as possible to help ensure you get to experience all of these rewards.

### **[8] Ph.D. has a Lengthy Duration:**

**Myth-** People believe that a Ph.D. takes forever.

**Reality-** While it's not a short journey, structured programs, and efficient planning can help complete it in a reasonable time.

### **[9] Ph.D. Candidates Work Alone:**

**Myth-** Ph.D. research is a solitary endeavor with minimal interaction with others. People assume that Ph.D. students are isolated in their labs or libraries.

**Reality-** While independent work is a significant component, Ph.D. candidates often collaborate with advisors, peers, and other researchers. Collaboration and networking are essential. Attending conferences, and workshops, and participating in research groups are integral parts of the doctoral experience.

## **Realities of Pursuing a Ph.D.**

**i. Institutional Variability:** Different universities provide Ph.D. programs of varying caliber. Prestigious institutions like the Indian Institutes of Technology (IITs), Indian Institutes of Science Education and Research (IISERs), and central universities often provide better research facilities, funding opportunities, and mentorship compared to lesser-known institutions. Prospective Ph.D. candidates must carefully evaluate the institutions and their specific programs before applying.

**ii. Funding Challenges:** Securing adequate funding is a critical aspect of the Ph.D. journey. While scholarships and fellowships are available from various governmental and non-governmental organizations, they are often competitive and limited. Many Ph.D. students rely on teaching assistantships or research assistantships for financial support, which may not always be sufficient to cover all expenses.



**iii. Supervisory Support:** The relationship with a Ph.D. supervisor can significantly influence the doctoral experience. Effective mentorship, guidance, and support from supervisors are crucial for the successful completion of a Ph.D. However, not all supervisors provide the necessary support, and mismatches in expectations can lead to frustration and delays in the research process.

**iv. Research Infrastructure:** Access to state-of-the-art research infrastructure and resources varies across institutions. While top-tier institutions are well-equipped with modern laboratories, libraries, and digital resources, others may struggle with outdated facilities and limited access to journals and databases. This disparity can impact the quality and scope of research.

**v. Administrative and Bureaucratic Hurdles:** Ph.D. students often face administrative and bureaucratic challenges, including cumbersome paperwork, rigid regulations, and delayed responses from university authorities. These hurdles can add to the stress and extend the duration of the Ph.D. program.

**vi. Mental Health Concerns:**

The Ph.D. journey can be isolating and stressful, leading to mental health issues such as anxiety and depression. The pressure to publish, meet deadlines, and the uncertainty about future career prospects can take a toll on students' well-being. Institutions are gradually recognizing this issue and starting to provide mental health support services, but these resources are still limited in many places.

### Conclusion

Pursuing a Ph.D. involves navigating a landscape marked by both opportunities and challenges. Dispelling myths and understanding the realities can help prospective Ph.D. candidates make informed decisions about their academic futures. While the journey demands hard work, resilience, and a strategic approach to overcoming challenges, it also offers a profound opportunity for intellectual growth, professional development, and contribution to knowledge. With the right preparation and mindset, aspiring researchers can successfully embark on and complete their doctoral studies.



Remember, a Ph.D. is a rewarding journey that combines passion, perseverance, and intellectual curiosity. It's about debunking myths and embracing the reality of scholarly pursuit!

# 20

## Chapter

Dr. Gautam Ganguly is one of the most calm and composed personalities in the department. Professor Ganguly carries a positive aura around him everywhere. Sir's main interests lie in the fields of pteridology and plant taxonomy. In this article, Sir will guide students about the future of botanical sciences based on the recent development of artificial intelligence and the importance of book reading in an era of touch screens.



## Future of Botany

*-Dr. Gautam Ganguly*

The B.Sc. Honors in Botany Syllabus focuses on the specialized scientific study of Plants groups like, Algae, Fungi, Bryophytes, Pteridophytes, Plant Taxonomy, and covers subjects like Plant Physiology and Plant Anatomy etc.

Students gain skills and knowledge, which they can apply to do the Botanical research in areas such as Agriculture, Forestry, Horticulture, Plant Breeding, Environmental Science and Genetic Modification of Plants etc.

After completing B.Sc. in Botany Honours, a student may go for a Master's Degree or go for different industries specified for Botany students. These graduates have diverse job opportunities in both Government and Private sectors.

### **SCOPE FOR HIGHER STUDIES IN BOTANY:**

1. Plant Pathology
2. Biotechnology
3. Plant Genetic Engineering
4. Industrial and Environmental Biotechnology
5. Microbiology
6. Biochemistry
7. Bioinformatics and computational Biology
8. Herbal Science
9. Environmental Science
10. Genetics
11. Marine biology
12. Molecular Biology

### **JOBS & CAREER OPTIONS:**

This course provides following multiple options after successful completion

1. Career in Educational Institutions
2. Career as a researcher / scientist in highly reputed research institutes in India as well as abroad
3. Career in National and State agencies and various Industrial sectors.
4. Career at State Forest Services / Indian Forest Services.

With additional training and experience, a botanist can work in plant-related industries:

1. Pharmaceutical companies,
2. Seed Companies,
3. Biotechnology Firms,
4. Biological supply houses,
5. Botanical illustrators in Scientific Publishers
6. Food Science & Technology

Dr. Suchandra Sett Naidu, is a veteran professor of the botany department. Dr. Naidu has two patents regarding plant based compound purification. She is famous among students for her generosity, and her constant support in every stages of their journey. She has a keen interest in exploring various alternatives to fossil fuels as currently prevailing resources are limited. In this article she will share glimpses from her quest.



## BIODIESEL: AN ALTERNATIVE OF FOSSIL FUEL

-Dr. Suchandra Sett Naidu

Fossil fuel being a limited resource is set to perish in the coming years. Amidst the increasing fuel demands, biodiesel is set to make an appearance in the industry. Biodiesel refers to a vegetable oil or animal fat-based diesel fuel consisting of long-chain alkyl (methyl, propyl, or ethyl) esters. Biodiesel is typically made by chemically reacting lipids [e.g., vegetable oil, animal fat (tallow)] with an alcohol. It is an alternative clean-burning renewable fuel similar to conventional diesel. It is produced using animal fats, vegetable oils, and waste cooking oil. Due to its biodegradable nature, it is used as a replacement for fossil diesel fuel. It can also be mixed with petroleum diesel fuel in any proportion.

### Important Features of Biodiesel:

- 1) Biodegradable and Renewable Fuel.
- 2) Safer to use and has low toxicity compared to fossil diesel fuel.
- 3) Lower exhaust emission rate than normal diesel fuel.
- 4) As per ASTM D 6751 quality parameters, the quality of diesel is analyzed.
- 5) Using biodiesel doesn't require any diesel engine modification.

### Production:

Biodiesel is produced from tallow, vegetable oil or animal fat, and waste oils. There are three stages of this transformation of oil and fats to biodiesel.

- a) Transesterification of the oil in which it is base-catalyzed.
- b) The direct acid-catalyzed transesterification
- c) Finally conversion of oil to fatty acid and then the formation of biodiesel.

The production of biodiesel involves a chemical reaction. This chemical reaction is known as **transesterification**.

Transesterification is the chemical process, which converts natural fats and oils into Fatty Acid Methyl Esters (FAME) or Biodiesel. Some of the major sources of suitable oil (to make biodiesel) come from crops like palm, soybean or rapeseed. High-quality biodiesel is made from rapeseed, but nowadays most of the biodiesel is produced from waste vegetable oils obtained from chip shops, restaurants, and industrial food producers.



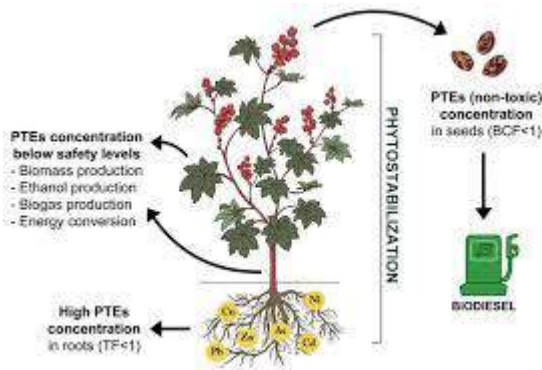
*Jatropha gossypifolia L.*

### Benefits of Biodiesel:

- 1) Biodiesel and biodiesel blends are used in almost all diesel engines and vehicles.
- 2) It is a carbon-neutral liquid, which means that the combustion of biodiesel never produces the net output of carbon in the form of carbon dioxide like other mineral diesel.
- 3) In 2007, British Royal Train ran its train with 100% biodiesel fuel.
- 4) Used as heating oil – In many commercial & domestic boilers, biodiesel is also used as heating fuel

## Future of Biodiesel:

Over the next five years biofuel demand is set to expand 38 billion litres, a near 30% increase from the last five-year period. In fact, total biofuel demand rises 23% to 200 billion litres by 2028, with renewable diesel and biojet accounting for almost half of this growth with the remainder coming from ethanol and biodiesel.



## India's position in Biodiesel industry:

India is now the world's third largest producer and consumer of ethanol thanks to nearly tripling production over the past five years. It has potential to expand further with the right policies, keeping costs in check and securing sustainable feedstocks. In 2018 India released its National Policy on Biofuels which set blending targets for ethanol (20% blending by 2030) and biodiesel (5% by 2030), feedstock requirements for different fuels and laid out the responsibilities of 11 ministries to coordinate government actions. Beyond blending targets, India established guaranteed pricing, long-term ethanol contracts, and technical standards and codes. Financial support for building new facilities and upgrading existing ones was also provided. Buoyed by its success, the Government moved the 20% volume blending target for ethanol forward by 5 years to 2025-26, which was enshrined in an updated National Policy on Biofuels in 2022.

## Conclusion:

Biodiesel is no longer a fringe idea of a few scientists in a few countries but has gained worldwide acceptance. India has been playing a leading role in biodiesel technology as is evident from the first successful trial run of the Delhi Amritsar Shatabdi express using biodiesel (B5) on December 31, 2002.

Alternative fuels for diesel engines have attracted more and more attention in the auto fuel market due to the depletion of fossil fuels in the world market stock and worsening of air pollution caused by fossil fuel-based vehicles. As early as 1900, straight vegetable oil (SVO) had already been used directly for operating diesel engines. The carbon deposits and thickening of lubricating oil occur in the engine from the use of raw vegetable oil as fuel mainly due to its high viscosity, low volatility, and polyunsaturated hydrocarbon character, as well as its gum formation characteristics due to oxidation and polymerization and this has led to the use of raw vegetable oil being discouraged for engine operation. This has resulted in efforts at improving the viscosity of vegetable oil by blending, pyrolysis, and emulsification, etc. An alternative way to make best use of vegetable oil in the existing diesel engine is to convert the oil into mono alkyl ester through the transesterification process. Transesterification is a reaction between triglycerides and alcohol in the presence of catalyst to produce glycerol and mono alkyl esters. The molecular weight of a typical ester molecule is roughly one third that of a typical oil molecule and, therefore, it has very low viscosity. The introduction and commercialization of biodiesel in many countries around the world has been accompanied by the development of standards such as ASTM D6751 and European standard



The cultivation of Jatropha is getting more and more popular nowadays as the beliefs are developing around the terms, as Fossil fuel are guaranteed to perish one day, but biodiesel will continue to prevail. Biodiesel is set to be an eco-friendly alternative of fossil fuel.

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# *Departmental Events*



# 22

## Chapter

# Entrepreneurship Development Drive

Mushroom cultivation is a part of the skill enhancement course under the CBCS curriculum. The Department of Botany took initiatives aimed at fueling the entrepreneurial spirit in the students and educating the inquisitive minds to create a start-up culture that will not only help the students to learn their syllabus practically in a more efficient way but also equip them with small scale business ideas in mushroom cultivation.

Mr. Anujit Das from Earth star mushroom was the resource person of the event and guided the students about various processes used to propagate, grow and cultivate *Calocybe indica*, commonly known as the milky white mushroom which is used in the diet as a great source of protein and other nutritious elements.



# 23

## Chapter

# LPVD Classes for School Students

As a part of Institutional Social Responsibility (ISR), Chandernagore College organized a laboratory visit and practical demonstration for high school students to motivate them to join the basic science stream at the end of their secondary course.

The department of botany, being a practical-based subject, actively participated in the LPVD initiative.

Students from Kanailal Vidyamandir, Ushangini Balika Vidyalaya performed the following practicals under the guidance of Dr. Swadesh Sarkar and other esteemed faculties-

1. Identification of cell cycle stages from prepared slides
2. Cytoplasmic streaming in the leaves of *Hydrilla verticillata*



# 24

## Chapter

## Student's seminar

Communication is the key to any academic progress. The Botany department kept organising such events in 2023 where students got a chance to present a 10 minutes long powerpoint presentation.

The professors were actively present in the event and gave their valuable feedbacks. More such events are planned to be organised in the academic year 2023-24 as well.



*Soumi Nandi, a student of Sem-II delivering her presentation on Fungal reproduction*



*Souvik Hazra, a student of Sem-II explaining paraphyses- a reproductive apparatus present in fungi, ferns, bryophytes and some thallophytes*



“Wherever you find something extraordinary,  
you’ll find the fingerprints of a great teacher.”

— Arne Duncan

What are we even without our beloved professors ?

Just like the 7-methylguanosine (m7G) cap, an essential epitranscriptomic mark at the 5' terminus of eukaryotic mRNAs which plays the critical roles in mRNA stability, our teachers keeps us under their guidance .



*Students felicitating two of our beloved  
senior faculties:  
Dr. Brij kumar Tiwary  
Dr. Suchandra Sen Naidu*

# 26

## Chapter

# Gloriosa: The Wall Magazine

In 2023, students from the department of Botany took an innovative approach towards learning various complex concepts of Life sciences through diagrams and flowcharts.

Dr. Gautam Ganguly put the stepping stone of Gloriosa, the wall magazine. Students from semester II actively participated in the process and executed the massive project within a month.

The magazine highlighted a very interesting topic in Plant sciences; The Evolution Of Plants.



The principal, Dr. Debasis Sarkar inaugurating Gloriosa on the occasion of teachers' day, 2023.

*We cordially welcome everyone to come and visit the department.*

*Our students will love to guide you through the wall magazine!*

## *Creative corner*



“রোজ কত কী ঘটে যাহা তাহা  
এমন কেন সত্যি হয় না আহা।

ঠিক যেন এক গল্প হত তবে,  
শুনত যারা অবাক হত সবে...”

-রবীন্দ্রনাথ ঠাকুর

## IF I WERE A PLANT

-Dr. Gautam Ganguly

### The Sacred Connection between Tree and Hinduism:

Myself born in a Hindu Brahmin Family with a culture of respect to nature, means our original God, whose existence can be proved and whose bless is feels by everyone everyday every moment in the world. The dynamic component of the nature is the biotic components, and among the biotic components plants are the key components for the survival of the entire ecosystem.

Hindu religion from its ancient ages have a culture to respect trees, specifically large trees like Banyan Tree (*Ficus benghalensis*) and Pipal Tree (*Ficus religiosa*) for their greatness to serve the entire ecosystem for long period of time.

If I could be a plant for a day, I want to be the Great Banyan Tree

for the following reasons-

#### **Religious belief:**

Hinduism originated in India and is the world's third largest religion with over 1.2 billion followers. Regarded as one of the oldest religions, dating as far back as 7000 BCE, Hinduism holds sacred, ancient beliefs about nature, specifically regarding the religious significance of trees that I learn from my ancestors.

In the religious text known as Puranas, trees experience happiness and sorrow, have a conscience, and are living beings. Just like humans, trees are a part of samsara, also known as the cycle of life, death, and rebirth.

Stemming from the ancient Vedic religion, Hindus hold great reverence towards nature and believe trees are the origin of life. Trees hold high religious significance in Hinduism. In fact, every tree has a tree deity, or a god/goddess, who is to be worshiped, respected, and given offerings. The Pipal, a sacred fig, is likely the most worshiped tree in all of India. Lord Brahma, the Universe's creator, is associated with the tree's roots. Lord Vishnu, the world's protector, relates to the tree's trunk and Lord Shiva, the world's destroyer, links to the tree's leaves. Furthermore, the banyan tree, otherwise known as the tree of life, is a symbol of life and fertility. Hindu women who hope to have children worship the banyan tree and married women present offerings to the tree of life to pray for their husbands and sons to have long lives.



## Scientific:

We are all well aware of the environmental benefits of the Banyan Tree, but do you know that Banyan trees also have numerous medicinal benefits, from boosting immunity to preventing depression? Yes, you heard it right. Banyan tree leaves, aerial roots, and fruits are used in various forms for treating illnesses like diarrhea, tooth decay, gum diseases, vomiting, cholesterol and even diabetes.

In conclusion, the Great Banyan Tree stands not only as a botanical wonder but as a living testament to India's history, culture, and deep-rooted spirituality. Its enduring legacy continues to inspire awe and wonder in all who encounter its majesty. As we celebrate its existence on National Tree Day and beyond, let us also reflect on the larger message it conveys – the importance of interconnectedness, preservation, and harmony with nature.



## Living wonder:

Located in the **Acharya Jagadish Chandra Bose Indian Botanic Garden** in Kolkata, West Bengal, The Great Banyan Tree (*Ficus benghalensis*) is an enormous example of the Ficus species. Spanning over an astonishing 14,500 square meters, the tree's canopy spreads like a living green umbrella, making it one of the largest trees in the world. Astonishingly, it is not a single tree but a labyrinth of aerial roots that have grown from the main trunk, forming a vast interconnected network of branches.

## Timeless Legacy

The Great Banyan Tree has witnessed centuries of history and has been an integral part of Indian culture for generations. Its estimated age exceeds 250 years, with some experts suggesting that parts of it could be even older. This living legacy has stood witness to British colonial rule, and India's struggle for independence, and continues to flourish in the modern era.

## Symbolic Significance

The Banyan Tree holds a deep symbolic significance in Indian mythology and spirituality. According to Hindu beliefs, it is believed that Lord Vishnu, the preserver of the universe, resides in the roots of the Banyan Tree. It is also considered a symbol of immortality due to its ability to propagate through aerial roots that grow and give rise to new trunks even as the original trunk decays.

## Self Ecosystem:

The Banyan Tree plays a vital role in the environment by providing shelter, food, and protection to various forms of wildlife. Its vast canopy offers a haven for numerous bird species, insects, and small mammals.

Additionally, the tree's leaves are a vital food source for herbivores, while the figs it produces provide nourishment to fruit-eating animals, including birds and bats.

## Tourism over the years

The Great Banyan Tree has become a significant tourist attraction, drawing visitors from all over the world. The Indian Botanic Garden ensures that the tree remains accessible to tourists who wish to marvel at its grandeur and explore its intricate network of roots and branches.

## Conquering Adversity

Despite its resilience and long life, the Great Banyan Tree has faced numerous challenges throughout history. In 1925, it was struck by a cyclone, causing the main trunk to split.

However, the tree's extraordinary adaptive capabilities allowed it to recover and continue thriving. Moreover, the tree has been subject to extensive conservation efforts to protect it from pests and diseases.



## Paradise:

The Great Banyan Tree's ethereal beauty and unique structure make it a favorite subject for photographers and artists alike. The aerial roots cascading from the branches, the twisted trunks, and the green canopy create a mesmerizing sight that has been captured in countless photographs, paintings, and films.

## Inspiration to Mankind

Beyond photography, the Great Banyan Tree has inspired writers, poets, and artists throughout the ages. Its mystical aura and its role as a symbol of life and interconnectedness have found their way into Indian literature, folklore, and artistic expressions.

## Unity & Prosperity

The Great Banyan Tree's interconnectedness serves as a metaphor for the unity and diversity of India. Just as its aerial roots connect and support each other, India's strength lies in its ability to weave together people from diverse backgrounds and cultures, creating a rich tapestry of harmonious coexistence.

## Living Legend

The Great Banyan Tree teaches us valuable life lessons. Its adaptability, longevity, and ability to thrive despite challenges remind us of the importance of resilience and embracing change. It also emphasizes the significance of preserving our natural heritage and nurturing the environment for future generations.

# 28

## Chapter

### Just a Monologue: সক্রিয় সমাধি

“আমার ভিন দেশী তারা, একা রাতের ই আকাশে,  
তুমি বাজালে একতারা, আমার চিলেকোঠার পাশে,  
ঠিক সন্ধ্যে নামার মুখে, তোমার নাম ধরে কেউ ডাকে,  
মুখ লুকিয়ে কার বৃকে, তোমার গল্প বলো কাকে...”

## সক্রিয় সমাধি

-Avik Manna

সত্যিই তো ১ মাস হয়ে গেলো, তোমার কথা আর বলি ই বা কাকে, মা, তোমার তো আর দেখা নাই, আর এখন ১ মাস কাজ-বাজ ও কিছু নাই, কেনো যে মরতে ৩ মাসের ছুটি নিলাম কে জানে, গত ৬ বছর ধরে বাচাচ্ছিলাম ছুটি গুলো, একটা একটা করে। আর এখন দেখো, হেলায় হারাচ্ছি... লোকে বলে কেউ চলে গেলে সব কিছুই পাল্টে যায়, কিন্তু কই, তোমার গমনের ২ মাস হয়ে গেলো, তাও, এখনো, বাবার দেখা নেই। একবারও তো এলো না, বাড়িতে সে। ফোন করেছিলাম আমি কতবার, তোমার কোনো idea ও নেই, আর ঠিকই তো, প্রেম করে পালিয়ে বিয়ে করাকে, বিয়ে করা বলে নাকি। সে তো সমাজের কাছে unacceptable কান্ড, আর মা, তুমি দেখো, গাড়ি বাড়ি ছেড়ে এক ডাকে, তুমি বাবার সাথে চলে এসে ছিলে। (চোখের কোনে গড়িয়ে পড়া জল মুছে)

ওহ আপনারা, আসুন, আগের কথা গুলো শুনে একটু অবাক হয়েছেন বুঝি, তাহলে একটু বলি, নমস্কার, আমি সোহিনী সেন, আমার মা প্রতিমা সেন ২ মাস হল পরলোক গমন করেছেন, আর দেখুন না এই সব শ্রাদ্ধ এবং বাকি জোগাড় জাতের জন্য আমি বলে কয়ে, আমার ৬ মাসের ছুটির savings সব নিয়ে নিলাম, এখন regret করছি জানেন তো, প্রাইভেটের ছুটি তো, ছোটবেলায় মা বলত বটে, পড়াশোনা কর, পড়াশোনা কর, আমি সারা জীবনই আকাশের ঘুড়ি ছিলাম, একান দিয়ে ঢুকিয়ে, ওকান দিয়ে বেরিয়ে গেছে, (মুচকি হাসি) এখন রিগ্রেট করছি, লোকে বলে জানেন, "Life is itself a regret and realm at the same time" আর দেখুন, আমার realm টা তো প্রায় শেষ, আর এখন বেঁচে শুধু regret, যদি একটা সরকারী চাকরী পেতাম, তাহলে একটু বেশি stress-free থাকতে পারতাম জানেন তো... তখন আমার ৩ বছর বয়স,... তার আগে একটু বলে রাখি, মা আমার ত্রিপুরার সেন পরিবারের মেয়ে, বাবা অরিন্দম দাস, কলকাতায় বাড়ি, কলেজ এ পড়ার সময় দেখা হয় দুজনের, তার পর প্রেম, পালিয়ে বিয়ে, মায়ের পরিবার supportive, কিন্তু, বাবা ঘর

জামাই হতে রাজি নন, তারপর '৯৫ এ আমি আসি, তখন মনে হয়, বাবার দিক থেকেও মেনে নেবে বলেছিলো, আমার তখন ৩ বছর বয়স, রাত দুটো তখন, দাদুর ফোন আসে, মানে বাবার বাবা আর কি, বললো যে বাবা কে বাড়ি আসতে, নিয়ম মেনে বিয়ে হবে, তাই আপাতত একাই আসতে, তাই মা এখানেই থেকে যায়। তারপর শুনেছি, নিয়ম মেনে বিয়ে তো হয়েছে, কিন্তু... আমার মায়ের সাথে নয়। সেই যে গেলো বাবা আর ফেরেনি, জানেন।

জানেন, বাবা যাওয়ার সময় আমার জন্য একটা খেলনা আনবে বলেছিলো,... বলেছিলো, যে কলকাতায়, নাকি, ওরকম অনেক ধরণের রকমারি খেলনা পাওয়া যায়, আলো জ্বলে, গান বাজানো যায় এমন ও পাওয়া যায় নাকি, আমি খুব এক্সাইটেড ছিলাম, তার পর থেকে দিন যায় মাস যায়, বাবার দেখা নেই, মা বলে, কাজের জন্য আসতে পারেনা, মাসে টাকা পাঠায়। মনে মনে বলি, যে হ্যাঁ খুব টাকা পাঠায়, এত টাকা পাঠায়, যে মাকে দুটো চাকরি করে আমার পড়াশোনার খরচা তুলে, না খেয়ে শুতে হয়,

যাই হোক back to 2013, আমার ১৮ তম জন্মদিন, আমি মাকে বললাম, যে বন্ধুদের সাথে একটু ঘুরতে বেরোবো, ১ দিন পর আসব, বলে একটা বন্ধু কে একটু manage করতে বলে, একা বেড়িয়ে পড়লাম, কলকাতায়, খেলনা টা due ছিল ওটা নিতে হবে না। (জল গড়িয়ে পড়ে, মুখ মুছে)

কলেজ স্ট্রিট দিয়ে একটু দূর গিয়ে অনেক ওলি গলি দিয়ে গিয়ে পৌঁছলাম একটা ২ তলা বাড়িতে, "অগ্নিদুর্ভিত দাস এন্ড ফ্যামিলি" engraved করা, গেটে চুকতে যাব, অমনি দেখলাম একটা গাড়ি এসে দাঁড়ালো। সেখান থেকে, একটা ছোটো বাচ্চা নামলো, ছেলেটার ৮ কি ৯ বছর হবে, পেছনে আরও একটা মেয়েও নামলো, ১২-১৩ বয়স হবে, ওদের নামিয়ে গাড়ি টা আমার পাশ দিয়ে

বেরিয়ে গেলো। ওরা এসে গেটে ঢুকবে, অমনি আমাকে দেখে মেয়েটা বললো, "কাউকে কি খুঁজছেন?" আমি বললাম, যে "হ্যাঁ, তুমি কি জানো, যে অরিন্দম দাসের বাড়িটা কোনটা?" "তুমি বাবাকে খুঁজছো, বাবা তো আবার অফিস এ গেলো, আমাদের বাড়িতে নামিয়ে দিয়েই তো গাড়ি করে বেরিয়ে গেলো। বেশি দূর হয়তো যায়নি, তুমি বাড়িতে এসে বসো, আমি ফোন করে ডাকছি," আমি বললাম, "নানা থাক এখন অফিস গেছে যে কালে, আর ডাকতে হবে না", "দিদি কই রে আয় ৫ টা বাজলো, Pokémon স্টার্ট হয়ে যাবে", ছেলেটি ডাকলো বাড়ীর ভেতর থেকে। "হ্যাঁ আসছি!", মেয়েটি হাঁক দিয়ে বললো। "আম্মা তাহলে বাড়িতে চলুন at least, মাকে বলে দেবেন কী দরকার, বাবা কে ঠিক জানিয়ে দেবে মা, after all মাই তো বাবার manager,"। আমি মুচকি হাসলাম, "ও আম্মা, না আজ থাক, এমনিতেই, সন্ধ্যা নেমে এলো, আমি পরে কোনো একদিন আসবো,"। "আম্মা, টাটা দিদি", বলে চলে যাবে অমনি আবার এসে বললো, "আম্মা তোমার নামটা কী তাই তো জানা হলো না, বাবা জানলে খুব রাগ করবে, যে আমি নামটা জানলাম না..." আম্মা, তাই নাকি, (হেসে) আমি সো..সৌমী দাস "আম্মা আসছি তাহলে এবার... ভাই দাঁড়া, সোফায় আমি বসবো।"

জানেন, তখন নিজের নামটা বলতে আর সাহস হলো না, আমি ভাবলাম, বাবা যেখানে আছে এখন, সেটা আগের থেকে অনেক বেটার জায়গা, পিছুটানটা তাই আর রাখতে চাইলাম না।

বাড়ি ফিরে এলাম সেই দিনই, মা জিপ্সেস করলো, "কিরে হয়ে গেলো তোদের পার্টি", আমি বললাম, "হ্যাঁ আসলে, মধুরীমা আর ওর বাবা মা কাল বেড়াতে যাবে, তাই আমরা আর ওদের রাত্রে ঘুমটা কারলাম না", মা বললো, "আম্মা, হ্যাঁ ঠিকই তো, আমরাও তো কত দিন হয়ে গেল কোথাও যায়নি, চো একদিন ঘুরে আসি, কলকাতা যাবি? তাহলে বাবার সাথেও দেখা হয়ে যাবে তোর", আমি বললাম, "যে তোমার এখনও বাবার সাথে কথা হয়?", মা বললো, "হবে না, আমরা কত কথা বলি, এখন তোর বাবা কাজের জন্য আর আসতে পারেনা, চ'না একবার যাই ঘুরে আসি, তোর বাবার কাছ থেকে, কত দিন দেখি নি মানুষ টাকে", আমি বললাম, "থাক না মা, এখান থেকে কলকাতা যাওয়া, একেই আমার পড়াশোনার জন্য নেওয়া লোন মেটানো যাচ্ছেনা ওখানে গিয়ে থাকা যাওয়া কি করে সামলাবো আমরা", মা বলে, "ধুর বোকা, থাকতে খেতে আবার পয়সা লাগবে নাকি থাকবো তো তোর দাদুর বাড়িতে, কত বড়ো বাড়ি, ২ তলা, বিরাট বড়ো বাগান আছে, বড়ো উঠোন আছে, তোর দাদু পেশায় লয়ার ছিলেন, জানিস, এখন retired কিন্তু এখনও ও সুনাম যায়নি, lawyer অগ্নিদ্যুতি দাস, কি রমরমা তখন",

আমি আর কিছু বললাম না, আইনের রক্ষক যখন আইন মানে না, তখন আর কमेंট করা ঠিক হবে না, বলুন, তারপর জানেন, থাক... আর মনে করতে চাইছি না, মায়ের মাথায় টিউমার আর সে কথা বেমালুম চেপে গেলো ২ বছর ধরে, কিনা আমি এই সবে loan

মিটিয়েছি, আমাকে আর ও নিয়ে ভাবতে হবে না... খুব খারাপ মানুষ ছিল মা, আবার বড় ভালো মানুষ ও। টাকার অর্থটা অনেক আগে বুঝতে পেরেছি শুধু মাত্র মায়ের থেকেই তাই হয়তো রাগ ও করতে পারছি না, শেষ বারের মতো ফোন করে বলেছিলো, যে "মা সুখি হোস, বিয়ে করিস, আবার নিজের কোলে আমাকে ধারণ করিস, কেমন আমি চললাম রে", কাজের peak hour তখন, আমি রেগে মেগে একটু ঝেড়ে কল কেটে দিয়েছিলাম....(কাল্লয় ভেঙে পড়ে) "মা তোমার এ সমাধি কীভাবে বইবো মা, তুমি যে আমার মনে এই সমাধি বসিয়ে গেলে, এ যে এখনও তোমার ছোওয়ায় জীবিত মা জীবিত.." এমন সময় কলিং বেল বেজে উঠল....

"কেউ আছেন, এটা কি প্রতিমা দাস এর বাড়ি?" (চোখ মুছে, দরজা খুলে,) হ্যাঁ কাকে চাই, "হ্যাঁ বলছি এটা কি প্রতিমা দাস এর বাড়ি," "প্রতিমা সেন এর বাড়ি ছিল, (হেসে মুচকি) এখন আর নেই, আপাতত, এটা আমার বাড়ি, আমি সৌমি সেন, ওনার মেয়ে, বলুন কী দরকার?" "ছিল মানে, আর আপনি ওনার মেয়ে, সৌমি? সহিনী নয়? আর সেন?" "মা মারা গেছে ২ মাস হলো, আপনি হয়তো তাহলে ভুল বাড়িতে এসেছেন," "হয়তো না, নমস্কার, আমি কাকলি দাস আমার বাবার নাম অরিন্দম দাস, তিনি ২ মাস হলো মারা গেছেন, ওনার ডায়েরি তে লাস্ট লেখা, যে একবার এই ঠিকানায় যেতে এবং ওখানে প্রতিমা দাস ও সহিনী দাস কে এই চিঠি খানা দিতে, তাহলে আমরা নাকি ওনার শেষ ইচ্ছা পূরণ করতে পারব, এটা ২৫ নং বাড়ি, আর এই ঠিকানা টাই exactly আছে লেখা চিঠি তে," "ক্ষমা চাইছি, কিন্তু এটা প্রতিমা দাস এর বাড়ি নয়, আর আমি সত্যিই সহিনী নই, নমস্কার" (দরজা বন্ধ করতে যাবে) "এক মিনিট, আপনি এই চিঠি খানা ধরুন" "গত মানুষের শেষ চিঠি অজ্ঞাতপরিচয় ব্যক্তি কে দিতে নেই, অমঙ্গল হয়"



## “Vasudhaiva Kutumbakam”

*(The World is One Family)*

The Department of Botany takes immense pride in providing a platform for all the talented and creative minds around us. We invited everyone to take part and showcase their creativity through our e-magazine.

We wish them all the best in their future endeavors



*Srija Nandy, Class -VIII  
Baidyapur Raj Rajeswar Balika Vidyalaya*



*Srija Nandy, Class -VIII  
Baidyapur Raj Rajeswar Balika Vidyalaya*



*Udeshna Pramanik, Class IX  
ST. Anthony's High School, Chandernagore*

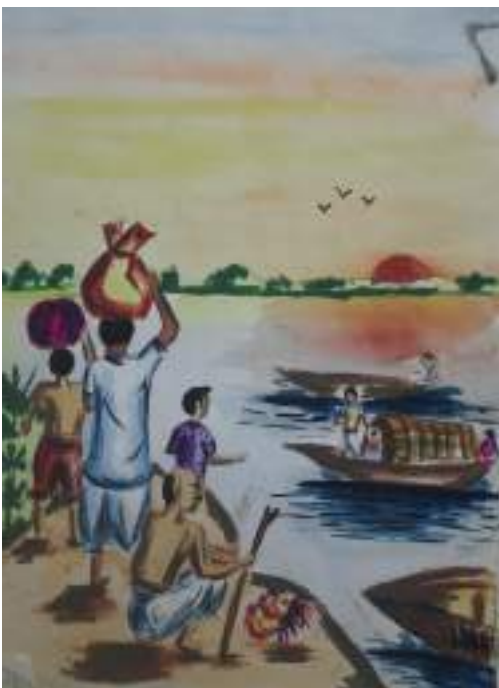
## The City Lights

Year seventy seventy nine  
Mom, where is the dark sky?  
They faded for the city lights  
No more 'shooting stars' at night.

Our fathers had seen the fireflies,  
Mom what were they? Did they glow at night?  
They used to do, but now they don't  
The city lights have washed them out.

No more joining twinkling dots  
Creating shapes and funny thoughts,  
I wonder how the night would've seemed  
If the city lights had not there been.

*Jahnnabi Guha, Class XI  
Chandernagore Banga Vidyalaya*



*Soham Dutta, Class X  
Techno India Group Public School*



Shaoni Das  
Class IX, Section B, Roll No 10  
ST. Anthony's High School



Ishaana Banerjee  
5th Sem  
SBS, IACS, Kolkata



Parna Paul  
4th Sem  
Department of Botany, CNC



Piyas Das, Class X  
Sri Aurobindo Vidyamandir

## Dear Diary

*-Rehan Seal X/A/37  
Chandannagar Banga Vidyalaya*

This part of a diary is a complete collection of my heart wrenching reminiscences and the occurrences which changed my life forever.

It was a fine day amidst the Covid Pandemic period, I was a 12-year-old boy who was only neighbored by love a guy who was completely unknown of dejection, sorrow, misery. This is my experience about how that me experienced the worst time period of his life, This is the story of how May, 2021 became the worst month of my life.

2nd May, 2021- It was my parent's anniversary, My grandparents threw a little party on the occasion. On the following day we found out that my grandpa had a mild fever, we just ignored it as a minor fever and charged some medicines... But who knew? Who knew that the little ignorance will completely erase the existence of two of the most astounding and major characters from my life? Who knew that the little ignorance will fetch our family that big of a fortune...Our whole family (except me) got caught in Covid within a few days, And I changed house for safety precautions....

11th May- My grandparents started having breathing problems. Due to the lack of Oxygen cylinders in our town they were admitted in a Hospital in Kolkata as soon as possible.

13th May- My grandmother's oxygen level dropped by a lot, she was rushed into the emergency but Covid got the best of her, Covid won...She set a foot into the afterlife, Few days later on 17th May my grandpa followed the footsteps of the person he adored the most, the love of his life.

They both got their eternal rest...All this was happening behind my back while I was living in a different house for the time being. Eventually when I was notified about the mishap surprisingly, I couldn't shed a single drop of tear to show but my inside was crying tears of blood. I was in so much disbelief that I thought all of it as a prank but when I looked into the eyes of the person who conveyed the message it was crystal clear that I had lost something precious, something priceless... Standing in the middle of the desert not being able to grasp the situation I asked myself -" How was I sucked in their whirlpool of love so divine that I had never touched the shore".

18th May midnight - A call came in from my father. I could hear a faint weeping from the background (It was my mother) amidst of the situation he was in, with a 101° C fever running through his veins he asked me of my health in a broken voice. Unable of thinking of an answer I asked him back of their status. Trying to reply he almost broke out his voice got shaggier and he replied in a dull, broken voice " Son, I don't think I am going to last much longer either. Take care of your mother, Don't fight with your brother to cost your mother more problems be a good kid, I trust you. Take care of the family after I am gone"... All of that was said in the most heartbreaking voice I have ever heard. I was left speechless. To the 12-year-old me it was nothing less than a nightmare, It felt like someone was tearing open my heart and pouring burning liquor in there, it felt like I was being Stabbed by a million swords, It was horrifying. That was the first and the last time I heard my father cry. I spent the next few days without a blink of sleep. I spent those days only wanting to see the smiling faces of the ones I lost, I just wanted to be enfolded in the warmth of their arms for the one last time... But It was just left as a fantasy, a fantasy which was never to be fulfilled...

4th June - I turned 13. The guy who used be so much excited for his birthday had just become an empty vessel, a lifeless shell. That was my worst Birthday. The day I had decided to commemorate with my loved ones were missing two of the most prime pieces. If my life was a game of chess, I was missing my King and queen. I had so deep of an affection for them but I was never able to express, It's unexplained that how my heart still yearns to hug them and tell them how much they meant to me, That last chance is all my heart grieves for till the date.

It's 4th June 2024, My birthday. Hope you guys are doing good. Hope you guys are watching over us from the heaven with a big smile on your faces, I was never able to tell you what you guys were for me and our family ... You guys were so perfect to me that -" I would be honoured to flaunt you guys right at the pinnacle of the showcase of my memories "- You guys were the greatest present one could ever get... Love you dadan, diya and thank you for making my colourless life so colourful "...

“ To the ones we'll never see again....

To the scars never to be healed.... “

# 30

## Chapter

## Through the lenses

Join us as we explore the world beyond our reach with **Arghyadip Bhattacharya**, a passionate photography enthusiast, who captures the universe's beauty through his lens. Unequipping his lenses of passion, he is completing his Bachelors in Geology from Asutosh College. Avik Manna from the editorial board got in touch with him, to reciprocate a glance through the lenses of this avid stargazer.



*Lunar Palette; Unveiling the Moon's Hidden Mineral Symphony*

**For every photo behind the lens there are some of the most bizarre experience when it comes to photographers. Do you have some experiences that you might want to share with our readers?**

*Capturing the Milky Way always fascinates me, But the provided photo did come with its fair share of lore. The area from where the photo was taken is called Rangbull, a pollution free offbeat tourist site, almost 10 kms from the main city. The resort was on the edge of a forest and we were the only family staying there. The area had confirmed sightings of cheetah. I assembled a makeshift barrier with a bit of mobile furniture almost out in the open and clicked the image. It took about hour and a half past midnight to take the photo in pitch dark.*

**With your growing interests, and passion for photography, you have learned and experienced a lot of things, with what you know now, how much are you willing to set out on such endeavours again and again?**

*Seeing the Sagittarius Arm of our Milky Way is already a dazzling experience of its own, and according to me any risks are worth it every time, well except for the life-threatening ones (laughs). But I do wish to capture more and more pictures of our beautiful universe to inspire and motivate fellow stargazers and astrophotographers, so that is my way to take calculated risks while taking such amazing photos of the endless cosmos.*



*Sagittarius Arm; A Glimpse into the Heart of Our Milky Way*



*Moonlit Mirage; The Moon Peeks Through a Shroud of Clouds*



*Nature's Frame; Milky Way Rises in Pristine Darkness, Untouched by Light Pollution*

### **Do you have any parting words for our readers?**

*To start with you don't need any expensive telescopes or cameras to be very honest. I started my astrophotography journey with a really cheap smartphone and a makeshift tripod. But you need to have a lot of patience in this time, travelling with your lens. With time you can buy better gadgets. I bought my first ever Dslr with the scholarship I received.*



*Arghyadip Bhattacharya, 6th sem  
Asutosh College, Geology department*

Discover the captivating worlds of nature and beyond with **Krishnendu Goswami**, a nature photographer and astrophotographer, who seamlessly blends the beauty of Earth and sky through his stunning imagery. Avik Manna from the editorial board got in touch with the one who believes in “Vision matters, Seldom the lens”.



*Milky Way to the Home*

**There is a backstory behind every photos, and they are great stories to read, but what does it takes to prepare photos like this, in short, what is the journey behind a photograph?**

*It all starts with a click of the shutter button! (laughs). But really, it ends with that click after all the planning and thinking culminate in the final "click." Then comes the process of selecting the perfect focus, considering overlays, and extensive post-processing. Data compilation is just the beginning; the real journey is in editing, where each photographer's unique vision shines. For me, the joy is in experimenting with adjustments and finding delight in each slider's movement. The most crucial stage is reflection: letting the final edit sit in your gallery for at least two weeks before posting. As time passes, perspectives change, enhancing the image to resonate with a broader audience.*

**Have you any crazy experience that you encountered in the pursuit of photography? Do you want to have more of these experiences going forward?** Ref: Milky Way To Home;

*One night, while trekking in Madhyamaheshwar, my father and I had dinner under the stars in Bantoli. Despite the cold, our hot food kept us cozy. Suddenly, I saw a celestial dusty path filled with countless stars—the Milky Way. Excited, I rushed to take a picture, even though I wasn't dressed warmly enough. As I set up my phone, I noticed two shining eyes approaching. Fearing it might be a snow leopard, I was relieved to find a friendly dog instead. Despite catching a cold, the experience of seeing the Milky Way for the first time was unforgettable. The fever & cold I caught the next day couldn't take away the charm of seeing the milky way for the first time... they say it right **“open sky is the open textbook of science...”***



*North Star Trail*



*Bird and Full Moon*



*Fall*



*After it rains*

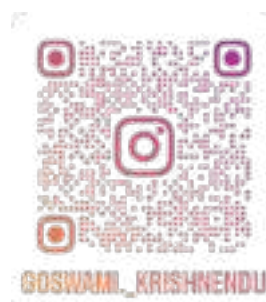
## Do you have any parting words for our readers?

*I don't consider myself an expert, just an eager novice learning every day. Still, I follow a few key principles that I think everyone should:*

- 1. always adhere to the foundational rules of photography,*
- 2. focus on making the most of existing resources because seriously **"Vision matters, seldom the lenses"** rather than longing for more,*
- 3. capture every possible angle to avoid regrets, and*
- 4. embrace constructive criticism while having confidence in your artistry, remembering that art is subjective. That's the essence behind every click of my shutter.*



*HALO there*



GOSWAMI\_KRISHNENDU



Krishnendu Goswami, 6th sem  
Uttarpara Peary Mohan College, Physics department



# 31

## Chapter

# Chhobighor

Parna Paul, a student of our Botany family, sets an example of how we can use our skills to set up small businesses.

Parna runs her Instagram page, where she takes orders for customized, handmade gifts.

She says this little start-up not only gives her a platform to earn while following her passion but also gives her an immense sense of happiness when people love her products.

You can check out more of her creations here:



# Brain Games



32

WHO AM I ?



I have a chemical called lycopene, which plays a role in preventing cancer. I'm present in your everyday salad.



I block neuromuscular transmitter substance through inhibiting the phosphodiesterase activity in the skeletal muscle cytosol. My skin contains the alkaloid compound quinine, which is an effective treatment for the life-threatening disease malaria



I can grow up to 20 m. tall and with a trunk up to 1m in diameter. I can be found in the Sonoran desert of Baja California and Mexico, I can live for almost 300 years

33

MATCH THE FATHER

Column A	Column B
Father of Botany	Carl Linnaeus
Father of Indian Botany	Gregor Mendel
Father of Taxonomy	Gottlieb Haberlandt
Father of Plant Anatomy	Theophrastus
Father of Genetics	Heinrich
Father of plant tissue culture	M. S. Swaminathan
Father of Plant Pathology	William Roxburgh
Father of the Green Revolution in India	Pauling
Father of Indian Biotechnology	Pushpa Bhargav
Father of molecular biology	Nehemiah Grew

34

HELP WATSON & CRICK FIND THEIR DNA



35

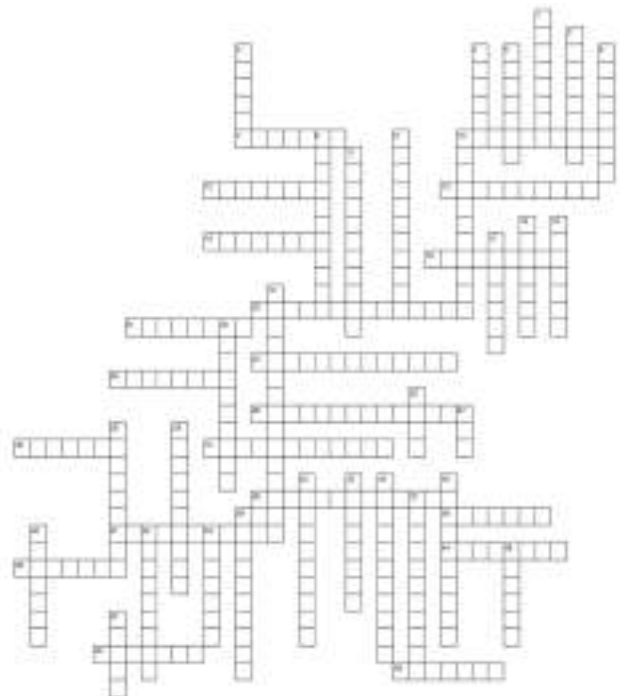
CONSTRUCT THE CELL



- Hints:
1. There are 8 words.
  2. All of them can be seen in an eukaryotic cell.
  3. Words can go in any direction.
  4. Words can share letters as they cross over each other.

36

THE GREAT BOTANICAL CROSSWORD



- | Across                                  | Down  |
|---|---|
| 7. Ovid is a                            | 1. Principal compound in coffee   |
| 10. male reproductive organ of a flower | 2. Seen in wheat  |
| 12. Fused calyx and corolla             | 3. Professor who studied the pleidophyte diversity of south island and its conservation |
| 13. Ascomycetes                         | 4. Pollution indicator  |
| 16. Quinine is extracted from           | 5. Parental ploidy is seen  |
| 18. Deadly nightshade                   | 6. Active compound in fumero  |
| 20. Fungi imperfecti                    | 8. Most advanced flower family  |
| 21. Present in both plants and animals  | 9. Bilateral symmetry   |
| 23. DNA to RNA                          | 10. Guineo pig of plant kingdom   |
| 24. Father of Indian botany             | 11. DNA to DNA  |
| 26. End product is glucose              | 14. Tiny openings of leaf surface   |
| 30. Name of our magazine                | 15. Professor who worked on apoptosis in leukemic cell                                  |
| 31. Study of fossils                    | 17. Develops into root  |
| 36. Vacuolar cryptogams                 | 18. Silenced during transcription   |
| 39. Multinucleated                      | 22. Chromosomes at equatorial position  |
| 41. Actively transcribed                | 25. Functional unit of heredity   |
| 44. Main axis continues to grow         | 27. Primary source of energy  |
| 46. Develops into shoot                 | 28. Crossing over takes place   |
| 48. Assist in DNA packaging             | 29. When both the anther and filament are together                                      |
| 49. Seen in stems                       | 32. Amphibian of plant kingdom  |
|   | 33. Seen in monocot stems   |
|   | 34. Only in green plants  |
|   | 35. Largest flower family   |
|   | 37. RNA to protein  |
|   | 38. Aggregate fruit   |
|   | 40. Activation in coleoptile  |
|   | 42. X shaped structure in cell division   |
|   | 43. Equatorial division   |
|   | 45. Father of genetics  |
|   | 47. Activation in cotton  |

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## Departmental events

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## Creative corner

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## Brain Games

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Ruellia is a genus of flowering plants commonly known as Ruellias or Wild Petunias which belongs to the family Acanthaceae. It contains about 250 genera and 2500 species. Most of these are shrubs, or twining vines; some are epiphytes. Many species of the genus has antinociceptive, antioxidant, analgesic, antispasmodic, antiulcer, antidiabetic and anti-inflammatory properties. The major phytochemicals constituents found in the plants are glycosides, alkaloids, flavonoids and triterpenoids. This genus has been traditionally used for the treatment of flu, asthma, fever, bronchitis, high blood pressure, eczema, and diabetes across India.