



Evolution of Eukaryotes from Prokaryotes

Why in News?

Recently, there has been considerable interest in understanding the **evolution of eukaryotes from prokaryotes**, shedding light on the intriguing question of how complex cells with nuclei and organelles emerged.

- The prevailing theory of **endosymbiosis** suggests that eukaryotes evolved from a symbiotic relationship between an ancient [archaeon](#) (a primitive group of microorganisms that thrive in extreme habitats) and **a bacterium**.

What are Eukaryotes and Prokaryotes?

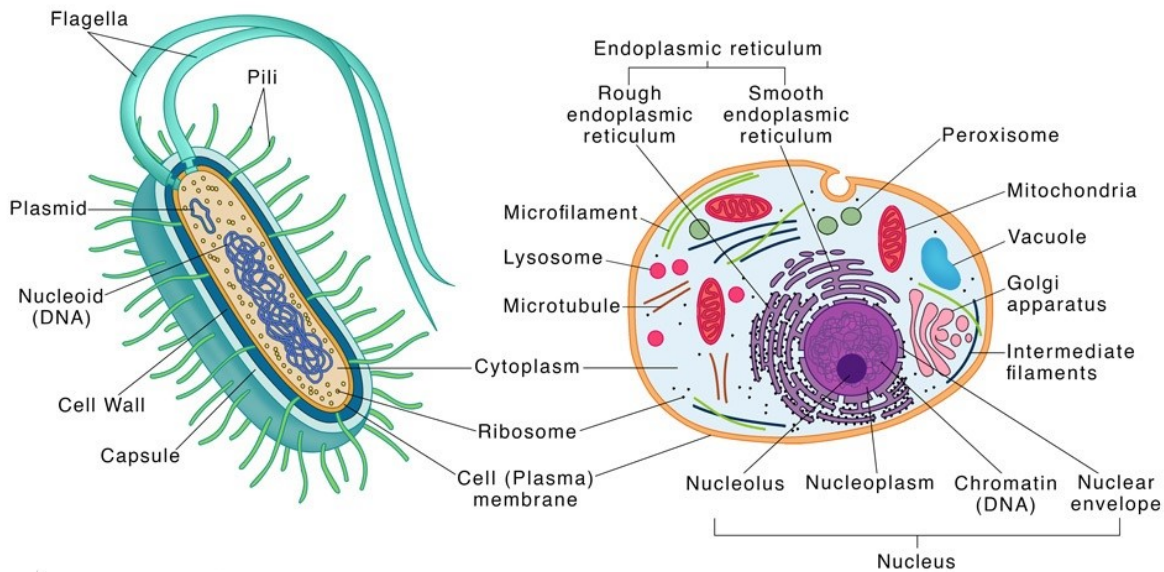
- Organisms on planet earth, based on the type of cells, are broadly divided into prokaryotes and eukaryotes.

Prokaryotes	Eukaryotes
<ul style="list-style-type: none">▪ Prokaryotes are organisms that lack a true nucleus and membrane-bound organelles. Their genetic material, typically a circular DNA molecule, is present in the cytoplasm without being enclosed within a nuclear membrane.▪ Prokaryotes include bacteria and archaea.▪ Key features include small, simple cells without a nucleus or organelles.	<ul style="list-style-type: none">▪ Eukaryotes are organisms that have cells containing a well-defined nucleus enclosed within a membrane.▪ Eukaryotic cells have a variety of membrane-bound organelles, such as mitochondria, endoplasmic reticulum, Golgi apparatus, and a complex network of internal membranes. These organelles perform specialized functions within the cell.▪ Key features include large, complex cells with a nucleus and various organelles.

Prokaryotic Cells



Eukaryotic Cells



How did Endosymbiosis Lead to Eukaryotes?

- Endosymbiosis is a process where **one organism lives inside another** and both benefit from the relationship.
- The endosymbiotic theory suggests that eukaryotes evolved from a **small archaeon engulfing a bacterium**.
 - The archaeon protected the bacterium and provided a stable environment, while the **bacterium supplied energy to the archaeon**.
- Over time, they became **dependent on each other** and formed a **new type of cell called a eukaryote**.
 - The engulfed **bacterium became the mitochondrion**, which produces energy for the cell.
- In plants, another endosymbiotic event occurred with a **cyanobacterium becoming the chloroplast**, responsible for **photosynthesis**.
 - This symbiotic relationship allowed eukaryotes to grow larger, become more complex, and adapt to different environments.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q1. With reference to 'stem cells', frequently in the news, which of the following statements is/are correct? (2012)

1. Stem cells can be derived from mammals only
2. Stem cells can be used for screening new drugs
3. Stem cells can be used for medical therapies

Select the correct answer using the codes given below:

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 3 only
- (d) 1, 2 and 3

Ans: (b)

Exp:

- Stem cells are undifferentiated or “blank,” cells capable of developing into cells that serve numerous functions in different parts of the body. Most cells in the body are differentiated cells. These cells can only serve a specific purpose in a particular organ. For example, red blood cells are specifically designed to carry oxygen through the blood.
- Stem cells are not only found in mammals but also found in plants and other organisms. **Hence, statement 1 is not correct.**
- Since stem cells have the ability to turn into various other types of cells, scientists believe that they can be useful for treating and understanding diseases. According to scientists, stem cells can be used to:
 - Grow new cells in a laboratory to replace damaged organs or tissues.
 - Correct parts of organs that do not work properly
 - Research causes of genetic defects in cells.
 - Research how diseases occur or why certain cells develop into cancer cells.
 - Test new drugs for safety and effectiveness. **Hence, statement 2 is correct.**
 - To carry out medical therapies. **Hence, statement 3 is correct.**
- **Therefore, option (b) is the correct answer.**

[Source: TH](#)

Radio Telescope

Why in News?

[Telescopes](#) are **indispensable tools for astronomers**, enabling them to observe and study celestial objects.

- Among the various types of telescopes, [radio telescopes](#) are **gaining traction by playing a crucial role in unveiling the mysteries of the universe** by detecting radio waves.

What is a Radio Telescope?

- **About:**
 - A **radio telescope** is a device that **detects and analyses radio waves from astronomical objects in the sky.**
 - Radio waves are a **type of [electromagnetic radiation](#) that have wavelengths ranging from about 1 millimetre to 10 metres.**
 - They can **penetrate dust and gas clouds that block [visible light](#)**, so radio telescopes can reveal hidden structures and phenomena in the universe.
- **Features:**
 - They are typically **situated on the ground rather than in orbit due to their large size.**
 - It consists of two main components: **a large [antenna](#) and a sensitive receiver.**
 - The **antenna is usually a parabolic dish that reflects and focuses the incoming radio waves** to a focal point.
 - The receiver amplifies and converts the radio signals into electrical signals that can be recorded and analysed by computers.

▪ **Significance:**

- It can **operate day and night**, unlike **optical telescopes** that need clear and dark skies.
- It can observe objects that are **too faint or too distant to be seen by optical telescopes**, such as the **cosmic microwave background** [radiation](#), [pulsars](#), [quasars](#), and [black holes](#).
- It can **study the chemical composition and physical conditions of interstellar gas and dust clouds** by detecting the spectral lines of various atoms and molecules.
- It can **measure the magnetic fields and rotation rates of stars and galaxies** by detecting the polarisation of radio waves.

Note:

- A **pulsar (from pulsating radio source) is a highly magnetised rotating neutron star** that emits beams of electromagnetic radiation out of its magnetic poles.
 - Most neutron stars are observed as pulsars.
- **Quasars are very luminous objects in faraway galaxies** that emit jets at radio frequencies.
 - Among the brightest objects in the universe, a quasar's light outshines that of all the stars in its host galaxy combined, and its jets and winds shape the galaxy in which it resides.
- **Examples of Radio Telescopes:**
 - [Giant Metrewave Radio Telescope \(India\)](#)
 - [SARAS 3 \(India\)](#)
 - [Atacama Large Millimetre/submillimetre Array \(ALMA\) \(Atacama Desert, Chile\)](#)
 - **Five-hundred-metre Aperture Spherical Telescope (FAST)** (China) (one of the biggest with a 500-metre-wide dish).



UPSC Civil Services Examination, Previous Year Question (PYQ)

Q. Consider the following (2008):

Assertion (A): Radio waves bend in a magnetic field.

Reason (R): Radio waves are electromagnetic in nature.

Which of the following is correct?

(a) Both A and R are individually true, and R is the correct explanation of A

(b) Both A and R are individually true, but R is not the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

Ans: (a)

Q. A layer in the Earth's atmosphere called Ionosphere facilitates radio communication. Why? (2011)

1. The presence of ozone cause the reflection of radio waves to Earth.
2. Radio waves have a very long wavelength.

Which of the statements given above is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

Ans: (d)

[Source: TH](#)

India-U.S. Strategic Partnership

For Prelims: [US-India Initiative on Critical and Emerging Technology](#), [India Semiconductor Mission](#), [Bharat 6G](#), [Indian Space Research Organization](#), [GE's F414 combat aircraft](#), [India-US Defence Acceleration Ecosystem](#), [Basic Exchange and Cooperation Agreement for Geospatial Intelligence](#), [Communication Compatibility and Security Agreement](#), [Indian Ocean Dialogue](#), [UN Security Council](#), [WTO](#), [Biofuels](#)

For Mains: Areas of Cooperation Between India and US

Why in News?

The **Indian Prime Minister** was on a significant visit to the [United States of America](#).

- The visit aimed to **strengthen the strategic partnership between the two countries** and focused on **addressing common challenges, taking a stand on global issues, collaborating in [critical emerging technologies](#), promoting [sustainable development](#), and transitioning towards [clean energy](#).**

What are the Areas of Cooperation Highlighted During the Visit?

- **Strengthening Semiconductor Supply Chains: Micron Technology**, with support from the [India Semiconductor Mission](#), will invest in a new semiconductor assembly and test facility in India.
 - Applied Materials will establish a **Semiconductor Centre for Commercialization and Innovation in India** to enhance the diversification of the semiconductor supply chain.

- Lam Research will train **60,000 Indian engineers** through its "**Semiverse Solution**" to accelerate India's semiconductor education and workforce development goals.
- **Advanced Telecommunications: India and the US have established public-private Joint Task Forces** on the development and deployment of **Open RAN systems and advanced telecoms research and development**.
 - [Bharat 6G](#) from India and the **US Next G Alliance** will co-lead the public-private research, aiming to reduce costs, enhance security, and improve the resiliency of telecommunication networks.

Note: Open RAN, also known as **Open Radio Access Network**, is a concept and approach to **designing and implementing radio access networks in telecommunications**. It aims to introduce greater **openness, flexibility, and interoperability into traditional RAN architectures** by **decoupling hardware and software components and promoting multi-vendor integration**.

- **NASA-ISRO Collaboration in Space:** India has signed the **Artemis Accords**, joining 26 other countries committed to **peaceful, sustainable, and transparent cooperation for space exploration**.
 - NASA will provide **advanced training to [Indian Space Research Organization \(ISRO\)](#) astronauts**, with the goal of a joint effort to the **International Space Station in 2024**.
 - A strategic framework for human spaceflight cooperation between **NASA and ISRO is being developed by the end of 2023**.
- **Quantum, Advanced Computing, and Artificial Intelligence:** The **Joint Indo-US Quantum Coordination Mechanism** has been established to facilitate joint research on **[quantum technology](#) , [Artificial Intelligence \(AI\)](#), and advanced wireless technologies**.
 - Joint collaboration on trustworthy and responsible AI, including **generative AI**, will promote AI education, workforce initiatives, and commercial opportunities.
 - India's leadership as **Chair of the Global Partnership on AI** was commended, and **Google's investment in Indian startups and AI research centre** was appreciated.
- **Fibre Optics Investments:** **Sterlite Technologies Limited from India** has invested USD 100 million in constructing a **[optical fibre](#) cable manufacturing unit near Columbia, South Carolina**, facilitating **USD 150 million in annual exports of optical fiber from India**.
- **Cutting-edge Research:** The **US National Science Foundation has joint research collaborations** with India's Department of Science and Technology.
 - A cooperative arrangement has been signed with **India's Ministry of Electronics and Information Technology** to promote emerging technologies.
- **Innovation Handshake:** The **US-India Commercial Dialogue** will launch an "**Innovation Handshake**" to connect the startup ecosystems of both countries, supporting the **[US-India Initiative on Critical and Emerging Technology \(iCET\)](#)**.
- **Critical Minerals Partnership:** India has become the **newest partner of the US-led Minerals Security Partnership (MSP)**, focused on developing diverse and sustainable critical energy minerals supply chains globally.
 - **Epsilon Carbon Limited, an Indian company, will invest in a greenfield [electric vehicle](#) battery component factory** in the US.
- **Defense Partnership:** A groundbreaking proposal has been welcomed to co-produce **[GE's F414 combat aircraft engines](#) in India**, allowing for greater transfer of US jet engine technology.
 - India intends to procure **armed [MQ-9B SeaGuardian UAVs](#)** from General Atomics to enhance intelligence, surveillance, and reconnaissance capabilities.
 - Agreements have been reached for **service and repair of US Navy ships at Indian shipyards, fostering closer cooperation**.
 - **Master Ship Repair Agreements** with Indian shipyards will expedite contracting processes for mid-voyage and emergent repair.
 - The **[India-US Defence Acceleration Ecosystem \(INDUS-X\)](#)** has been inaugurated, fostering **joint innovation on defence technologies** and integrating India's private sector defence industry with the US defence sector.
 - The adoption of a **Defense Industrial Cooperation Roadmap** will provide policy direction for defence industries.
 - The roadmap aims to enable co-production of advanced defence systems and collaborative research, testing, and prototyping.

Note:

- India and US have four foundational defence agreements:
 - [Basic Exchange and Cooperation Agreement for Geospatial Intelligence \(BECA\)](#).
 - **General Security of Military Information Agreement (GSOMIA)**.
 - **Logistics Exchange Memorandum of Agreement (LEMOA)**.
 - [Communication Compatibility and Security Agreement \(COMCASA\)](#).

- **Fighting Terror and Drugs:** The US and India stand united in countering [global terrorism](#), condemning terrorism and violent extremism in all forms.
 - Emphasis is placed on **taking action against UN-listed terrorist groups and urging Pakistan to prevent the use of its territory for launching attacks**.
 - A **counternarcotics framework** will be developed to disrupt the production and trafficking of illicit drugs, including synthetic drugs and precursors.

- **Cooperation in the Indo-Pacific:** The US will join the **Indo-Pacific Oceans Initiative**, promoting a **safe, secure, and stable maritime domain and regional coordination**.
 - India will continue to participate as an **observer in the Partners in the Blue Pacific**.
 - A [Indian Ocean Dialogue](#) will be held, bringing together experts and stakeholders to enhance regional coordination.

- **Strengthening and Reforming the Multilateral System:** Both countries supported a **comprehensive UN reform agenda**, including expansion of the [UN Security Council's permanent and non-permanent membership](#).
 - The U.S. endorsed [India's permanent membership on a reformed UN Security Council and India's candidature as a non-permanent member for the 2028-29 term](#).

- **Initiatives on Healthcare:** Collaboration between US and Indian scientists will be fostered through grants to develop **AI-enabled digital pathology platforms and AI-based automated radiotherapy treatment for cancer**.
 - Agreements will be signed to further research on diabetes, and a **US-India Cancer Dialogue** will be hosted to accelerate progress against cancer.

- **Digital Public Infrastructure (DPI) for Inclusive Development:**
 - Recognizing the potential of **DPI approaches**, both countries aim to provide **global leadership in promoting inclusive development, competitive markets, and protecting individual rights**.
 - Collaboration will be pursued to develop and deploy robust DPIs, with safeguards for privacy, data security, and intellectual property.
 - Exploring the **establishment of an India-U.S. Global Digital Development Partnership** to enable DPI development and deployment in developing countries.

- **Strengthening India-U.S. Trade and Investment Partnership:**
 - Bilateral trade exceeds **USD 191 billion in 2022**, with a focus on greater engagement and technical cooperation in emerging technologies, clean energy, and pharmaceuticals.
 - **Harmonisation of standards and regulations**, lowering barriers to trade and investment, and promoting an innovative digital economy.
 - **Resolution of outstanding WTO disputes and market access issues**, with further engagement through the **India-U.S. Trade Policy Forum**.
 - Exploring **restoration of India's status under the U.S. Generalised System of Preferences program** and recognition as a [Trade Agreements Act-designated country](#).

- **Sustainable Development:** Collaborative efforts between **India and the US will continue to achieve national climate and energy goals**, including co-leading the [Hydrogen Breakthrough Agenda](#).
 - Innovative investment platforms will be **created to attract international private finance for renewable energy**, battery storage, and emerging green technology projects in India.
 - The U.S. Agency for International Development will support Indian Railways' target to become a ["net-zero" carbon emitter by 2030](#).
 - Initiatives are in place to **decarbonize the transportation sector and promote biofuels**.

- **People-Centric Efforts:**
 - Initiatives have been taken to **simplify visa renewals for certain petition-based**

- temporary work visas**, benefiting Indian nationals and reducing the need to leave the country for renewal.
- Plans are underway to **open new consulates in Bengaluru and Ahmedabad**, fostering closer diplomatic ties.
 - Student exchanges and scholarships have been enhanced, with a record **number of visas issued to Indian students**, and increased opportunities for US undergraduate students to study or intern in India.
 - The Leaders welcomed the **establishment of the Tamil Studies Chair at the University of Houston** and **reinstating the Vivekananda Chair at the University of Chicago** to further research and teaching of India's history and culture.

UPSC Civil Services Examination Previous Year Question (PYQ)

Prelims

Q.1 Consider the following statements about G-20: (2023)

1. The G20 group was originally established as a platform for finance ministers and central bank governors to discuss international economic and financial issues.
2. Digital public infrastructure is one of India's G-20 priorities

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: C

Mains:

Q. What introduces friction into the ties between India and the United States is that Washington is still unable to find for India a position in its global strategy, which would satisfy India's National self-esteem and ambitions'. Explain with suitable examples. (2019)

[Source: HT](#)

Lab-Grown Meat

For Prelims: Lab-Grown Meat, Cell-cultivated chicken

For Mains: Potential of lab-grown meat in addressing food security, Animal welfare implications of cell-cultivated meat.

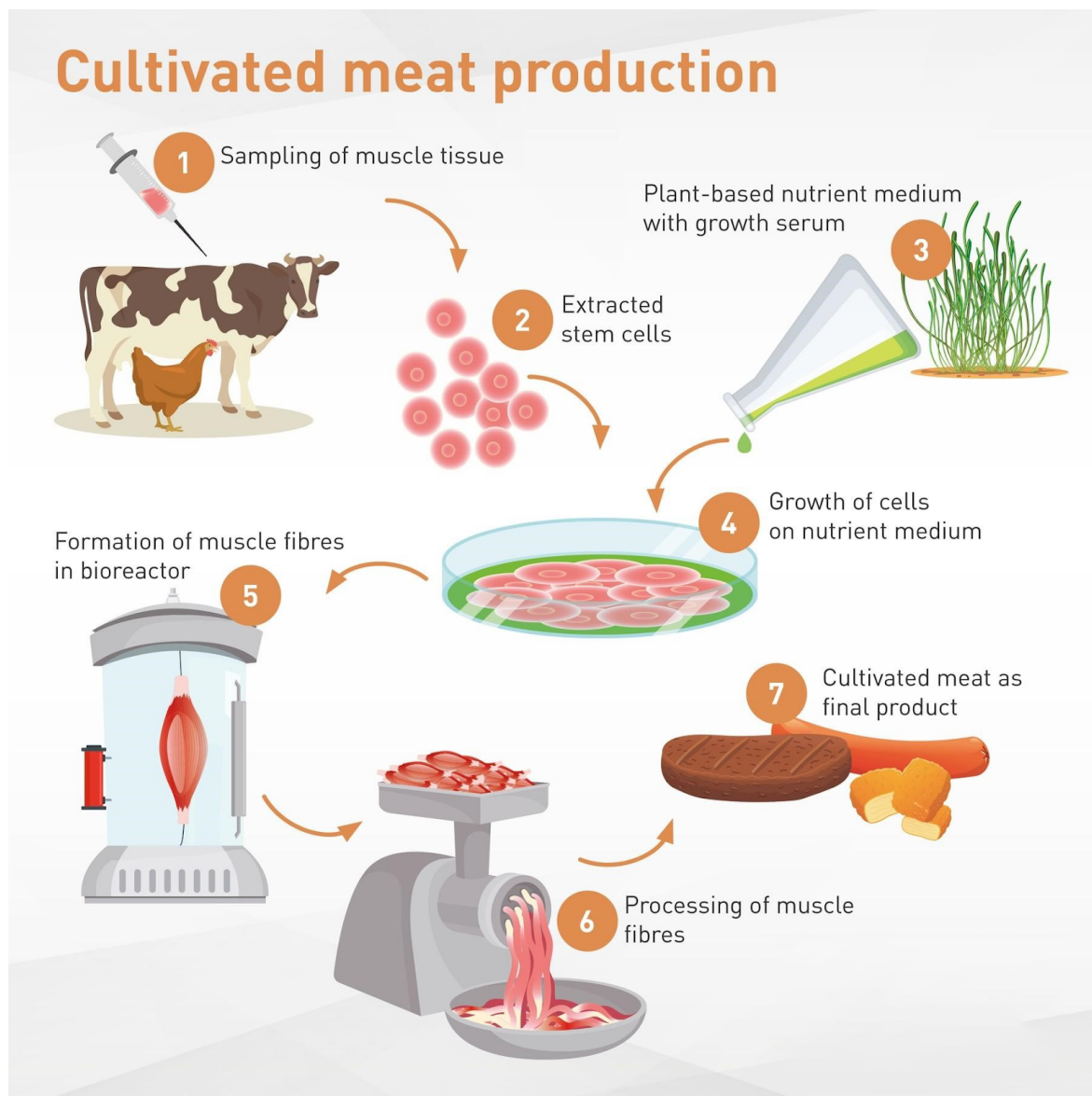
Why in News?

Recently, there has been a significant development in the world of sustainable food production with the United States' **approval of lab-grown meat**, specifically **cell-cultivated chicken**, by two California-based companies.

- Two California-based companies, Good Meat, and Upside Foods received U.S. government approval to produce and sell the '**cell-cultivated chicken**'.

What is Lab-Grown Meat?

- Lab-grown meat, officially known as cell-cultivated meat, refers to meat that is grown in a **laboratory setting using isolated cells derived from animals**.
- These cells are provided with the necessary resources, such as nutrients and a suitable environment, **to replicate and grow into edible meat**.
- The process typically takes place in **bioreactors**, specialized containers designed to support the cellular cultivation process.
- The **first country to approve** the sale of alternative meat was **Singapore** in 2020.



▪ Cell-Cultivated Chicken:

- Cell-cultivated chicken refers to **chicken meat grown** in a laboratory setting using isolated cells that have the resources needed for growth and replication.
- Bioreactors, specialized containers designed to support a specific biological environment, are commonly used to facilitate the cultivation process.
- Once the cells reach a sufficient number, they are **processed, often with additives, to**

enhance texture and appearance, and prepared for consumption.

How is Cell-Cultivation Technique Significant for Meat Production?

- **Climate Mitigation:**
 - Lab-grown meat offers a potential solution to reduce [greenhouse gas emissions](#) associated with [livestock production](#).
 - According to the [Food and Agriculture Organization \(FAO\)](#), livestock production contributes about **14.5% of global anthropogenic GHG emissions**, mainly in the form of [methane](#) and [nitrous oxide](#).
- **Land Use Efficiency:**
 - Cell-cultivated meat requires significantly less land compared to traditional meat production methods.
 - A 2021 report estimated that lab-cultivated meat would use **63% less land in the case of chicken and 72% in the case of pork**.
- **Animal Welfare:**
 - The development of cell-cultivated meat aims to minimize the need for [animal slaughter](#).
 - By producing meat directly from cells, cultivated meat offers the possibility of **reducing animal suffering** and improving animal welfare standards.
- **Food Security and Nutrition:**
 - Lab-grown meat has the potential to address future [food security](#) needs.
 - Cell-cultivated meat can be **tailored to be healthier and meet specific dietary requirements** such as being designed to **contain less fat**.

What are the Challenges to Cell-Cultivated Meat?

- **Consumer Acceptance:**
 - Achieving **taste, texture, appearance, and cost parity** with conventional meat remains a challenge for cell-cultivated alternatives. Perception of cultured meat as "**artificial**" or "**unnatural**" may impact consumer willingness to adopt these products.
- **Cost:**
 - The cost of cell-cultivated meat is **expected to remain high**; primarily attributed to the complex and resource-intensive process of cell culturing. Scalability and quality control processes may impose additional costs.
- **Scalability:**
 - Currently, production is limited to small quantities, and **scaling up while maintaining product quality and consistency** is a significant challenge. Developing efficient and **cost-effective bioreactor systems** and finding suitable cell culture media are critical steps in achieving scalability.
- **Resources:**
 - Researchers require **high-quality cells, suitable growth mediums**, and other resources to ensure the quality of the final product.
- **Environmental Impact Concerns:**
 - Some studies suggest that the environmental impact of cell-cultivated meat production could be higher than traditional meat production if highly refined growth mediums are required.
- **Intellectual Property and Patent Issues:**
 - The field of cultivated meat involves numerous [Intellectual Property and Patent](#) considerations. Companies and researchers are filing patents for various techniques and technologies involved in the production of cultivated meat. Resolving **intellectual property disputes** and **ensuring fair access to technology** will impact the growth and development of the industry.

Way Forward

- Increase **consumer awareness and acceptance** through transparent communication about the

benefits and safety of lab-grown meat.

- Invest in R&D to improve production processes, taste, texture, and cost efficiency of lab-grown meat.
- Focus on technological advancements and optimize production facilities to **reduce costs and meet market demand**.
- Encourage international collaboration, **harmonize regulations, and facilitate trade to expand the lab-grown meat** market worldwide.
- Cultivated meat is a relatively new field, and establishing a **clear regulatory framework** is essential. Governments and regulatory bodies need to determine how to classify and **regulate cultivated meat products to ensure safety, quality, and consumer confidence**.

[Source: TH](#)

Ethical Concerns of Organ Donation and Transplantation

For Prelims: Transplantation of Human Organs Act, 1994, National Organ Transplantation Guidelines 2023, WHO's Guiding Principles Related to Organ Donation

For Mains: Organ Donation and Transplantation - related ethical concerns, Deceased Organ Transplantation

Why in News?

Recently a man from Odisha, who was declared brain dead after a severe head injury, has given a **new lease of life to four people in three different states**.

- While organ transplantation **gives new life to someone it also surfaces ethical issues** such as the consent of the donor, human rights violation, organ trafficking etc.

What is the Scenario of Organ Donation and Transplantation in India?

- **Donation and Transplantation:** India conducts the **3rd highest number of transplants** in the world. Organs from deceased donors accounted for nearly **17.8% of all transplants in 2022**.
 - The total number of deceased organ transplants climbed from 837 in 2013 to 2,765 in 2022.
 - The total number of organ transplants - with organs from both deceased and living donors - increased **from 4,990 in 2013 to 15,561 in 2022**.

How is Organ Donation Regulated in India?

- In India, [Transplantation of Human Organs Act, 1994](#) provides various regulations for the removal of human organs and its storage. It also regulates the **transplantation of human organs for therapeutic purposes** and for the prevention of commercial dealings in human organs.
- In February 2023, the Ministry of Health and Family Welfare notified [National Organ Transplantation Guidelines](#), allowing those above **65 years of age to receive an organ for transplantation** from deceased donors.
 - The **guidelines have removed** the age limit for organ recipients, eliminated the domicile requirement, and **abolished registration fees previously charged** by certain states

like Gujarat, Telangana, Maharashtra, and Kerala.

What are the Ethical Concerns Related to Organ Donation and Transplantation?

- **Living Persons:**
 - **Violates the Traditional Rule of Medicine:**
 - Kidney donors are known to live healthy lives. However, studies in the European Union and China have shown that **a third of them are vulnerable to urinary and chest infections, which** violates the first traditional rule of medicine, **primum non nocere** (above all, do no harm).
 - **One person becomes a patient** to benefit another person **who is already a patient.**
 - **Donation is Prone to Trafficking:**
 - Organ **donation is susceptible to trafficking** when there is **illegal and unethical activity involved** in the acquisition, transportation, or transplantation of organs.
 - In its 1991 document "Guiding Principles on Human Organ Transplantation," the [World Health Organisation \(WHO\)](#) expresses concern over "the rise of commercial traffic in human organs, particularly from living donors who are unrelated to recipients."
 - **Emotional Coercion:**
 - The relationship between the **donor and recipient influences the donor's motivation** for organ donation. Living related donors are genetically related to the recipient and often **feel obligated due to family ties and emotional bonds.**
 - Ethical concerns include the potential for undue influence, **emotional pressure, and coercion.**
- **Deceased Person:**
 - **Consent and Autonomy:**
 - It is important to determine whether the person had expressed their consent or **refusal for organ donation while they were alive.**
 - If the person's wishes are unknown, it can be ethically challenging to make decisions on their behalf.
 - **Allocation and Fairness:**
 - Determining how organs are **allocated fairly and equitably is an ongoing ethical concern.**
 - Ethical concerns can emerge when there are **disparities in access to transplantation based on factors such as wealth, social status, or geographical location.**
 - **Transparency and Public Trust:**
 - The ethical concerns related to disclosure of information, the handling of organ procurement and transplantation procedures, and the management of organ donation registries **are important considerations.**

Note:

- While both deceased and living organ transplantation **have their own ethical considerations,** the **absence of harm to living donors,** respect for autonomy, and fairness in allocation **make deceased organ transplantation generally considered more ethically preferable.**

What are the WHO's Guiding Principles Related to Organ Donation?

- There are eleven guiding principles some are as follows:
 - **Guiding Principle 1:**
 - Cells, tissues and organs may be removed from the **bodies of deceased persons for the purpose of** transplantation if:
 - Any consent required by law is obtained, and
 - There is no reason to believe that the deceased person objected to such

removal.

- **Guiding Principle 2:**
 - Physicians determining that a **potential donor has died should not be directly involved in cell, tissue or organ removal** from the donor or subsequent transplantation procedures; nor should they be responsible for the care of any intended recipient of such cells, tissues and organs.
- **Guiding Principle 3:**
 - Deceased donations should **maximize therapeutic potential**, while living adult donors should comply with domestic regulations. Typically, living donors **should have a genetic, legal, or emotional connection** to their recipients.
- **Guiding Principle 4:**
 - No organs should be **taken from living minors for transplantation**, except for limited exceptions allowed by national law. Special measures must be implemented to safeguard minors, and whenever possible, their consent should be obtained before donation. The same principles apply to legally incompetent individuals (who are not able to testify or stand trial).
- **Guiding Principle 5:**
 - Donations of cells, tissues, and organs must be **voluntary and without monetary compensation**. The sale or purchase of these items for transplantation should be prohibited.
 - However, reasonable and verifiable expenses incurred by the donor, including loss of income, can be reimbursed.
 - Additionally, covering the costs of recovery, processing, preservation, and supply of human cells, tissues, or organs for transplantation is allowed.

Way Forward

- Surveys in most parts of the world show that people do appreciate the ethical need for organ donation. But their **altruism is also premised on the presumption that organs will be distributed in a fair manner** to those in need.
- Regulations in organ transplant **policy are crucial to uphold ethical principles**, protect the rights of donors and recipients, prevent organ trafficking, and maintain public trust.
- They provide a framework for a well-functioning, transparent, and morally sound organ donation and allocation system.

[Source: IE](#)

Rapid Fire Current Affairs

Mushroom Cultivation Transforms Assam's Kokrajhar District

In Assam's Kokrajhar district, through the launch of the **Mushroom Mission in 2021**, aligning with the **'one district one Product'** initiative and the introduction of mushrooms into the **midday meal scheme** has yielded remarkable results.

The inclusion of **nutrient-rich mushrooms in children's meals** has reduced the number of **underweight, wasted, and anaemic children** by 56%, 55%, and 76%, respectively. **Maternal mortality** rates in the district also **decreased by 72.37%**, and the **infant mortality rate decreased by 30.56%**.

Mushrooms are highly nutritious and offer several health benefits. They are **low in calories and fat**, making them an ideal choice for **weight management**. Mushrooms are a rich source of vitamins and minerals, including **B vitamins, copper, selenium, and potassium**. They also provide **dietary fiber and antioxidants**, which support digestive health and strengthen the immune system. Additionally, mushrooms are one of the **few non-animal sources of vitamin D**, which is essential for bone health.

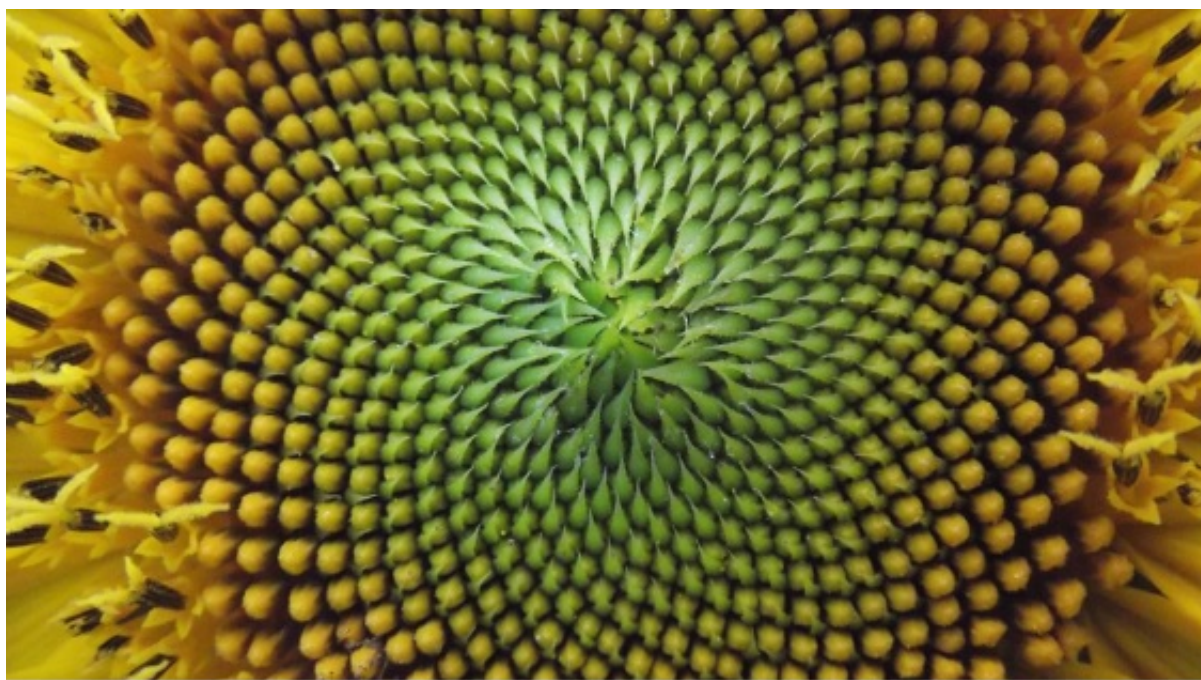
DPCGC Takes Action Against Obscene Content on OTT Platform

Recently, the **Digital Publisher Content Grievances Council (DPCGC)**, a **self-regulatory body** for **online curated content providers (OCCPs) in India**, has taken action against the **Over-the-Top (OTT) platform ULLU** for streaming explicit and obscene content. Headed by retired Supreme Court Judge Justice A K Sikri, the council issued an order demanding the removal of such content within 15 days, citing violations of the **Information Technology Rules (2021)** and complaints raised by a dissatisfied viewer.

DPCGC addresses **consumer grievances and content-related issues**. It operates under the **Ministry of Information & Broadcasting** and enforces the **Code of Ethics** and regulations set by the government. The DPCGC consists of an **OCCP Council and a Grievance Redressal Board**.

Read more: [Over-the-Top \(OTT\) platform](#), [Over-the-Top Challenge](#)

Fibonacci Spirals in Plants



The characteristic of being arranged in spirals that adhere to a numerical sequence called the Fibonacci sequence. | Photo Credit: The Hindu

A recent study has **questioned the commonly held belief that plants exhibit ancient and consistent patterns known as Fibonacci spirals**. These spirals can be observed in **various parts of plants, including leaves and reproductive structures**. However, researchers studying fossilised plants dating back 407 million years discovered that the **spirals in this particular species did not conform to the Fibonacci sequence**.

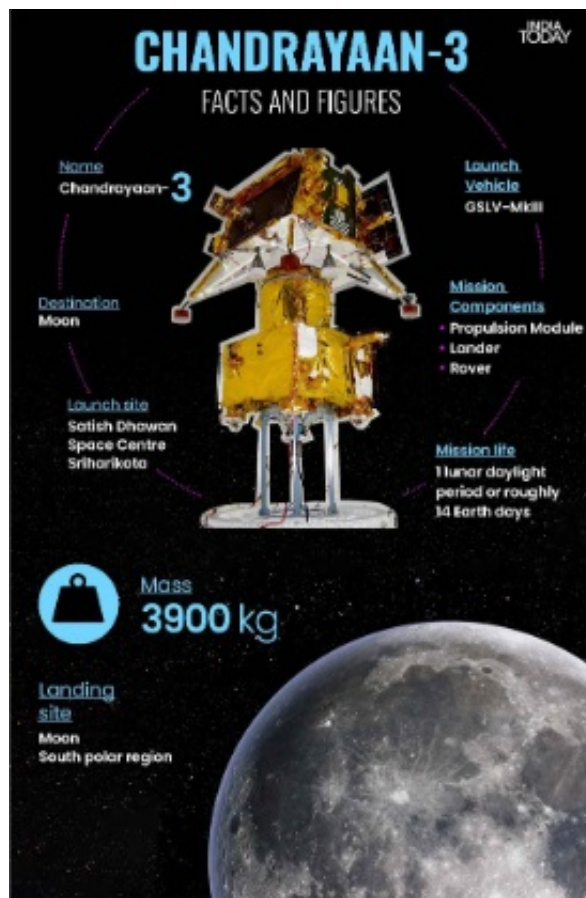
The **Fibonacci sequence is a series of numbers in which each number is the sum of the two preceding ones**. The sequence starts with 0 and 1, and each subsequent number is obtained by adding the two numbers immediately before it. The sequence begins as follows: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, and so on.

The new finding suggests that **early plants had a different pattern of spiral arrangement, with non-Fibonacci spirals being more prevalent**. It indicates that the **evolution of leaf**

arrangement and Fibonacci spirals had a distinct history in certain plant groups, such as **clubmosses**, which differs from other living plant groups like ferns and [flowering plants](#).

This research opens up new avenues of exploration and may help unravel the mystery behind the prevalence of these patterns in nature.

Chandrayaan-3 to Retain Chandrayaan-2 Lander and Rover Names



ISRO has recently announced its decision to use the **same names for the lander and rover of the upcoming Chandrayaan-3 mission**, following the unfortunate outcome of the **Chandrayaan-2 mission**, in which the lander named **Vikram** experienced a crash during its attempted soft landing on the lunar surface

The **lander of Chandrayaan-3 will be named 'Vikram' in honour of Vikram Sarabhai**, a key figure in India's space program, **while the rover will be called 'Pragyan'**. The launch is scheduled for **mid-July 2023**, and the mission will carry out experiments and collect data through various payloads on the lander, rover, and propulsion module.

Read more: [Indian Space Research Organisation](#), [Chandrayaan-3 mission](#).

Protecting India's Forest Frontline

For Prelims: [Indian Forest Act, 1927](#), [The Wild Life \(Protection\) Act, 1972](#), [The Forest Conservation Act, 1980](#), [Simlipal tiger reserve](#)

Why in News?

Recently, [poachers](#) killed a forester in [Odisha's Simlipal tiger reserve](#), marking the second such death in a span of a few weeks when another forest guard was shot dead.

- India's **frontline forest staff, including contract laborers, guards, foresters, and rangers**, have been engaged in a longstanding and uneven battle against poachers, illegal miners, tree-fellers, mass encroachers, and insurgents.

Who are the Forest Officers?

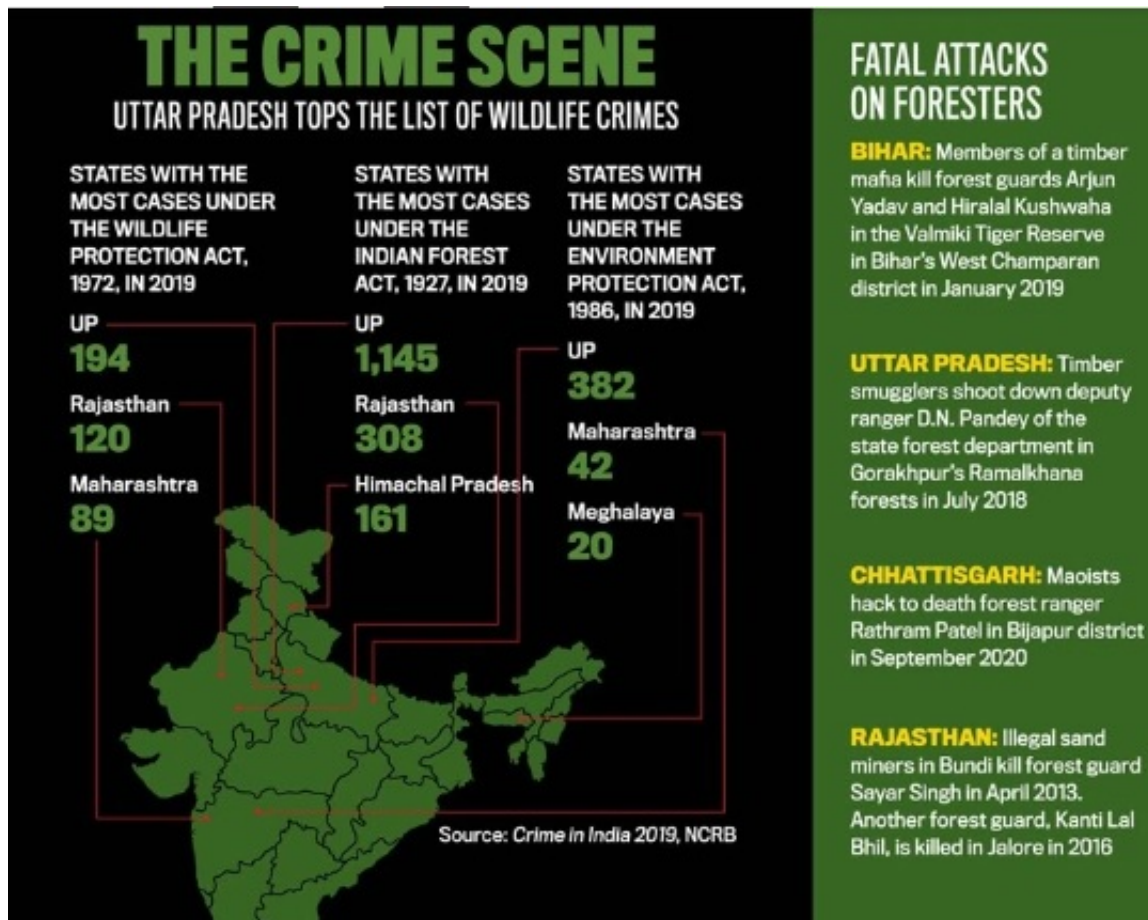
- Forest officers are **public servants employed by the Government for the administration and governance of forests** across the territory of India.
 - All the States in India have formulated their own legislation for governing forests in their territory, with the [Indian Forest Act, 1927](#) as the base (forests being a [concurrent list](#) subject under [7th Schedule](#)).
- The **three primary acts** which bestow power upon forest officers are:
 - Indian Forest Act, 1927.
 - [The Wild Life \(Protection\) Act, 1972.](#)
 - [The Forest Conservation Act, 1980.](#)
- Forest staff's **primary responsibility is to safeguard valuable and limited resources** such as endangered animals, trees, sand, boulders, [minerals](#), and forest land. **As a result, they face a constant and relentless onslaught.**

What are the Concerns Associated with Foresters' Safety?

- **Conditional Armed Status of Forest Guards:** Forest guards are not always unarmed. Depending on the state, they may be equipped with various weapons. However, **due to uncertain law and order situations, especially in [insurgency-affected regions](#), forest guards often face restrictions** on carrying these weapons.
 - In the case of Simlipal, which **falls within the [red corridor](#) stretching from Chhattisgarh's Indravati to Bihar's [Valmiki tiger reserves](#)**, forest staff had discontinued carrying guns for the same reason.
- **Limited Authority for Proactive Use of Weapons:** Furthermore, forest officials do not possess the authority to proactively use their weapons. **Like any other citizens, they are only entitled to exercise their right of private defense** as outlined in **Sections 96 to 106 of the [Indian Penal Code \(IPC\)](#).**
 - This means they can use force, including weapons, only **to protect themselves or others from imminent harm or danger.**
- **Risks and Considerations of Carrying Firearms:** Weapons can indeed pose a risk even in situations without the presence of insurgents as there are certain challenges (potential accidents or misuse of weapons) and considerations that arise when it comes to carrying and using firearms.
- **Wildlife-Human Conflict:** Foresters often encounter [conflicts between wildlife and human populations](#). This includes instances of crop raiding by animals, attacks on humans by wild animals, and encroachment of forest habitats by human settlements.
- **Lack of Manpower:** Forest establishments in India tend to **prioritise cumbersome bureaucratic processes and administrative matters over the welfare and support of the frontline workforce.**
 - This can be problematic as it **creates a situation where there are too many vacant positions** within forest departments across the country.
 - As a result, **there are insufficient numbers of personnel on the ground to**

effectively protect the forests and ensure their own safety.

- **Lack of Effective Defense:** According to the International Ranger Federation, a total of 31 forest field staff members lost their lives while on duty in India in 2021. **Out of these cases, only 8 were classified as homicides** and the rest were attributed to factors like forest fires, elephant/rhino attacks and motor accidents.
 - In some instances, the casualties occurred not because they were unarmed, but because they did not know how to fire their weapons.



Enhancing Legal Protection for Forest Officers:

- In July 2010, **Assam took a significant step by implementing the provisions of Section 197(2) of the Criminal Procedure Code (CrPC) for all forest officers.**
 - This provision **granted them protection from arrest and criminal proceedings, unless a magisterial investigation determined that the use of firearms was deemed "unnecessary, unwarranted, and excessive."** The state had to review and accept the findings of the investigation.
- Following a series of tiger poaching cases in 2012, **Maharashtra also issued a similar order.**

Why are Foresters not Provided with Excess Powers in Terms of Using Weapons?

- **Protection of Ecosystems and Wildlife:** Foresters have a critical role in safeguarding forests, wildlife, and their habitats. Excessive powers could lead to **unintended harm to ecosystems and wildlife** if firearms are used indiscriminately or without proper justification.
- **Potential for Misuse:** Excessive powers could increase the risk of misuse or misconduct by foresters. It is **important to maintain checks and balances** to prevent misuse of firearms and ensure that foresters act in accordance with the law.

- **Civilian Law Enforcement Perspective:** Foresters are **primarily tasked with conservation** and environmental protection, **rather than law enforcement**.
 - Providing them with excessive powers in using weaponry **could blur the line between their conservation roles and the responsibilities of law enforcement agencies**, potentially leading to confusion and conflicts in their duties.
- **Balancing Safety and Potential Risks:** Arming foresters with guns in remote jungle areas may **increase the vulnerability of the local population**.
 - The presence of firearms in the hands of foresters could potentially escalate conflicts and result in unintended consequences, **especially in areas where tensions already exist between foresters and local residents**.

Way Forward

- **Professional Training:** Forest frontline staff in India require comprehensive training to effectively carry out their duties.
 - This training **should equip them with the necessary skills and knowledge** to handle the complexities and risks associated with their work.
 - Foresters need **adequate support, both in terms of resources and infrastructure**, to effectively carry out their duties.
- **Adequate Compensation:** Forest staff should be provided with fair and **sufficient compensation and incentives** for their services.
 - Considering the demanding nature of their job and the risks they face; it is **crucial to ensure they are adequately rewarded for their efforts**.
- **Strengthening Legal Framework:** Ensuring a strong legal framework that protects foresters and enables them to perform their duties without unnecessary interference or intimidation is essential.
 - However, the framework should be formed in such a way that besides ensuring foresters' security, it **also ensures that the officials are not exploiting their power and showing unnecessary force on forest communities**.

[Source: IE](#)
