



Champakam Dorairajan Case and Evolution of FRs and DPSPs

For Prelims: [Champakam Dorairajan Case](#), [Fundamental Rights](#), [Directive Principles of State Policy](#), [Article 46](#), [Article 14](#), [Article 16\(4\)](#), [1st Constitutional Amendment Act](#), [Article 15\(4\)](#), [Ninth Schedule](#), [25th Constitutional Amendment Act, 1971](#), [Article 31C](#), [Article 39\(b\) & \(c\)](#), [42nd Constitutional Amendment Act, 1976](#).

For Mains: Conflict between Fundamental Rights (FRs) and Directive Principles of State Policy (DPSPs) and related judicial rulings.

[Source: IE](#)

Why in News?

[Champakam Dorairajan Case, 1951](#) presented the first instance of **conflict** between the [Fundamental Rights \(FRs\)](#) and [Directive Principles of State Policy \(DPSPs\)](#).

What is Champakam Dorairajan Case, 1951?

- **Background of the Case:** In 1948, the **Madras government** introduced the **Communal General Order (GO)**, which **reserved seats in educational institutions** based on **caste and religion**.
 - The government cited [Article 46](#), which mandates promoting the **education and economy of SCs, STs, and weaker sections**.
 - **Champakam Dorairajan**, a **woman from Madras**, challenged the order in the **Madras High Court (HC)**, citing a violation of her **right to equality (Article 14)**.
- **Madras High Court Verdict, 1950:** The Madras HC **struck down the Communal GO** as **unconstitutional** for using **caste and religion** as basis of classification, but the Madras government **appealed to the Supreme Court (SC)**.
- **Supreme Court Verdict, 1951:** A five-judge Supreme Court bench **upheld the Madras HC ruling**, declaring the **Communal GO unconstitutional**.
 - The judgment stated that it **violated** fundamental rights under **Article 14** (Right to Equality) and **Article 15(1)** (Prohibition of Discrimination on Grounds of Religion, Race, Caste, Sex, or Place of Birth).
 - The SC ruled that **FRs prevail over DPSPs** and established that **Parliament can amend FRs** through constitutional amendments.
- **Impact of the SC Ruling:** The ruling **struck down caste-based reservations** in education, as the Constitution then allowed reservations **only in public jobs (Article 16(4))**.
 - This led to the [1st Constitutional Amendment Act, 1951](#) to restore education reservations.
- **1st Constitutional Amendment Act, 1951:** The government **amended Article 15** by introducing [Article 15\(4\)](#), which allowed the state to make **special provisions** for the advancement of [socially and educationally backward classes \(SEBCs\)](#), **Scheduled Castes (SCs)** and **Scheduled Tribes (STs)**.
 - This amendment provided the **constitutional basis for reservations in educational institutions**.

What are Key Constitutional Provisions for Vulnerable Groups?

- **Article 15(1):** Prohibits discrimination **on grounds of religion, race, caste, sex, or place of birth.**
- **Article 15(4):** Allows **special provisions** for the **advancement of SEBCs, SCs, and STs**, thus enabling **reservations in educational institutions.**
- **Article 16(4):** Permits **reservations in public employment** for **backward classes.**
- **Article 17:** Abolishes **untouchability.**
- **Article 46 (DPSP):** Mandates the **promotion of educational and economic interests of SCs, STs, and weaker sections.**

What Provisions were Amended by the 1st Constitutional Amendment Act, 1951?

- **Fundamental Rights:**
 - **Article 15(4):** Allowed special provisions for **SEBCs, SCs, and STs.**
 - **Article 19:** Expanded **reasonable restrictions** on free speech (Article 19(2)), including **security of the state, public order, and incitement to offenses.**
 - The State can set **professional qualifications** and **regulate or nationalize trade, business, or industry** through State-owned corporations.
- **Parliament and State Legislatures:**
 - **Article 85 & 174:** Ensured that the **gap** between two parliamentary or state legislative sessions **does not exceed six months.**
 - **Article 87 and 176:** The President/Governor's **address to the legislature** was now required only **once after each general election and at the beginning of the first session each year.**
- **Land Reforms:**
 - **Article 31A:** Secured laws related to the **acquisition of estates and property rights** from being challenged under fundamental rights.
 - **Article 31B:** Created the **Ninth Schedule**, protecting listed laws from judicial review regarding **fundamental rights.**
- **SCs and STs:** The **President** was given authority to specify **SCs (Articles 341) and STs (Articles 342)** for each State separately.

What are Other Judgements on Conflict Between FRs and DPSPs

- **Golaknath Case, 1967:** The SC overturned its **Champakam Dorairajan** ruling, declaring that Parliament **cannot amend FRs**, ensuring their **absolute protection.**
- **Kesavananda Bharati Case, 1973:**
 - **Background:** **25th Constitutional Amendment Act, 1971** introduced **Article 31C**, which contained **two key provisions:**
 - Laws for implementing DPSPs on resource distribution (**Article 39(b) & (c)**) were shielded from **judicial review**, even if they violated FRs provided under **Article 14, 19, or 31.**
 - Any law designed to implement the **Article 39(b) & (c)** was **protected from judicial review**, even if it did not fully achieve its goals.
 - **Verdict:** The SC **upheld the first provision**, ensuring laws implementing **Article 39(b) and (c) remained valid** even if they conflicted with Fundamental Rights.
 - It **struck down** Article 31 C's **second provision** barring judicial review.
 - The SC also introduced the concept of **Basic Structure** that states that certain fundamental principles of the Constitution **cannot be altered or destroyed** through amendments. E.g., **Judicial review, limited amending power** etc.
- **Minerva Mills Case, 1980:**
 - **Background:** **42nd Constitutional Amendment Act, 1976** extended Article 31C's

protection to **all DPSPs, prioritizing them over FRs** under Articles 14, 19, and 31.

- **Verdict:** The SC **struck down** the 42nd Amendment's expansion of **Article 31C**, ruling that there is a **harmonious construction between FRs and DPSPs** and **DPSPs cannot override FRs**, preserving the Constitution's balance.
- **Current Status: FRs take precedence over DPSPs**, but Parliament can amend Articles 14 and 19 to implement Articles 39(b) and 39(c).

Conclusion

The Champakam Dorairajan case established the **supremacy of Fundamental Rights over Directive Principles**, influencing constitutional amendments and judicial interpretations. Subsequent rulings, including **Golaknath, Kesavananda Bharati, and Minerva Mills**, shaped the **balance between FRs and DPSPs**, ensuring social justice while upholding individual liberties and judicial review as constitutional safeguards

Drishti Mains Question:

Analyze the Supreme Court's evolving stance on the conflict between Fundamental Rights and Directive Principles, citing key cases

UPSC Civil Services Examination Previous Year's Questions (PYQs)

Prelims

Q. Which part of the Constitution of India declares the ideal of Welfare State? (2020)

- (a) Directive Principles of State Policy
- (b) Fundamental Rights
- (c) Preamble
- (d) Seventh Schedule

Ans: (a)

Mains

Q. "Parliament's power to amend the Constitution is limited and it cannot be enlarged into absolute power." In light of this statement, explain whether Parliament under Article 368 of the Constitution can destroy the Basic Structure of the Constitution by expanding its amending power? (2019)

Rise of India's Private Space Industry

For Prelims: [Indian Space Research Organisation](#), [Indian National Space Promotion and Authorisation Centre](#), [Venture Capital](#), [POEM](#)

For Mains: India's space startups, Space Sector Reforms of 2020 and their impact.

[Source: BS](#)

Why in News?

The rise of **private participation in India's space sector**, driven by the [Space Sector Reforms of 2020](#), has accelerated innovation and investment by opening the industry to private players.

- [Indian Space Research Organisation's \(ISRO\)](#) continued achievements, along with **India's space tech startups**, are driving rapid advancements in space technology, exploration, and commercialization.

How Has India's Private Space Industry Grown?

- **Private Participation:** Over **200 space startups** are now active in India, leveraging ISRO's facilities (ISRO's testing, launch, and ground station facilities).
 - [Indian National Space Promotion and Authorisation Centre \(IN-SPACe\)](#) has provided regulatory and financial support (with a Rs. 1,000 crore [Venture Capital \(VC\) Fund](#)) to accelerate the growth of India's space sector.
 - [Antrix Corporation](#), ISRO's commercial arm, has played a key role in facilitating satellite launches and technology transfers to private players.
 - The [POEM \(PSLV Orbital Experimental Module\) program](#) has carried an increasing number of startup payloads, from **6 in 2022 to 24 in 2024**.
- **Private Investment:** Private funding is gaining momentum and drives the space economy.
 - **MountTech Growth Fund - Kavachh (MGF-Kavachh)** is boosting domestic investments through venture capital funding, with startups securing **Rs 2,500 crore in the past 3 years**.
 - MGF-Kavachh is a [Securities and Exchange Board of India \(SEBI\)](#) registered [Alternative Investment Fund \(AIF\) under Category II](#).
- **Indian Startups Advancements:** **GalaxEye** achieved the **world's first fusion of Synthetic Aperture Radar (SAR) with optical imagery**, enabling rapid data compression.
 - **Pixxel** is developing world's most advanced **hyperspectral satellite constellations (Firefly)**, while **InspeCity (IIT Bombay)** is working on in-orbit docking for satellite repair and refueling.
 - **Skyroot and Agnikul** are pioneering private launch vehicles for cost-effective satellite deployment.

Space Sector Reforms 2020

- India's **Space Sector Reforms 2020** expanded private participation across all space activities, including satellite design, launch vehicle manufacturing, and ground station services, to enhance India's global space economy share.
- **IN-SPACe** was established as a regulatory body to **facilitate and promote private sector participation** and enables **non-government private entities (NGPEs)** to engage in space-based activities rather than being just vendors for ISRO.
- The reform has also encouraged **technology transfer** from ISRO to private entities through [NewSpace India Limited \(NSIL\)](#).

What are the Challenges Facing India's Space Industry?

- **Funding and Investment Gaps:** While venture capital interest is rising, **early-stage funding remains limited**, making it difficult for startups to scale.
- **Talent Shortage:** The **lack of specialized educational institutions** and courses in space technology hinders talent development.

- Only one Indian Institute of Space Technology (IIST) exists, creating a need for more institutions and industry-academia collaborations.
- **Global Competition:** Nations like the **US, China, and Russia have advanced space programs**, including reusable spacecraft, space tourism, and extensive satellite constellations.
 - India is catching up, but **longer R&D cycles and limited high-end capabilities** pose hurdles.
- **Foreign Launch Vehicles:** While India has developed launch capabilities, **many startups still rely on foreign rockets like SpaceX's Falcon-9** due to cost and schedule constraints.
 - Developing **more efficient and reusable launch vehicles** is essential for reducing dependence.

Way Forward

- **Boosting R&D and Infrastructure:** Expand domestic manufacturing of satellite components through a **Production Linked Incentive Scheme** for space-grade components.
 - Establish more **IISTs and space-focused courses** in IITs to build a skilled workforce.
 - Develop a **dedicated space industrial corridor like Space Coast, Florida** to create a robust ecosystem for satellite and launch vehicle manufacturing.
- **Global Collaboration:** Strengthen **bilateral agreements** with leading space agencies (NASA, ESA, Roscosmos).
 - Promote **rideshare missions** for startups to make satellite launches more affordable.
- **Technology Transfer:** Expand **ISRO's technology transfer initiatives** to enable startups to commercialize homegrown innovations.
 - Leverage space startups to develop applications for industries such as agriculture, disaster management, and urban planning, driving commercial growth.

Drishti Mains Question:

Discuss the significance of the Space Sector Reforms of 2020 in fostering private participation in India's space industry.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Mains

Q. What is India's plan to have its own space station and how will it benefit our space programme? **(2019)**

Q. Discuss India's achievements in the field of Space Science and Technology. How the application of this technology has helped India in its socio-economic development? **(2016)**

Issue of Pradhan Pati in Panchayats

Source: [IE](#)

Why in News?

A panel constituted by the **Ministry of Panchayati Raj** in 2023 has submitted its report, *Transforming Women's Representation and Roles in Panchayati Raj Systems and Institutions: Eliminating Efforts for Proxy Participation*, recommending "exemplary penalties" to curb the practice of '[Pradhan Pati](#)'.

- The report suggests policy reforms, training, and technology-driven solutions to empower women leaders.

What are the Key Reforms Suggested by the Committee?

- **Strict Penalties for Proxy Leadership:** Enforcement of 'exemplary penalties' for proven cases of **male relatives acting as proxies for elected women representatives in Panchayati Raj Institutions (PRIs)**.
- **Structural and Policy Reforms:** The committee recommends **gender-exclusive quotas** in panchayat subject and ward-level committees (like Kerala's model), **annual 'Anti-Pradhan Pati' awards** to recognize efforts against proxy leadership,
 - Proposes **appointment of women's ombudspersons** to handle related complaints. It also suggests **public swearing-in ceremonies** in Gram Sabhas to reinforce women pradhans' authority.
 - Suggests creation of a **federation of women panchayat leaders** for peer support and collective decision-making.
- **Technological Interventions:** The committee proposes **Virtual reality (VR) simulation training** to enhance governance skills, **Artificial intelligence (AI) powered query-driven guidance** in vernacular languages for real-time legal and governance support
 - **WhatsApp groups** linking **Women Elected Representatives (WERs)** with officials for issue resolution.
 - Additionally, the **Panchayat Nirnay Portal** will enable citizens to track pradhans' participation, ensuring transparency and accountability.
 - The committee suggests **collaborating with prominent educational institutions** and international agencies for leadership programs.

What is the Issue of Pradhan Pati in PRIs?

- **Pradhan Pati:** Also known as '**Sarpanch Pati**' or '**Mukhiya Pati**,' this practice involves the husbands of elected women panchayat leaders exercising power on their behalf.
 - As a result, many WERs serve as **mere figureheads**, undermining their autonomy and leadership. It reinforces **patriarchy** and weakens the intent of the **73rd Constitutional Amendment**.
- **Menace of Pradhan Pati:** India has about **2.63 lakh panchayats** across three levels (Gram Panchayat, Panchayat Samiti, and Zila Parishad). Women make up **46.6% (15.03 lakh)** of **32.29 lakh** elected panchayat representatives.
 - However, their **effective participation remains low**, especially in northern states like **UP, Bihar, Haryana, and Rajasthan**, where **male relatives often control decision-making**.
- **Challenges in Addressing Pradhan Pati:** **Patriarchal norms** and **bureaucratic neglect** undermine **women's authority**, often reducing them to figureheads.
 - **Threats, violence, and social pressure** discourage women from actively participating in governance.
 - The committee cautions that strict penalties may push the issue underground instead of addressing root causes like patriarchy.

Read more: [SC Calls for Reform to Empower Women Leaders](#)

Governance of PRIs

- **State Subject:** Local governance falls under the jurisdiction of state governments, with PRIs operating as per respective **State Panchayati Raj Acts**.
- **Constitutional Framework:**
 - **73rd Constitutional Amendment Act (1992)** established a **three-tiered Panchayat system** and mandated **1/3rd reservation for women**, later increased to **50% in 21 states and 2 UTs**.
 - **Article 243D** provides for reservation for **Scheduled Castes, Scheduled Tribes, and**

Backward Classes in PRIs.

- **Article 40** of the Constitution, a **Directive Principle of State Policy**, mandates the State to establish **village panchayats** and grant them the necessary **powers and authority** to function as **self-governing units**.
- The **Panchayats Extension to Scheduled Areas (PESA) Act, 1996**, grants **Gram Sabhas in Scheduled Areas** special powers to **manage natural resources** and protect **tribal culture and livelihoods**.

Drishti Mains Question:

How does the practice of 'Pradhan Pati' undermine the objectives of the 73rd Constitutional Amendment? Suggest measures to strengthen women's leadership in PRIs.

UPSC Civil Services Examination Previous Year Question

Mains

Q.1 What are the continued challenges for Women in India against time and space? **(2019)**

Q.2 Discuss the desirability of greater representation to women in the higher judiciary to ensure diversity, equity and inclusiveness. **(2021)**

Farmers' Earning in Agri Produce: RBI

Source: IE

Why in News?

The **Reserve Bank of India (RBI)** conducted a **pan-India survey** on **farmers's share in consumer prices in rabi crops**.

- It covered mandis and villages across **18 states analysing 12 rabi crops** and including inputs from **farmers, traders and retailers**.

What are the Key Findings of the Survey on Farmers' Earning in Agri Produce?

- **Farmers' Share in Consumer Prices:** Farmers received **40-67%** of the final consumer price for major **rabi crops** surveyed.
 - **Wheat Farmers:** Wheat farmers received **67%** of the consumer price, the **highest** among surveyed crops, with **25%** selling at **MSP** for an assured market.
 - **Rice and Other Cereals:** **Rice farmers' share** in retail prices was **52% in 2024** that remained stable over the years i.e., **45% in 2022, and 49% in 2018**.
 - **Pulses and Oilseeds:** **Lentil (Masoor) farmers** received around **66%**, while **Gram (Chana) farmers** received **60%** of the consumer price.
 - **Mustard farmers** received **52%**, slightly lower than the **55%** recorded in a **2021 study**.
 - **Perishable Crops:** Farmers' share in **fruits and vegetables** ranged from **40-63%**, significantly lower than for cereals and pulses.

- The **combined share of traders and retailers** in consumer prices was more than **50% for most perishable crops** (except tomatoes).
- **Perishable crops (fruits and vegetables)** had a **lower farmers' share** compared to Non-perishable crops (such as wheat and pulses).
 - Perishable products have **short shelf life, seasonal production, varied quality, special logistics, strict standards, demand fluctuations**, climate dependency, and supply chain uncertainties.
- **Digital Transactions: Cash** transactions still **dominate** agriculture, but **electronic payments** have **risen** significantly in the **2024** survey compared to 2018 and 2022.
- **Supply Chain Challenges:**
 - An **unorganized supply chain** with **multiple intermediaries** limits transparency in **product movement, finances, and pricing**, reducing farmers' share of consumer prices.
 - A lower farmers' share discourages **crop diversification** away from cereals.

Click Here to Read: [Middlemen Gain as Farmers Earn Less in Agri Produce: RBI](#)

Drishti Mains Question:

Assess the role of intermediaries in India's agricultural supply chain and its impact on farmers' earnings.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Mains

Q. What do you mean by Minimum Support Price (MSP)? How will MSP rescue the farmers from the low income trap? (2018)

Ultra-Conserved Elements

Source: TH

Why in News?

A study found that **Ultra-Conserved Elements (UCEs)** in the **Tra2b (Transformer-2 beta) gene** have remained unchanged for **80 million years** due to their role in **preventing infertility** by regulating protein levels.

What are Key Findings of the Study on Ultra-Conserved Elements?

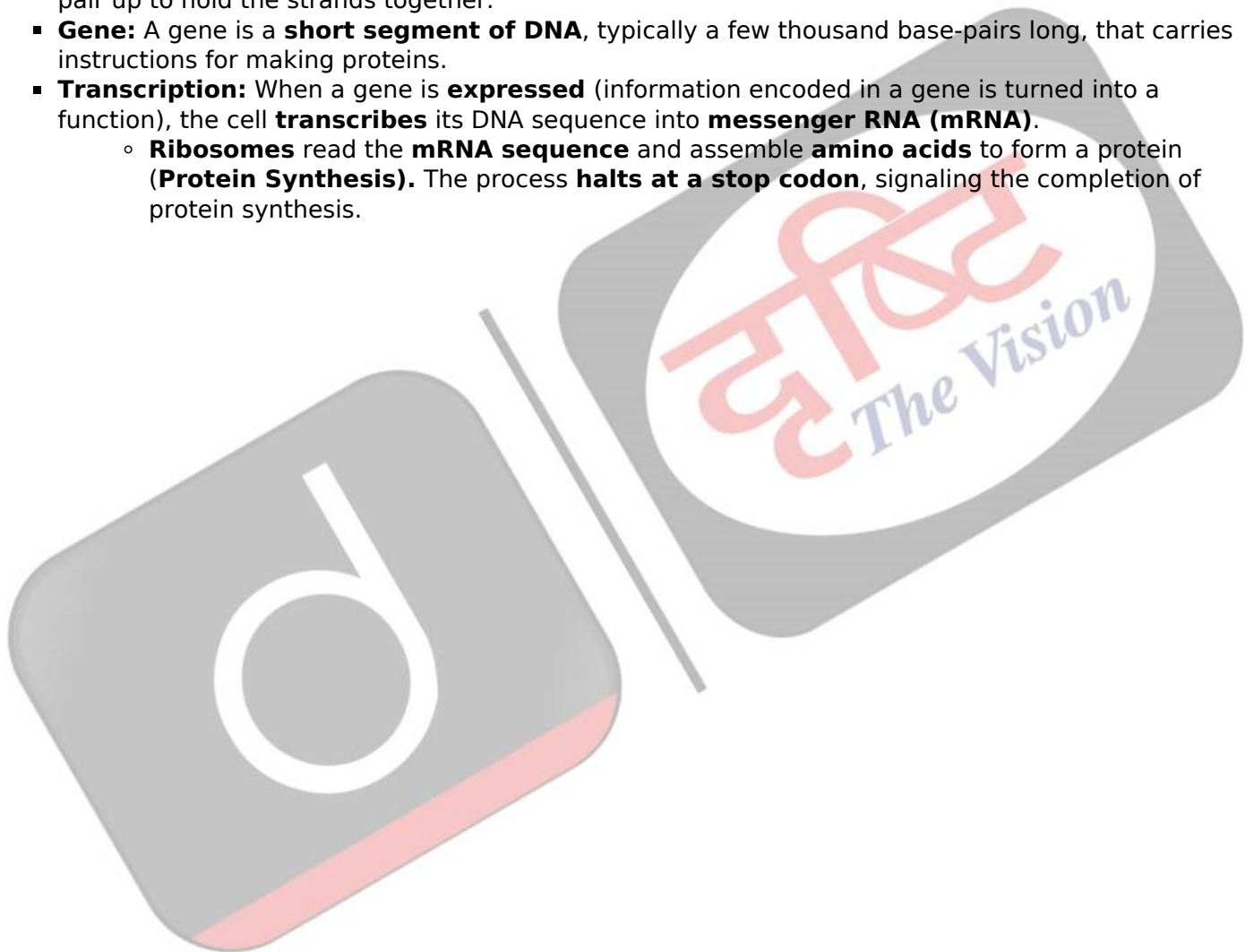
- **Findings of the Study:** Deleting the UCE in mouse testes caused excess Tra2 β protein, sperm cell death, and infertility.
 - A UCE in the *Tra2b* gene regulates Tra2 β protein production by acting as a **poison exon**.
 - When **Tra2 β protein** levels are too high, the **UCE triggers an extra exon** in the gene's RNA, introducing a **stop codon** that halts protein synthesis, preventing overproduction.
 - Mutations disrupting **UCE's protein-limiting function** cause **infertility**, preventing inheritance. Thus **Natural selection** has preserved UCEs across species for **millions of years**.

- **Ultra-Conserved Elements: UCEs** are **Deoxyribonucleic acid (DNA)** sequences of at least 200 base-pairs that have remained **completely unchanged** across multiple species for **80 million years or more**.
 - These sequences are found in humans, mice, rats, chickens, and even fish, indicating their **critical biological importance**.
 - Across the human **genome** (an entire set of DNA instructions found in a cell), there are nearly **500 UCEs**.
 - **Characteristics of UCEs:** UCEs exhibit nearly **identical DNA sequences across diverse species**, even those that are evolutionarily distant.
 - **Functions of UCEs:** They do not usually **code for proteins** but are involved in gene regulation.

DNA to Protein Conversion

- **DNA Structure:** DNA is a **double-helix molecule**, with each strand consisting of four bases that pair up to hold the strands together.
- **Gene:** A gene is a **short segment of DNA**, typically a few thousand base-pairs long, that carries instructions for making proteins.
- **Transcription:** When a gene is **expressed** (information encoded in a gene is turned into a function), the cell **transcribes** its DNA sequence into **messenger RNA (mRNA)**.
 - **Ribosomes** read the **mRNA sequence** and assemble **amino acids** to form a protein (**Protein Synthesis**). The process **halts at a stop codon**, signaling the completion of protein synthesis.

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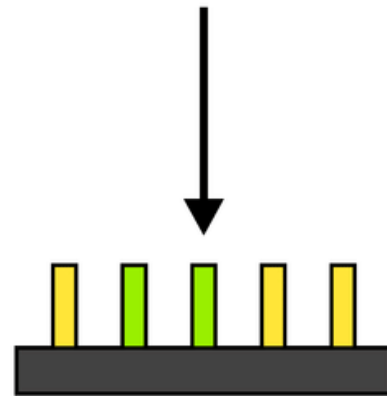
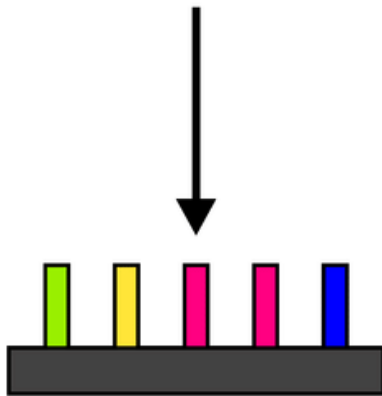
DNA

┌ Gene ─┘

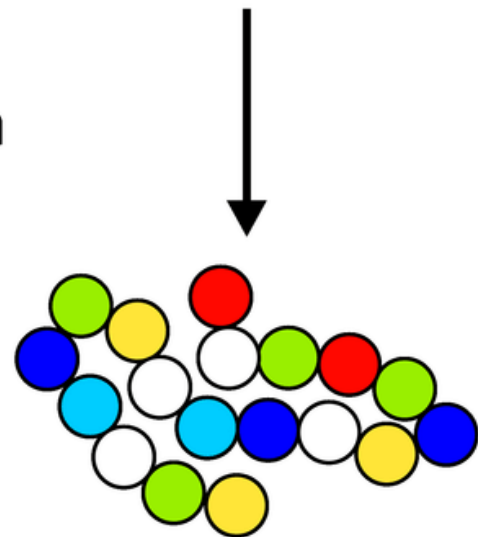
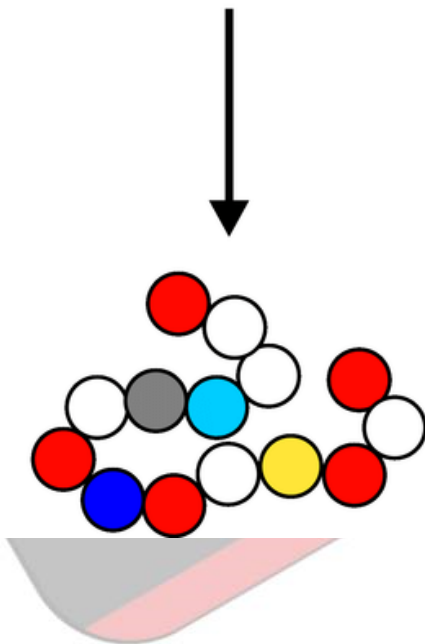
┌ Gene ─┘



mRNA



Protein



UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. What is Cas9 protein that is often mentioned in news? (2019)

(a) A molecular scissors used in targeted gene editing

(b) A biosensor used in the accurate detection of pathogens in patients

(c) A gene that makes plants pest-resistant

(d) A herbicidal substance synthesised in genetically modified crops

Ans: (a)

National Science Day 2025

[Source: IE](#)

Why in News?

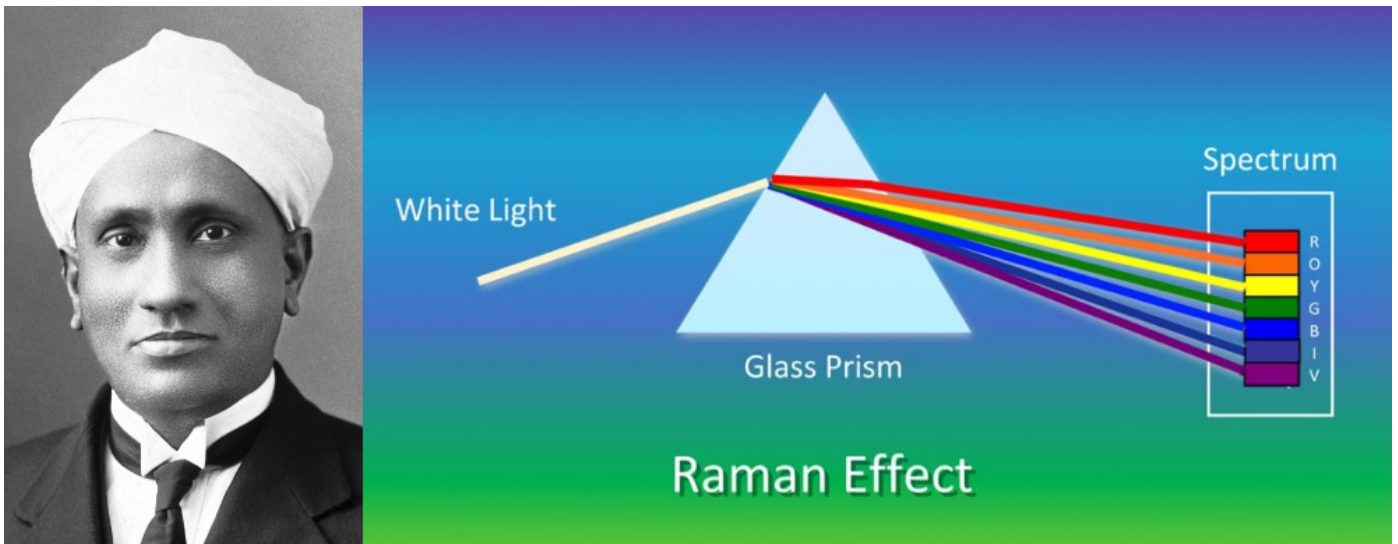
India celebrates [National Science Day \(NSD\)](#) on **28th February** annually to honor **Sir Chandrasekhara Venkata (CV) Raman's** discovery of the [Raman Effect in 1928](#).

- The **2025 theme**, “Empowering Indian Youth for Global Leadership in Science and Innovation for *Viksit Bharat*”, highlights the role of **scientific innovation and youth leadership** and aligns with the **Viksit Bharat 2047 vision**.

Note: In 1986, the Government of India designated **28th February** as **National Science Day**, which was first celebrated in 1987.

What are the Key Facts About CV Raman?

- **Early Life:** CV Raman was born on 7th November 1888, in Tiruchirappalli, Tamil Nadu. He earned his M.A. in Physics from Presidency College, Madras and contributed significantly to atomic physics and optics.
 - He founded the **Raman Research Institute (1948)**, **Indian Journal of Physics (1926)**, and **Indian Academy of Sciences (1934)**.
 - His research spanned **optics, light scattering, X-rays, acoustics, and sea colors**, leading to the discovery of the **Raman Effect**.
- **Honors & Recognition:** Knighted in 1929 by the British government, CV Raman won the **1930 Nobel Prize in Physics** for Raman Effect, making him the **first Asian to receive a Nobel Prize in science**.
 - He was also honored with the **Bharat Ratna in 1954**, India's highest civilian award.
- **Raman Effect:** It refers to the phenomenon where **incoming excitation light** interacts with a sample, undergoes a **change in wavelength**, and generates **scattered light** due to interactions with molecular vibrations. This phenomenon is known as **Raman scattering**.
 - **Applications of Raman Effect:** It forms the basis of [Raman Spectroscopy](#) (analyzing molecular vibrations), widely used to study material properties.
 - Its applications expanded after the advent of **lasers** in the 1960s, aiding **chemical analysis** by identifying substances without breaking them.
 - It also helps **forensic science** detect drugs in sealed evidence bags and enables safe **nuclear waste analysis** using **fiber-optic** probes.



India's Advancements in Science and Technology in 2024

- **Innovation and IP:** India ranked **39th** in the [Global Innovation Index 2024](#) and **6th** in global **Intellectual Property (IP) filings** ([World Intellectual Property Organisation 2024 Report](#)).
 - The [Network Readiness Index 2024](#) saw India rise to **49th** from **79th (2019)**, highlighting progress in **ICT and digital transformation**.
- **Anusandhan National Research Foundation (ANRF):** Launched under the **ANRF Act 2023**, boosts India's **R&D ecosystem** with key programs like **promoting electric vehicles (EVs) in India**.
- **National Quantum Mission (NQM):** Aims to position India as a leader in **quantum computing, communication, sensing, and materials**.
- **National Supercomputing Mission (NSM):** A total of **33 supercomputers** with a combined computing capacity of 32 **petaflops** have been deployed in the country under NSM.
 - Future plans aim to **increase capacity to 77 PetaFlops** using indigenous technology.
- **Artificial Intelligence:** The [BharatGen](#) initiative is developing India's first **multimodal, multilingual Large Language Model (LLM)** for **Generative AI (GenAI)**.
- **Geospatial Science:** **Geospatial technology** adoption has increased through Spatial Thinking Programs in Schools, covering 116 schools across seven states.
- **Climate Research:** India has strengthened climate resilience by launching **four Centres of Excellence** for **flood and drought risk mapping**, enhancing disaster preparedness and adaptation strategies.

Quantum Nature of Gravity

[Source: TH](#)

Why in News?

Scientists are **conducting experiments** with **nanocrystals** to explore **if gravity follows quantum principles**.

- This effort aims to **bridge the gap** between **General Relativity** (explains gravity at macroscopic scales) and **Quantum Mechanics** (governs atomic and subatomic interactions).
 - Since these theories are **fundamentally incompatible**, the research contributes to the pursuit of a **unified theory of quantum gravity**.

What is the Experiment Proposed to Test the Quantumness of Gravity?

- **About Experiment:** Scientists propose an experiment using **quantum superposition**, where **particles exist in multiple states until measured**.
 - **Nanocrystals** will test if gravity follows quantum mechanics.
 - A **test mass crystal** will be placed in **superposition** (existing in two places at once) while **another mass interacts with it via gravity**.
 - After **measuring the second crystal**, scientists will **check if gravity causes the test mass to collapse into a definite state**, potentially indicating that gravity follows quantum principles.
- **Significance:**
 - If successful, the experiment may prove that **gravity is not just a classical force but also exhibits quantum properties**, as current theories suggest that gravity should show quantum effects.
 - Most **quantum gravity tests rely on strong gravity** (e.g., black holes), which is **impractical to test**.
 - This experiment proposes **studying weak gravity near small objects**, making quantum gravity testing more feasible.
- **Challenges:**
 - The experiment requires **extreme precision** since even small disturbances (like **air molecules** or **seismic activity**) can affect the results.
 - Scientists need to create a **near-perfect vacuum** and measure the **results very quickly**.
 - The technology to perform this experiment is **still being developed**.

Read More: [What are the Key Features of Quantum Mechanics?](#)

What is Quantum Mechanics and General Relativity?


- **Quantum Mechanics:**
 - **About:**
 - **Quantum mechanics** is the branch of physics that explains how **sub-atomic particles**, like electrons and photons, can behave **both as particles** (small bits of matter) **and waves** (energy disturbances).
 - This concept is known as **wave-particle duality** and is a fundamental principle of quantum physics.
 - **Key Principles:**
 - **Wave-particle Duality:** Particles can behave both as waves and particles.
 - **Superposition:** A particle can exist in multiple states until measured.
 - **Entanglement:** Two particles can be correlated in such a way that the state of one instantly affects the other, even across vast distances.
 - **Uncertainty Principle:** The position and momentum of a particle cannot both be precisely measured at the same time.
- **General Relativity:**
 - **About:** It is the **modern theory of gravity** proposed by **Albert Einstein in 1915** as an extension of **Newton's law of universal gravitation**.
 - It describes **gravity not as a force, but as the curvature of spacetime** caused

by mass and energy.

◦ **Key Principles:**

- **Space-time curvature:** Massive objects like the Sun bend space-time, causing planets to orbit.
- **Time Dilation:** Time moves slower in stronger gravitational fields (e.g., near black holes).
- **Equivalence Principle:** Acceleration and gravitational forces are indistinguishable in a closed system.

QUANTUM MECHANICS VS GENERAL RELATIVITY

 Quantum Mechanics	$E=MC^2$ General Relativity
Quantum Mechanics is the theoretical basis of modern physics that describes the weird behavior of photons, electrons, and other particles that make up the universe.	General Relativity is the geometric theory of gravitation published by Albert Einstein in 1915 and is the cornerstone of modern physics.
Explains the behavior and nature of matter and energy on the atomic and subatomic levels.	The theory of relativity is central to our understanding of many areas of astrophysics and cosmology.
Events are the results of the fundamental interaction between subatomic particles that occur in a very short span of time, at a localized region of space.	Events are continuous and deterministic, meaning what you observe and measure about an event depends on your own point of view as well as the event itself.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q. Consider the following phenomena: (2018)

1. Light is affected by gravity.
2. The Universe is constantly expanding.
3. Matter warps its surrounding space-time.

Which of the above is/are the prediction/predictions of Albert Einstein's General Theory of Relativity, often discussed in media?

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

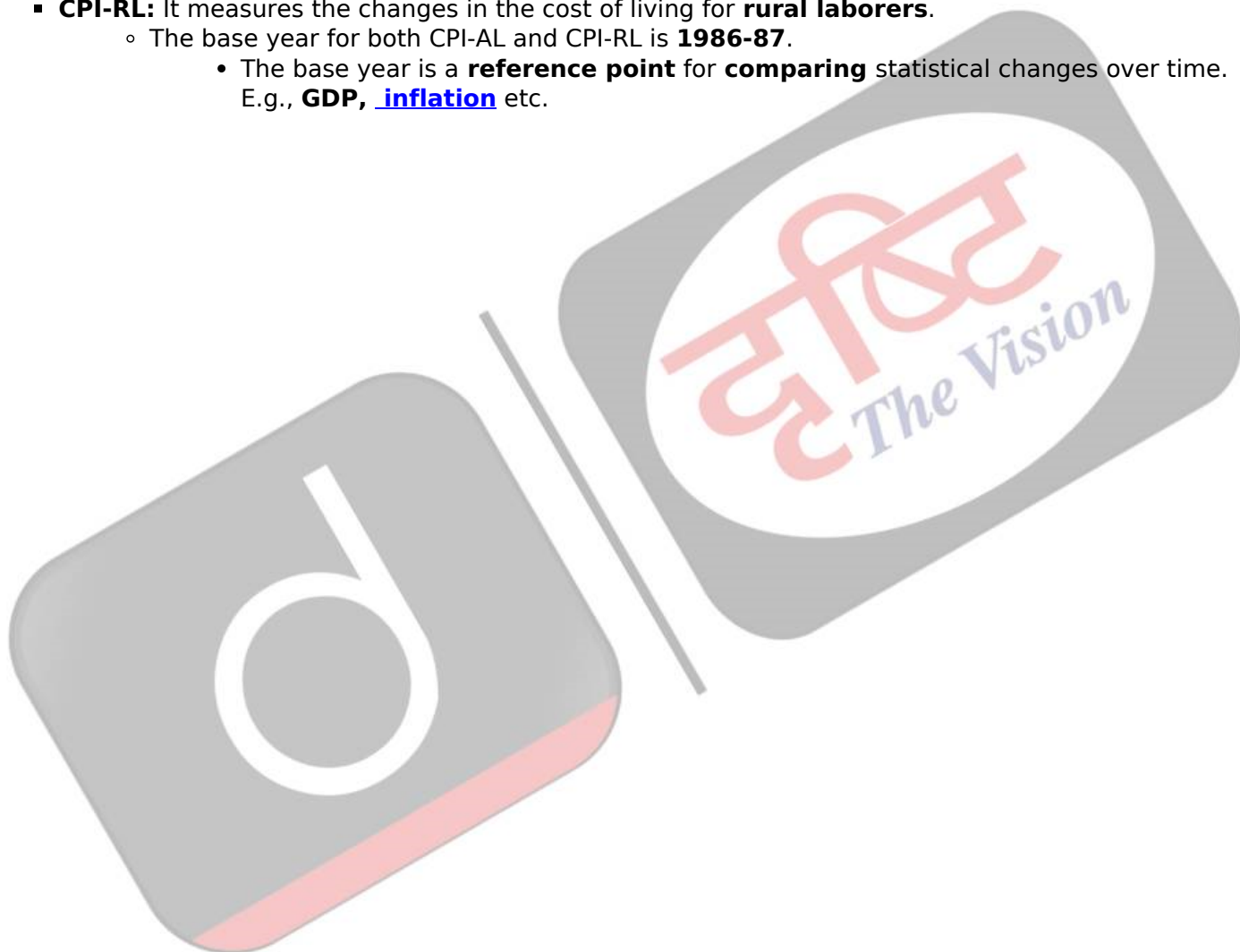
Ans: (d)

CPI for Agricultural and Rural Labourers

[Source: PIB](#)

The [Labour Bureau](#), Ministry of Labour & Employment has released the [All-India Consumer Price Index for Agricultural Labourers \(CPI-AL\)](#) and [Rural Labourers \(CPI-RL\)](#).

- The **CPI-AL and CPI-RL series** is presently compiled **monthly for 20 states and at the All-India level**.
- It recorded **inflation rates of 4.61% and 4.73% in January 2025** respectively, marking a **notable decline**, indicating reduced price pressures on essential goods and services in rural India.
- **CPI-AL:** It measures changes in **cost-of-living** for **rural agricultural laborers** and is used to adjust [minimum wages](#) for agricultural workers across different states.
 - CPI(AL) is a **subset of CPI(RL)**.
- **CPI-RL:** It measures the changes in the cost of living for **rural laborers**.
 - The base year for both CPI-AL and CPI-RL is **1986-87**.
 - The base year is a **reference point** for **comparing** statistical changes over time. E.g., **GDP**, [inflation](#) etc.



INFLATION AND RELATED TERMS

INFLATION

- Rise in goods/services prices; corresponding decline in purchasing power
 - **Creeping Inflation:** Mild/moderate inflation where price level persistently rises over a period of time at a mild rate (single digit inflation rate)
 - **Galloping Inflation:** Occurs when mild inflation is not checked/controlled (inflation in double/triple digits - 20/100/ 200% annually)
 - **Hyperinflation:** Prices rise a million or even a trillion percent annually (witnessed by Germany in 1920s)

CORE INFLATION

- Change in costs of goods/services but **excluding those from food/energy sectors** (due to price volatility)

HEADLINE INFLATION

- **Headline Inflation** - Change in value of all goods in the basket (including food and energy)

Core = Headline - Food & fuel items

STAGFLATION

- When **Inflation, unemployment and economic stagnation/recession** occur simultaneously; **most difficult type of inflation** to manage
 - Witnessed by developed countries in the **1970s (US, UK)** when world oil prices rose dramatically

DEFLATION

- **Reverse of inflation** - a sustained decline in price of goods/services
 - Here, **annual inflation rate falls below 0%** resulting in an increase in the real value of money (Japan suffered for almost a decade in **1990s**)
 - **Can worsen into recession/depression**; hence, more dangerous than inflation

DISINFLATION

- When inflation rate decelerates
 - Implies that prices are rising (**inflation is happening**) but at a **slower rate** each passing month

Deflation is decline in prices, whereas disinflation is a decline in inflation rate



REFLATION

- Typically **follows deflation**
 - Policymakers try to **stimulate economic activity by producing inflation** (more govt spending, reduced interest rates etc.)

SKEWFLECTION

- **Skewness of inflation** among different sectors of the economy - **some sectors facing huge inflation while some none and some even deflation**

GREEDFLATION

- Where (corporate) **greed is fuelling inflation**; **companies increasing their prices beyond just covering costs** to maximise profits

SHRINKFLATION

- **Hidden form of inflation**; often leads to **customer frustration/dissatisfaction**
 - Practice of **reducing the size of a product while maintaining its sticker price**



Read More: [Consumer Price Index for Industrial Workers](#)

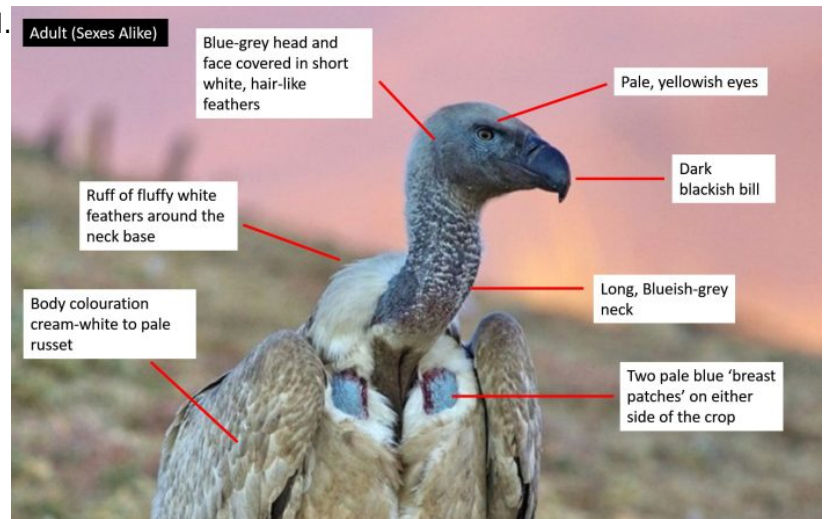
Cape Vultures Spotted in South Africa

Source: DTE

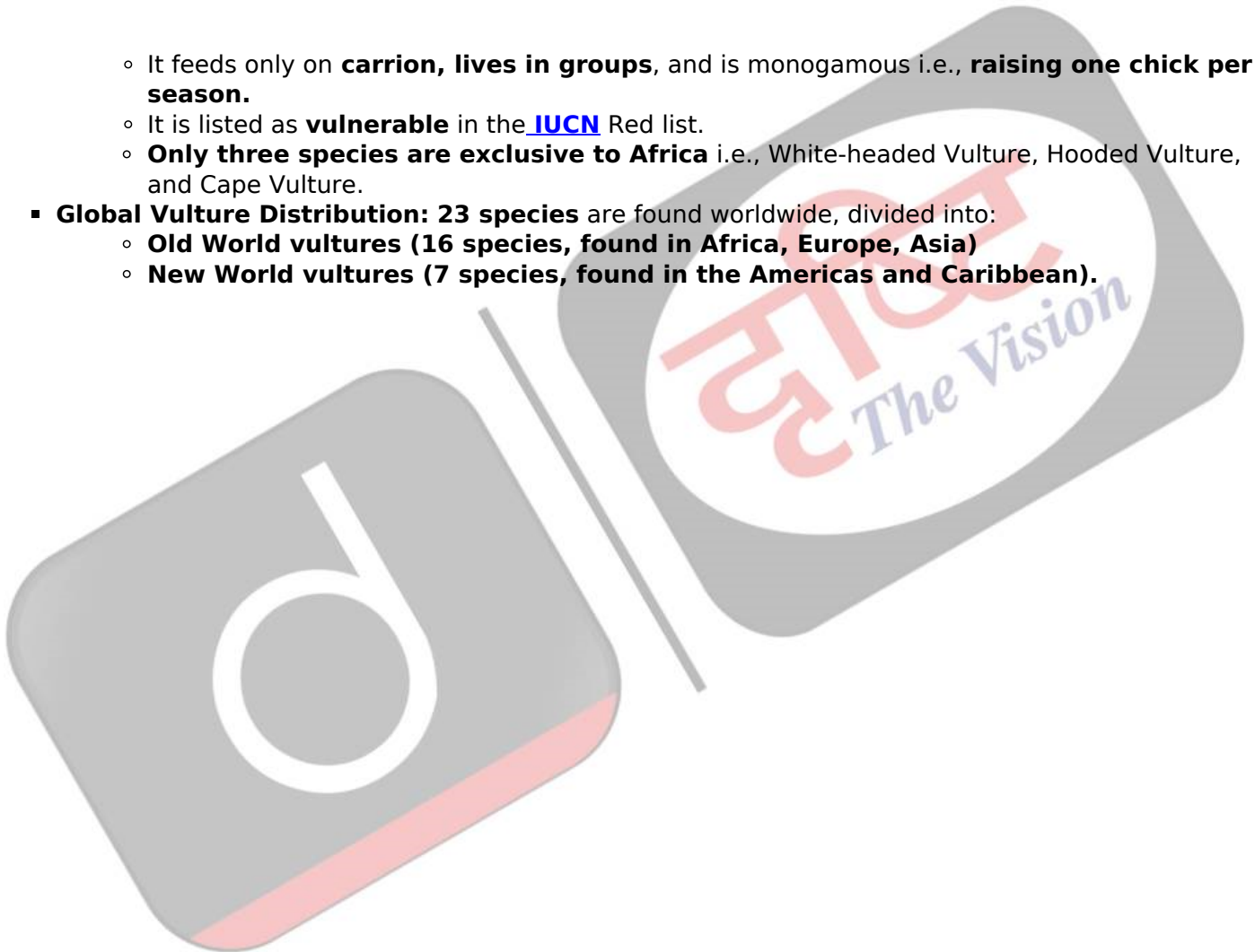
After 30 years, the **Cape Vulture (Gyps coprotheres)** has been sighted in South Africa's Eastern Cape province near Mountain Zebra National Park.

- **About Cape Vulture:** It is **exclusive to Southern Africa** and found in **South Africa, Lesotho, Botswana, and Mozambique**.
 - It has **creamy-buff plumage** with dark flight and tail feathers, **honey-colored eyes**, a

bluish throat, and a black bill.



- It feeds only on **carrion**, **lives in groups**, and is monogamous i.e., **raising one chick per season**.
- It is listed as **vulnerable** in the [IUCN](#) Red list.
- **Only three species are exclusive to Africa** i.e., White-headed Vulture, Hooded Vulture, and Cape Vulture.
- **Global Vulture Distribution: 23 species** are found worldwide, divided into:
 - **Old World vultures (16 species, found in Africa, Europe, Asia)**
 - **New World vultures (7 species, found in the Americas and Caribbean).**



Himalayan Griffon

Vulture



Scientific Name: Gyps Himalayensis

Family Accipitridae which also includes



Eagles



Kites




Buzzards



Hawks

It has a typical bald white head, very broad wings, and short tail feathers.

It has a white neck ruff and yellow bill, and the whitish body with dark brown greater covert feathers.

- Threatened**
- EX — Extinct
 - EW — Extinct in the wild
 - CR — Critically Endangered
 - EN — Endangered
 - VU — Vulnerable
 - NT — **Near threatened**
 - LC — Least concern
 - DD — Data Deficient
 - NE — Not Evaluated
- 

Distribution Range:
An Old-World vulture

They are found in the higher regions of the **Himalayas, Central Asian mountains** and the Tibetan plateau at an elevation range of 1,200 – 5,500 metres.



Read More: [Vultures at Risk in Protected Areas](#)