

**SEMESTER-2**

**PEDAGOGY OF SCHOOL SUBJECT**

**PSS-2: BIOLOGY**

**By**

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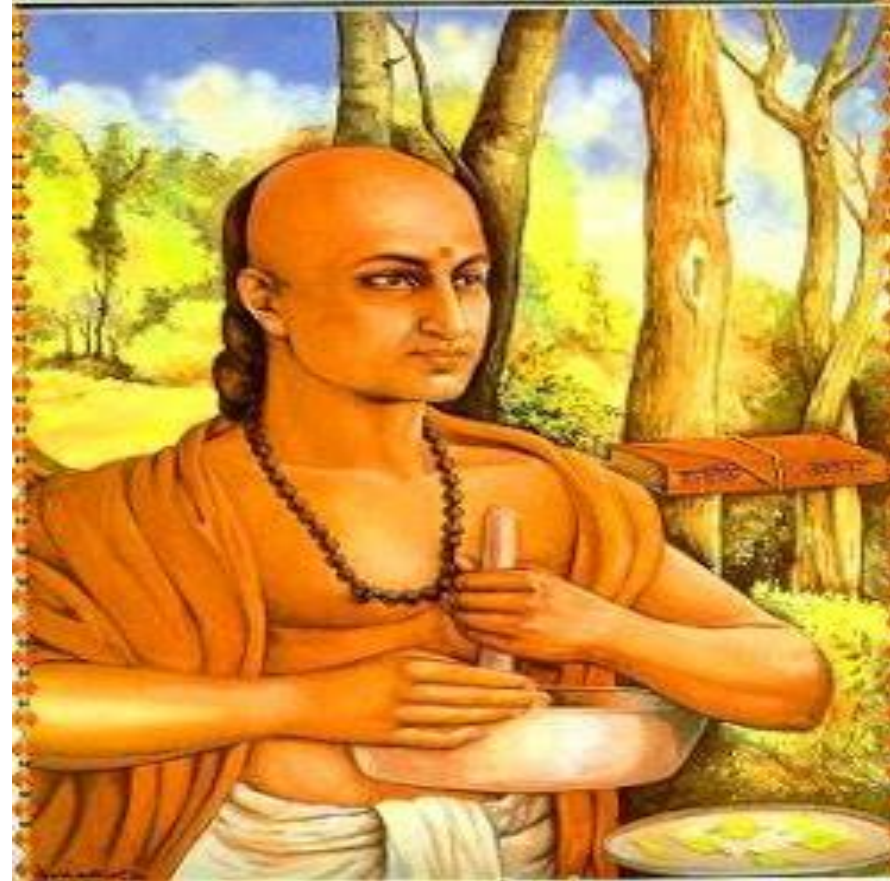
**Kumadvathi College of Education**

**Shikaipura**

## 1.3-Contributions of Indian Biologists-***Ancient Biologist*** and ***Modern Biologists.***

- **Ancient Biologist** ---- *Charaka,*  
*Sushrutha,*  
*Parashara*
- **Modern Biologists**-- Sir J.C. Bose,  
Dr. Haragobinda Khorana,  
Dr. P. Maheshwari,  
Dr.Swaminathan.  
Dr.BGL Swamy.

**Acharya Charaka**  
**- Father of**  
**Medicine**  
**[300BC]**



- Charak is considered the father of ancient Indian science of medicine.

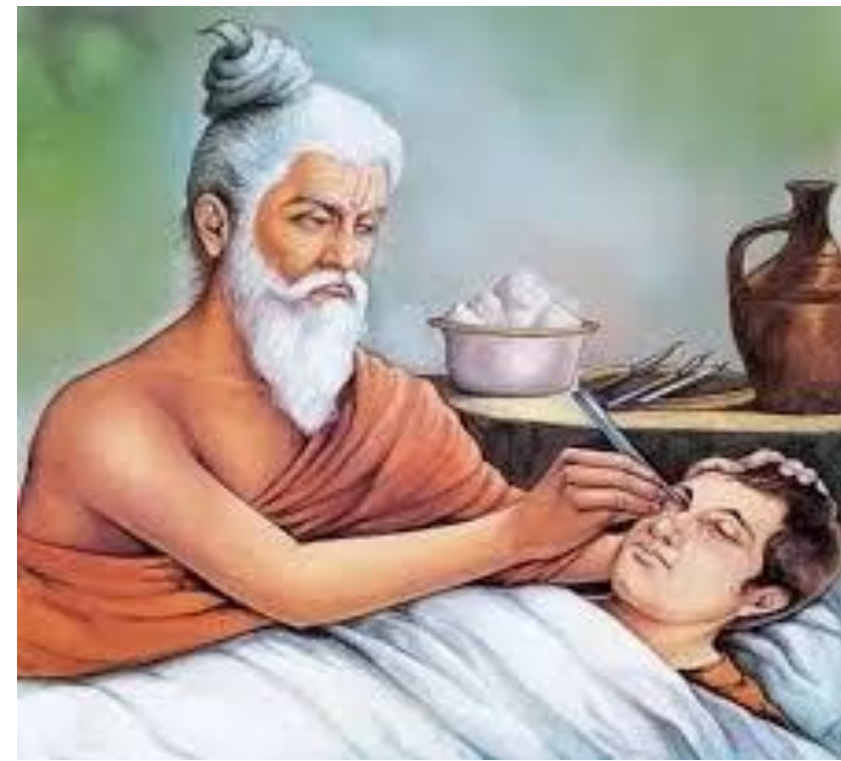
- He was the Raj Vaidya (royal doctor) in the court of Kanishka. His **Charaka Samhita** is a remarkable book on medicine.
- It has the description of a large number of diseases and gives methods of identifying their causes as well as the method of their treatment.

- He was the first to talk about **digestion, metabolism and immunity** as important for health and so medical science.
- In Charaka Samhita, more stress has been laid on **removing the cause of disease** rather than simply treating the illness.
- Charaka also knew the **fundamentals of Genetics**. Don't you find it fascinating that thousands of years back, medical science was at such an advanced stage in India.

- Born in 300 BC Acharya Charaka was one of the principal contributors to the **ancient art and science of Ayurveda**, a system of medicine and lifestyle developed in Ancient India.
- Acharya Charaka has been crowned as the **Father of Medicine**. His renowned work, the “***Charaka Samhita***“, is considered as an **encyclopaedia of Ayurveda**.

- Acharya Charaka revealed through his innate genius and enquiries of facts on human anatomy, embryology, pharmacology, blood circulation and diseases like diabetes, tuberculosis, heart disease, etc.
- The following statements are attributed to Acharya Charaka:
- *“A physician who fails to enter the body of a patient with the lamp of knowledge and understanding can never treat diseases. He should first study all the factors, including environment, which influence a patient’s disease, and then prescribe treatment. It is more important to prevent the occurrence of disease than to seek a cure.”*

# SUSHRUTA



- **World's First Plastic Surgeon**
- Sushruta was an Indian physician, who wrote one of the world's earliest works on medicine and surgery and is therefore regarded as the **'Father of Indian Medicine'** and **'Father of Plastic Surgery.'**



- During the 6<sup>th</sup> century, an Indian physician named **Sushruta** - widely regarded as the '**Father of Indian Medicine**' and '**Father of Plastic Surgery**' - wrote one of the world's earliest works on **medicine and surgery**.
- Sushruta lived in the ancient city of **Kashi**, now known as **Varanasi or Banaras** in the northern part of India.

## **Sushruta Samhita**

Sushruta is known for his pioneering operations and techniques and for his influential treatise 'Sushruta Samhita' or Compendium of Sushruta, the main source of knowledge about surgery in ancient India.

- Written in Sanskrit, the Sushruta Samhita dates back to the times before Christ and is one of the earliest works in the field of medicine.
- It forms the foundations of the ancient Hindu form of medicine known as Ayurveda and is highly regarded as one of the 'Great Trilogy of Ayurvedic Medicine.'

The Sushruta Samhita documented the **aetiology of more than 1,100 diseases**, the use of **hundreds of medicinal plants**, and **instructions for performing scores of surgical procedures** - including three types of skin grafts and reconstruction of the nose.

## Other contributions by Sushruta

1. Besides trauma involving general surgery, Sushruta gave an in-depth account of the treatment of **12 varieties of fracture and six types of dislocation**. This continues to spellbind orthopaedic surgeons even today.
2. He mentioned the principles of traction, manipulation, apposition, stabilization, and postoperative physiotherapy.

3.Sushruta also prescribed measures to induce growth of lost hair and removal of unwanted hair.

# PARASHARA



- Maharshi Parashara was a **Rigvedic Maharishi (seer/ ಕಾಲಜ್ಞಾನಿ)**, and the author of many ancient Indian texts. He is accredited for being the author of the first **Purana: Vishnu Purana** (before his Son Veda Vyasa wrote it in its present form).

- He was the **grandson of Vashista**, the son of Śakti Maharshi, and the father of Veda Vyasa.
- There are several texts which give reference to Parashara as an author/speaker.

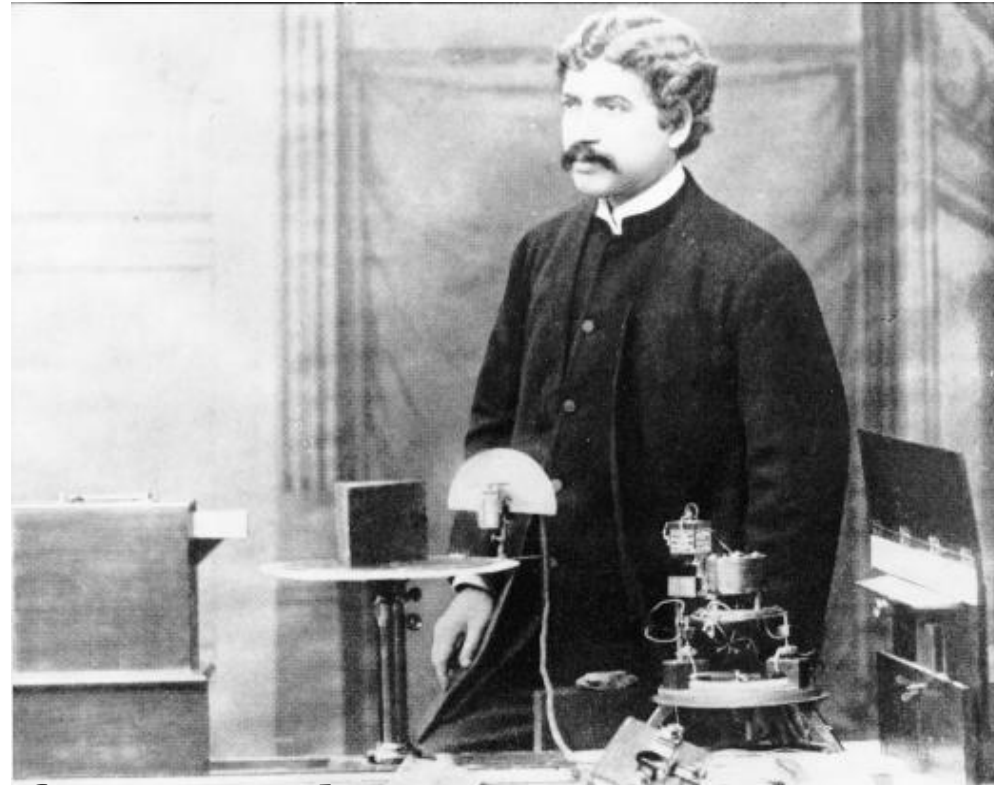


- In the year 1665 AD, Robert Hook, a botanist with the help of his microscope, explained to the world about the Plant cell and its structure.
- One thousand and six hundred years ago prior to that date, Maharshi Parasara in 1st century AD had clearly explained the structure of a Plant cell in the Sanskrit work “Vriksha Ayurveda”.

- Maharshi Parashara had even explained the **phenomenon of the Photosynthesis** (process of self nourishment in the plants) in the fourth chapter (Vriksha sharira Dharma sastram) of the same book.

# CONTRIBUTIONS OF MODERN BIOLOGISTS

## 1-Jagadish Chandra Bose (1858-1937)



Acharya J.C. Bose was a man of many talents. Born on 30 November, 1858 in Bikrampur, West Bengal, he was a **polymath** (a person of wide knowledge or learning), physicist, biologist, botanist and archaeologist.

- He, made important contributions in the **study of plants** and **laid the foundation of experimental science** in the Indian sub-continent.
- He was the **first person to use semiconductor junctions** to **detect radio signals**, thus demonstrating **wireless communication for the first time**
- Another of his well-known inventions is the Crescograph, through which he **measured plant response to various stimuli** and hypothesized that plants can **feel pain, understand affection etc.**

- Sir Jagadish Chandra Bose is one of the most prominent first Indian scientists who proved by experimentation that **both animals and plants share much in common.**
- He demonstrated that plants are also **sensitive to heat, cold, light, noise and various other external stimuli.**

- Bose contrived a very sophisticated instrument called **crescograph** which could record and observe the minute **responses because of external stimulants**.
- It was capable of magnifying the motion of plant tissue to about 10,000 times of their actual size, which found many similarities between plants and other living organisms.
- Using the crescograph, he further researched the **response of the plant to fertilizers, light rays and wireless waves**. The instrument received widespread acclaim,

- Bose authored two illustrious books: 'Response in the living and nonliving (1902) and 'The Nervous Mechanism of Plants (1926).
- He also extensively researched the behaviour of radio waves. Mostly known as a plant physiologist, he was actually a physicist. Bose devised another instrument called 'Coherer' for detecting the radio waves.
- Prior to his death (1937) Bose set up the Bose Institute at Calcutta. He was elected the fellow of the Royal Society in 1920 for his amazing contribution and achievements.

## HAR GOBIND KHORANA



Born on January 9, 1922 at Raipur village in West Punjab (now in Pakistan), Khorana was an Indian-American biochemist who shared the **1968 Nobel Prize for Physiology or Medicine with Marshall W. Nirenberg and Robert W. Holley** for research that helped to show how the order of nucleotides in nucleic acids, which carry the genetic code of the cell, control the cell's synthesis of proteins.



- In 1970, Khorana became the **first to synthesize an artificial gene in a living cell.**
- His work became the **foundation** for much of the later research in **biotechnology and gene therapy.**

- University of Wisconsin-Madison, the Government of India (**DBT Department of Biotechnology**), and the Indo-US Science and Technology Forum jointly created the **Khorana Program in 2007**.
- **The mission of the Khorana Program is to build a seamless community of scientists, industrialists, and social entrepreneurs in the United States and India.** Khorana died of natural causes on November 9, 2011 at the age of 89.

# PANCHANAN MAHESHWARI :

**The Originator Of  
Indian Plant  
Embryology**



Professor Panchanan Maheshwari is also known as  
the **Father of Indian Plant Embryology.**

- Professor Panchanan Maheshwari was born on **9<sup>th</sup> of November, 1904** at **Jaipur in the house of Shri Vijaypal** who was in an ordinary clerical job.
- Professor Panchanan Maheshwari got his graduation degree from Ewing Christian College, Allahabad in 1925. Post graduate degree (M.Sc.) and the most prestigious degree, Doctor of Science (D.Sc.) were awarded to him in 1927 and 1931 respectively.

## Honours and Awards

- The medals and awards are:

In 1931, Professor Panchanan Maheshwari was awarded *D.Sc.* By Allahabad University.

- Professor Panchanan Maheshwari was elected as the *President of Indian Botanical Society (IBS)*.
- The most prestigious institute at London, "*The Royal Society*" honoured Professor Panchanan Maheshwari as the *Fellow of Royal Society (FRS)* in 1965. Professor Panchanan Maheshwari was the *second FRS (After Sir J.C. Bose) to be honoured as FRS*.

- Professor Panchanan Maheshwari was awarded *Birbal Sahani Medal by the Indian Botanical Society (IBS) in 1959.*
- Professor Panchanan Maheshwari was selected as the *President of the National Academy of Sciences in 1963.*

## Contributions in Botany

The main contributions of Professor Panchanan Maheshwari in the field of botany are:

Detailed study of the structure and development of gametophyte of a Gymnosperm plant, *Ephedra foliata* .

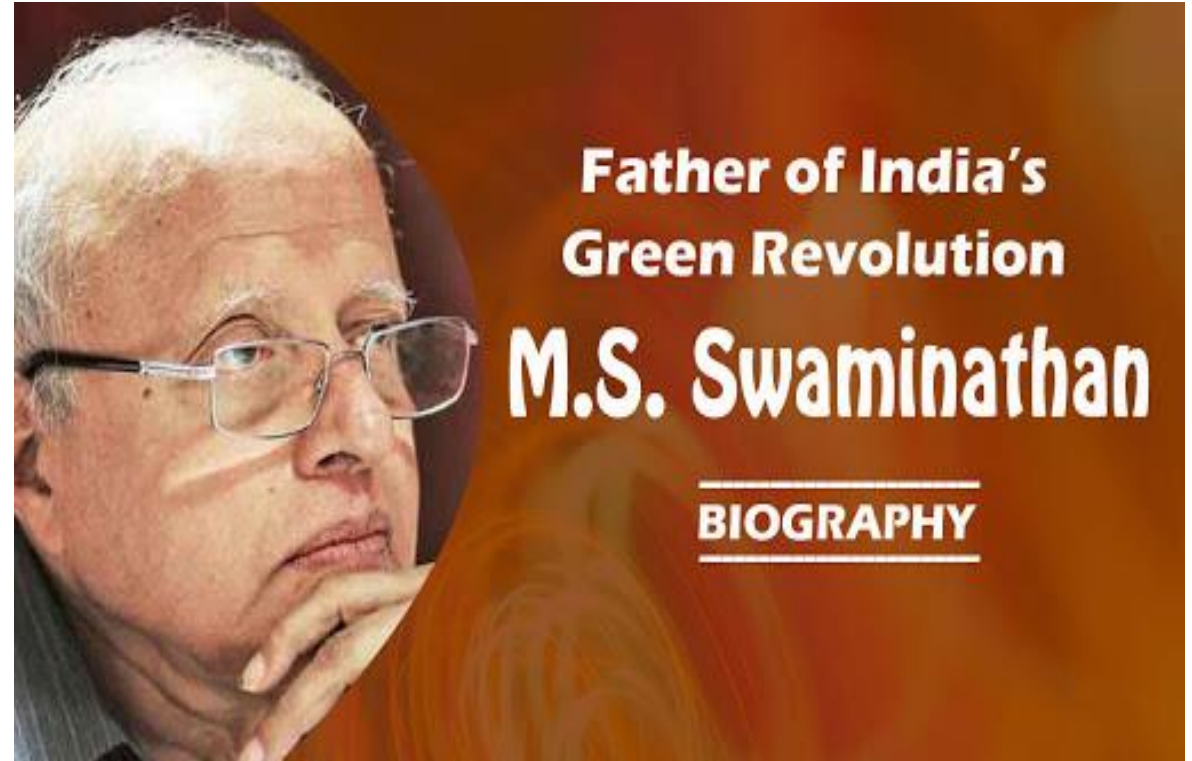
- Study of the stomata in the leaves of *Gnetum*
- Artificial culture of male cone of *Pinu roxburghii* and development of its pollen grains in culture medium.
- Study of embryogeny in many angiosperms.

- Study of the **development of vascular bundle** in *Boerhavia difusa* and *Rumex crispus*
- **Phylogenetic study of angiosperms** of the basis of their embryogeny.
- Culture of reproductive organs of many angiosperms on **artificial culture medium.**
- Authoring of the world famous book "***An Introduction of the Embryology of Angiosperms***" in 1950.



- Publication of the famous journal "**Phyto morphology**". It is still being published by IARI, New Delhi.
- Publication of another important book in botany "**Recent Advances in Embryology of Angiosperms** " in 1951.
- Last but not the least, Professor Panchanan Maheshwari was fond of Indian culture. In 1966, he gave the Presidential lecture in Hindi at **Indian Science Congress Association (ISCA)**.
- Professor Panchanan Maheshwari was **gifted with excellent memory**.

**Mankombu Sambasivan  
Swaminathan  
(7<sup>th</sup> Aug 1925):**



- He is known as '**Indian Father of Green Revolution**' for his sincere leadership and success in developing high-yielding varieties of wheat in India.

- M.S. Swaminathan is an **Indian geneticist and international administrator**, renowned for his leading role in India's Green Revolution, where high-yield varieties of wheat and rice seedlings were planted in the fields of poor farmers.

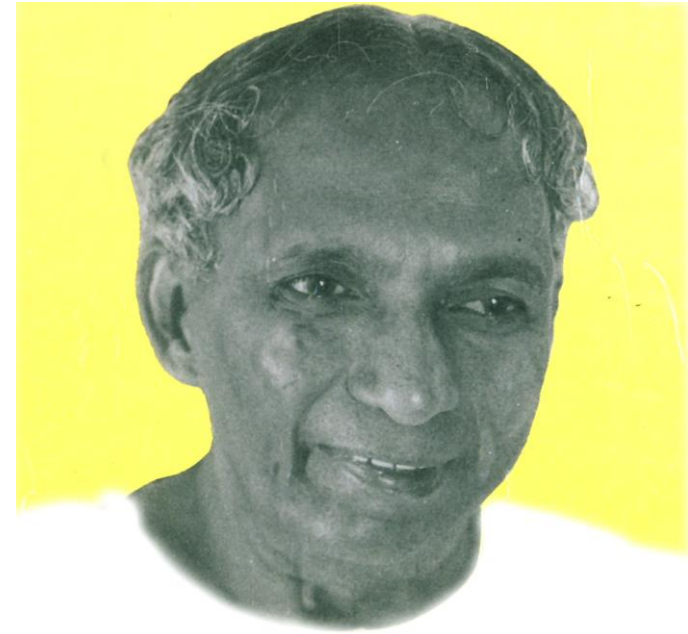
Swaminathan is an advocate of moving India to **sustainable development**, especially using environmentally sustainable agriculture, **sustainable food security** and the preservation of biodiversity which he calls an '**Evergreen revolution**'.

- In 1950, he moved to University of Cambridge School of Agriculture and earned a PhD degree in 1952 for his thesis 'Species Differentiation and the nature of polyploidy in certain species of the genus Solanum- Selection Tuberarium'.
- He accepted a post-doctoral research associateship at the University of Wisconsin, Dept. of Genetics

- Swaminathan was presented **first world food prize in 1987**, described as the **father of 'Economic Ecology'** by **United Nations Environment Programme**.
- The Times magazine's in 1999 listed him as one of the 20 most influential Asian people of the 20th century.
- He is a **fellow of the Royal Society of London, the U.S. National Academy of Sciences, the Russian, and Chinese & Indian Academy of Sciences**.

- He had 254 research papers for his credit in the fields of crop improvement, cytogenetics, genetics and phylogenetics.
- He has written a few books on general theme of his life's work, on biodiversity and sustainable agriculture for alleviation of hunger.

## B. G. L. SWAMY



- Bengaluru Gundappa Lakshminarayana Swamy (5 February 1918–2 November 1980) was an Indian botanist and Kannada writer who was professor, head of the Botany Department and Principal of Presidency College, Chennai.
- He was the son of D. V. Gundappa, an Indian philosopher and writer in the Kannada language.



- Swamy's primary research area was plant anatomy, particularly the structure of connections between plants' roots and stems.
- He discovered several plant species, including *Ascarina maheshwarii* and *Sarcandra irvingbaileyi*, which he named after two of his teachers.
- In 1976, he was awarded the Birbal Sahni gold medal by the Government of India for his work in Botany.

## Writings

- Swamy's literary works encompass a wide range of topics. Many of them are related to botany and introduce botanical concepts to the layperson.
- A few of his books cover plants used in everyday life in a scientific manner, such as *Namma Hotteyalli Dakshina Amerika* (**South America in Our Stomach**).

- Other works by Swamy pertain to **literature**, and some of them are partially autobiographical, dealing with his experiences as a Professor and Principal.
- Apart from being an acclaimed Botanist, B. G. L. Swamy was widely respected in the history and literary circles.

- Dr. Swamy authored more than **300 research articles** in English, Spanish, German, Latin and French that were published in well-known papers of international repute.
- **Hasuru Honnu.** His book **Hasuru Honnu**(Gold) won him the **Kendra Sahitya Academy** award given by the **Government of India** in 1978.
- With that, Gundappa and Swamy became the ***first father and son duo to win this prestigious award***

# Awards

- Karnataka Sahitya Academy Award for *Americadalli Naanu*
- Sahitya Akademi Award for *Hasuru Honnu*
- Rajyotsava Prashasti by the Government of Karnataka
- Kannada Sahitya Parishat Award
- Birbal Sahni gold medal by the Government of India for his work in botany.

