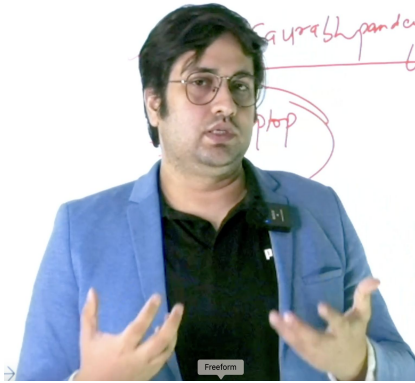
Topics - MINDS MAPS included (Daily current affairs 25th December 2024

- Target UPSC CSE Prelims 2025
- **Lion-Tailed Macaques**
- **The Impact of Deletion Mutations**
- **Speed of Light:**
- **Kilauea:**
- **Quantum Computing:**
- **Amendment to the Conduct of Election Rules:**
- **Mains**



By saurabh Pandey

THE HINDU

Target Mains -2025/26 -

Q Explain the factors responsible for high intraplate volcanism in pacific ocean region.

Q. Banaskantha’s Masali recently seen in news is associated with which among the following. (IE)

A) India’s first village to have achieved net zero emission.

B) India’s first village to have all women panchayat.

C) India’s first border solar village .

D) India’s first village to have zero budget farming.

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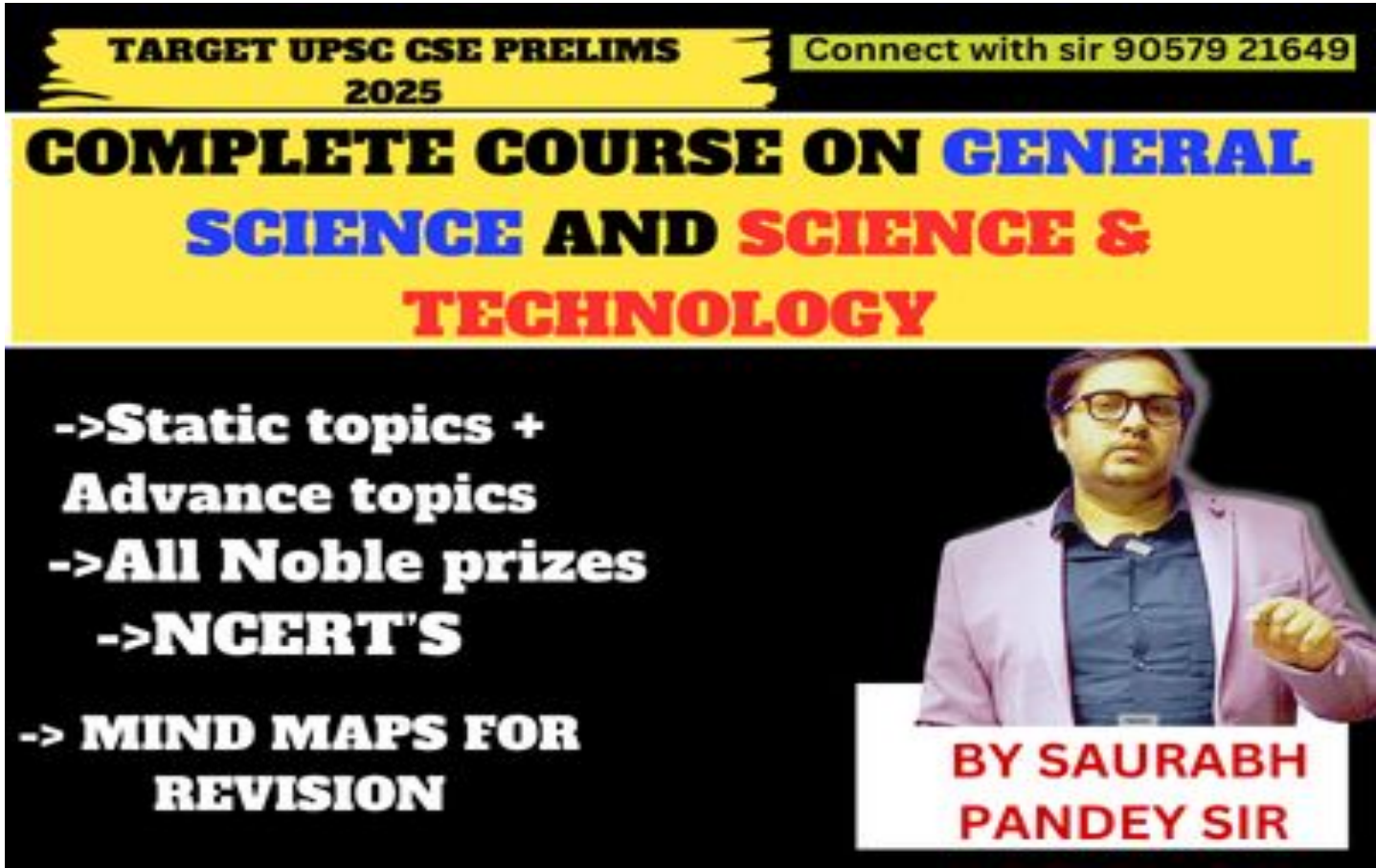

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‘Human contact threatens endangered lion-tailed macaque’

Mini Muringatheri
THRISSUR

Human-wildlife interaction is a growing concern in areas where roads and plantations continue to encroach on natural habitats. A recent study warns of a growing threat to the critically endangered lion-tailed macaque, endemic to the Western Ghats due to increasing human interaction.

“The genus Macaca, known for its adaptability to human-altered environments, often engages with humans, a behaviour that, while seemingly beneficial, poses serious risks to both them and people,” says a study conducted by Sheheer T.A. and Peroth Balakrishnan, researchers from the Kerala Forest Research Institute (KFRI) and Mewa Singh from the University of Mysore.

The study published in the journal *Primate Conservation* reveal that increased food provisioning and habituation to human activity are jeopardising the survival of lion-tailed macaque.

Eight key locations

The researchers surveyed the roads crossing through the lion-tailed macaque habitats across eight key locations along the Western Ghats: the Anamalai Hills, Nelliyampathy, Nilambur Ghats, Sholayar, Gavi, Sabarimala, Vallimalai Hills and Agumbe.

“Nearly 25% of the macaque population in these areas engage in interactions with humans. This includes accepting food from tourists, raiding waste, and entering human settlements. The lion-tailed macaque, with only about 4,200 individuals remaining, faces severe risks due to food provisioning, which leads to malnutrition, disease, and dependence on unnatural food sources and increased vulnerability to road accidents and aggression from humans,” says Dr. Balakrishnan, co-author of the paper and Head of the Department of Wildlife Biology, KFRI.


A lion-tailed macaque sitting on a motorcycle.

Specific hotspots such as Valparai, Nelliyampathy, and Sabarimala have seen rising macaque interactions. Valparai, in particular, has a decades-long record of human-macaque interaction, with over 180 macaques regularly engaging with humans.

“Unlike most regions where interactions between lion-tailed macaques and humans are recent, the Puthuthottam population in the Valparai Hills offers a unique, decades-long record of such interactions. Initially, these macaques avoided human food even when accessible, but habitat disruptions and increased tourism have drastically altered their behaviour. Provisioning by tourists has led to dependence on human food, shifting their foraging habits and creating conflicts,” said Professor Singh.

The lion-tailed macaque is classified as endangered on the IUCN Red List and protected under Appendix I of CITES. Its population faces threats from habitat loss, fragmentation, and human encroachment.

The long-term consequences of increased human interaction include increased exposure to zoonotic diseases and diet-related illnesses; behavioural changes such as reduced foraging in natural habitats; increased reliance on human-provided food and population decline through rise in injuries, road accidents, and stress-induced mortality, according to the study.

Topic → Human-Wildlife Interaction and Its Impact on Lion-Tailed Macaques

Overview of Human Encroachment

🌳 Human Encroachment: Expansion of roads and plantations into natural habitats is a growing concern, affecting wildlife interactions.

Endangered Species: Lion-Tailed Macaque

🐒 Endangered Status: The lion-tailed macaque, native to the Western Ghats, is critically endangered with a population of approximately 4,200.

Risks of Food Provisioning

🍽️ Food Provisioning: Human interaction leads to food provisioning, resulting in malnutrition, disease, and reliance on non-natural food sources.

Surveyed Locations in the Western Ghats

🚧 Survey Locations: Research was conducted in eight significant areas, including Anamalai Hills and Sabarimala, known for frequent human-macaque interactions.

Hotspot Behavior in Valparai

🏞️ Hotspot Behavior: Valparai is a notable hotspot with a history of human-macaque interactions, involving over 180 macaques.

Health Risks from Human Interaction

🦠 Health Concerns: Increased interaction heightens the risk of zoonotic diseases and diet-related health issues for the macaques.

Population Decline Factors

📉 Population Decline: Human interactions contribute to injuries, road accidents, and stress-induced mortality, leading to a decline in macaque populations.

Summary: The lion-tailed macaque is under severe threat due to escalating human interactions, which pose health risks and contribute to population decline in the Western Ghats.

lion-tailed macaque

Habitat and Distribution

The lion-tailed macaque predominantly inhabits the Western Ghats, a UNESCO World Heritage site in India. These primates are arboreal, spending most of their lives in the canopy of tropical evergreen forests.

Geographic Range: Found primarily in states like Kerala, Tamil Nadu, and Karnataka, their habitat spans around 3,500 square kilometers.
Population Status: Estimates suggest fewer than 2,500 individuals remain in the wild, elevating their status to critically endangered.

Behavior and Social Structure

Lion-tailed macaques exhibit intricate social behaviors that enhance their survival in the wild.

Social Dynamics: They live in matriarchal troops, typically comprising 20 to 30 individuals. The bonds formed within these groups are vital for foraging and protection.

Unique Behaviors: Their distinctive vocalizations and grooming habits play a crucial role in maintaining social cohesion and reducing stress within the troop.

Why do we lose muscle mass with age? Scientists find one factor

In November, researchers from the University of California Los Angeles and the University of Alberta, Canada, reported in the journal *Genome Research* that deletion mutations and aberrant expression of mitochondrial DNA correlated with biological aging in humans and in rodents

D.P. Kasbekar

As we age, we lose bits of our genome in tissues such as the skeletal muscle and the brain. These losses, called deletion mutations, gradually erode the function of a cell component called the mitochondrion.

Muscle cells lacking a sufficient number of functional mitochondria to support their contractile function die and this causes a loss of muscle mass.

Gaining a better understanding of the process that causes deletion mutations might help us to prevent or at least delay it.

The overwhelmingly large fraction of our genome (DNA) resides in the cell's nucleus. The rest, a mere five-millionth of the nuclear genome, is located in the mitochondrion. The age-related deletion mutations accumulate in the mitochondrial genome (mtDNA).

On November 27, researchers from the University of California Los Angeles and the University of Alberta, Canada, reported in the journal *Genome Research* that – together with the deletions – many mitochondrial genes also became aberrantly expressed. Both deletion mutations and aberrant expression of mtDNA correlated with biological aging in humans and in rodents.

So although mtDNA represents only a small fraction of our genome, its deletion mutations appear to be a major trigger of the decrepitude that comes with old age.

The cause of the mutations that erode mitochondrial functions, eventually leading to muscle loss, has been unclear. SERENA REPICE LENTINI

What are mitochondria?

Mitochondria are the powerhouses of the cell. They are where most synthesis of the compound adenosine triphosphate (ATP) happens. ATP is the energy source for all functions of a cell.

mtDNA encodes only a small subset of proteins required for mitochondrial function. Many more mitochondrial proteins are encoded by the nuclear genome, and enter the mitochondria after they are made in the part of the cell lying outside the mitochondrion and the nucleus (i.e. the cytoplasm).

Mitochondria are the descendants of free-living bacteria that our early single-celled ancestors then absorbed. Since then, many of the bacteria's genes have been transferred to the nuclear genome, leaving behind only a minor rump in the mtDNA. Today, mitochondria can't survive independently of their host cell.

Individuals inherit their mitochondria only via the mother's egg. As far as mitochondria are concerned, males are a dead-end, as they are not passed on by sperm cells to the baby. Each one of us shares mtDNA with only a subset of our maternal relatives, for example with the children of our mother's sister but not with those of our mother's brother.

By contrast, the nuclear genome comprises two copies of each of our 23 chromosomes, numbered 1 to 23. One chromosome of each pair came to us via our mother's egg and the other via our father's sperm. In turn we transmit only one chromosome of each pair to the sperm or eggs made by us. The fusion of a sperm and an egg creates a zygote, a cell with two copies of each chromosome. This cell then divides to generate all the other cells in the baby's body.

In other words, nuclear and mitochondrial genomes have different ancestries.

DNA, mRNA, and the gene

Each chromosome contains a single long DNA molecule. The molecule has two strands. Each strand is a sequence of four compounds, called bases, and the strands are held together by bonds between pairs of these compounds. These pairings are collectively called base-pairs.

The 23 chromosomes together have 3.2 billion base-pairs. This nuclear genome encodes about 20,000 genes that contain instructions to make proteins, plus another 15,000-20,000 genes that don't encode for proteins. In contrast, our mtDNA is a mere 16,569 base-pairs long, and has a circular shape. It encodes 13 protein-coding genes and 24 non-coding genes. Most cells, however, contain multiple mitochondria and each mitochondrion contains multiple copies of the mtDNA molecule. Hence the mtDNA can make up 1% or so of a cell's total DNA.

Given that mtDNA deletion mutations and chimeric mRNA are useful predictors of age, they can help develop ways to delay age-related decline in mtDNA quality

A gene is a segment of a DNA molecule, typically a few thousand base-pairs long. When a gene is expressed, the cell arranges for the sequence of bases on the DNA to be transcribed to a sequence of bases in a new molecule called messenger RNA (mRNA). The mRNA moves from the nucleus into the cytoplasm, where the cell 'reads' it to make new proteins.

For want of a nail, a muscle was lost

Any of the many mtDNA molecules can suffer deletion mutations. A deletion mutation is when one to few thousands of base-pairs become deleted from a gene. The mtDNA that bears deletion mutations is thus smaller in size, and as a result these molecules slowly outcompete non-mutated mtDNA when the cell makes copies of them during reproduction, and ultimately displace them from the mitochondria.

When the number of completely intact mtDNA molecules becomes too low to help the cell make mitochondrial proteins, the mitochondrion stops producing ATP. If the number of functioning mitochondria, i.e. those producing ATP, also becomes too low, the muscle cell is unable to properly contract and dies. This underlies the loss of muscle mass.

Deletion mutations also bring sequences of two different mtDNA genes into contact with each other to create novel chimeric genes. When these genes are expressed, the effects can interfere with the normal mRNA the cell has made from residual intact mtDNA. Thus, deletion mutations can affect the expression of normal mtDNA and thus also indirectly speed up mitochondrial loss.

The researchers compared mRNA of skeletal muscle biopsies from individuals younger than 30 years with those older than 65 years. They found that the older individuals showed a two-fold increase in chimeric mitochondrial mRNA. The chimeric mtRNAs were indeed products of the mtDNA deletion events.

Given that mtDNA deletion mutations and chimeric mRNA are useful predictors of biological age, they can help researchers develop new ways to delay age-related decline in mtDNA quality. Aside from when teenagers enter a liquor store, no one wants their biological age to outpace their chronological age.

(D.P. Kasbekar is a retired scientist. (kasbekardp@yahoo.co.in)

THE GIST

- Mitochondria are the powerhouses of the cell. They are where most synthesis of the compound adenosine triphosphate happens. ATP is the energy source for all functions of a cell
- Mitochondria is inherited only via the mother's egg. As far as mitochondria are concerned, males are a dead-end, as they are not passed on by sperm. Each one of us shares mtDNA with only a subset of our maternal relatives
- When the number of intact mtDNA molecules becomes too low, it stops producing ATP. If the number of functioning mitochondria becomes too low, the muscle cell dies. This underlies the loss of muscle mass

Topic → The Impact of Deletion Mutations on Aging and Mitochondrial Function

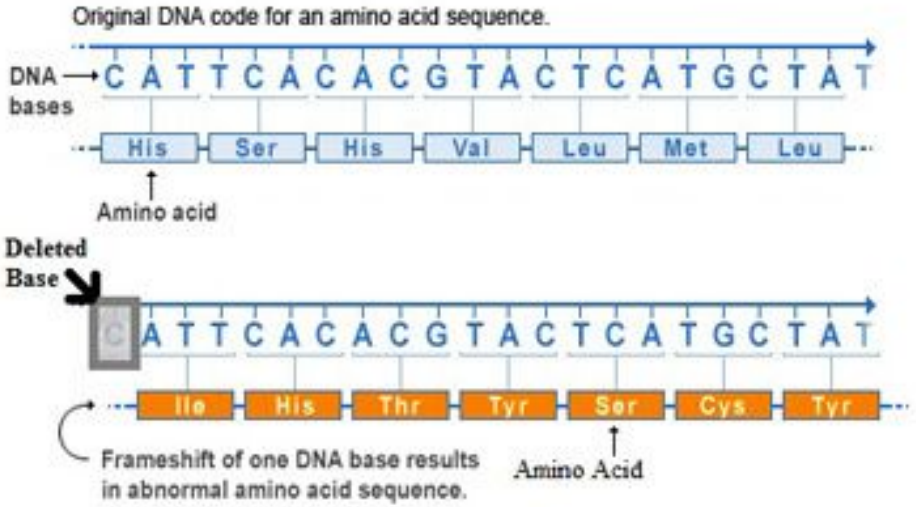
What Are Deletion Mutations?

Deletion mutations refer to the loss of segments of DNA, particularly in mitochondrial DNA (mtDNA), which becomes increasingly prevalent as we age. These mutations erode the functional capacity of mitochondria, the cell's powerhouses responsible for generating adenosine triphosphate (ATP), the energy currency of the cell.

Mitochondrial Function: Mitochondria play a crucial role in energy production.

Muscle Cells: A deficit in functional mitochondria leads to muscle cell death, contributing to muscle mass loss.

Frameshift mutation



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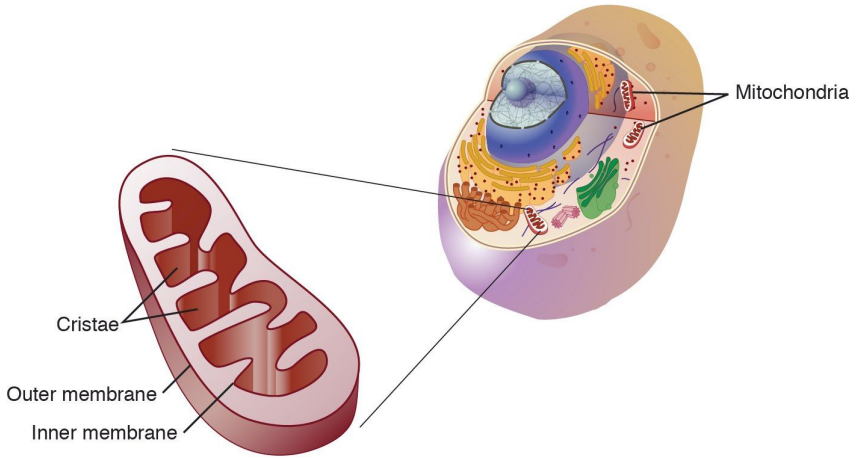

Understanding Mitochondrial Biology

Mitochondria, often dubbed the cell's powerhouses, are the sites of ATP synthesis. Although mtDNA constitutes a mere fraction of our total genome, its integrity is vital for cellular health. Loss of functional mtDNA can lead to severe cellular consequences, particularly in energy-demanding tissues such as skeletal muscle.

The Genetic Ancestry of Mitochondria

Mitochondria have a unique genetic heritage, tracing back to free-living bacteria that were engulfed by ancestral eukaryotic cells. This endosymbiotic event led to the integration of some bacterial genes into the host cell's nuclear genome while retaining a limited number of genes in mtDNA.

Maternal Inheritance: Mitochondria are passed down exclusively from mothers to offspring.

Genome Structure: Unlike the nuclear genome, which consists of 23 chromosome pairs, mtDNA is circular and encodes only a small number of genes.

The Role of Genes in Cellular Function

Each gene within mtDNA plays a pivotal role in mitochondrial function. When deletion mutations occur, the resultant mtDNA can become less effective at synthesizing essential proteins, leading to an energy deficit in muscle cells.

Consequences of Deletion Mutations

As deletion mutations accumulate in mtDNA, their impact becomes pronounced. These mutations lead to the production of chimeric genes, which can interfere with normal mitochondrial function and exacerbate the degradation of muscle tissue.

Chimeric Genes: Abnormal fusion of different mtDNA sequences can disrupt normal gene expression.

Muscle Mass Loss: The inability to generate sufficient ATP leads to muscle cell death, which is often observed in older individuals.

Conclusion

Understanding deletion mutations and their implications for mitochondrial function is crucial in combating age-related decline. By focusing on the integrity of mtDNA, we may uncover ways to preserve muscle mass and enhance overall health as we age

QUESTION CORNER

The universe's speed limit

Q: How do we know the speed of light?
A: After centuries of developing improved instruments to measure everything in the physical world with increasing precision, scientists have agreed to define the speed of light as precisely 299,792,458 m/s. Their agreement redefines their yardstick, in this case the metre, in terms of the speed of light rather than the other way around.

Before that, calculations of the speed of light were conventionally based on how long it took a pulse of light to cover a known distance. Because the speed of light is so great, it had to be a very great distance, and comparatively accurate measurements had to await the development of sensitive modern instruments.

The first practical estimate was made in 1676 by Ole Roemer, a Danish astronomer then working at the Royal Observatory in Paris. Roemer noticed when studying the eclipses of Jupiter's moons that the intervals between the disappearance of some of the moons behind the planet varied with distances between Jupiter and the earth. He reasoned that the velocity of light was responsible for an apparent delay in the eclipse when Jupiter was more distant from the earth. He calculated the speed of light to be around 225,300 km/s.

Roemer did not know the precise distance to Jupiter, so his estimate was considerably different from modern figures of around 299,792 km/s, give or take a few billionths of a second. These estimates are made with a laser beam and an atomic clock.

Modern estimates of the speed of light are made with a laser beam and an atomic clock. THOMAS KINTO

For feedback and suggestions
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Topic → Speed of Light: Historical and Modern Perspectives

Overview

📏 The speed of light is precisely defined as 299,792,458 m/s by scientists using advanced instruments.
🔬 Historical measurements relied on the time light took to travel a known distance.
🌌 The first practical estimate was made in 1676 by Danish astronomer Ole Roemer.
🌑 Roemer's observations of Jupiter's moons led to conclusions about light's velocity causing apparent delays in eclipses.
📊 Roemer estimated the speed of light to be around 225,300 km/s, significantly lower than modern measurements.
⏱️ Modern estimates use laser beams and atomic clocks for greater accuracy.
🔄 The definition of the meter is now based on the speed of light.

Historical Context

1676: Ole Roemer's pioneering work on light speed using astronomical observations.
Jupiter's Moons: Key to understanding light's velocity through observed delays.

Modern Measurement Techniques

Laser Beams: Provide precision in measuring light speed.
Atomic Clocks: Enhance accuracy in time measurement, crucial for calculating light speed.

Evolution of Definitions

Meter Redefined: Now based on the constant speed of light, reflecting advancements in measurement techniques.

Summary: The speed of light is precisely defined as 299,792,458 m/s, a measurement that has evolved from historical estimates, notably by Ole Roemer in 1676

BIG SHOT

This photo provided by the U.S. Geological Survey shows an eruption on the summit of the Kilauea volcano in Hawaii on December 23. AP

Topic →Kilauea: A Dynamic Natural Wonder

Overview

🌋 Kilauea is among the most active volcanoes globally, situated on Hawaii's Big Island.
🌴 It forms part of the Hawaii Volcanoes National Park, a recognized UNESCO World Heritage Site.
🌊 The volcano has been in a state of continuous eruption since 1983, with notable events in 2018 and 2020.

Environmental and Economic Impact

🌌 Known for its lava flows, Kilauea contributes to land formation and affects local ecosystems.
🏞️ It draws numerous tourists, boosting the local economy and offering avenues for scientific exploration


Kauai
Niihau
Kaula
Oahu
Molokai
Lanai
Maui
Kahoolawe
HAWAII
PACIFIC OCEAN
PACIFIC OCEAN
Hawaii
Kilauea
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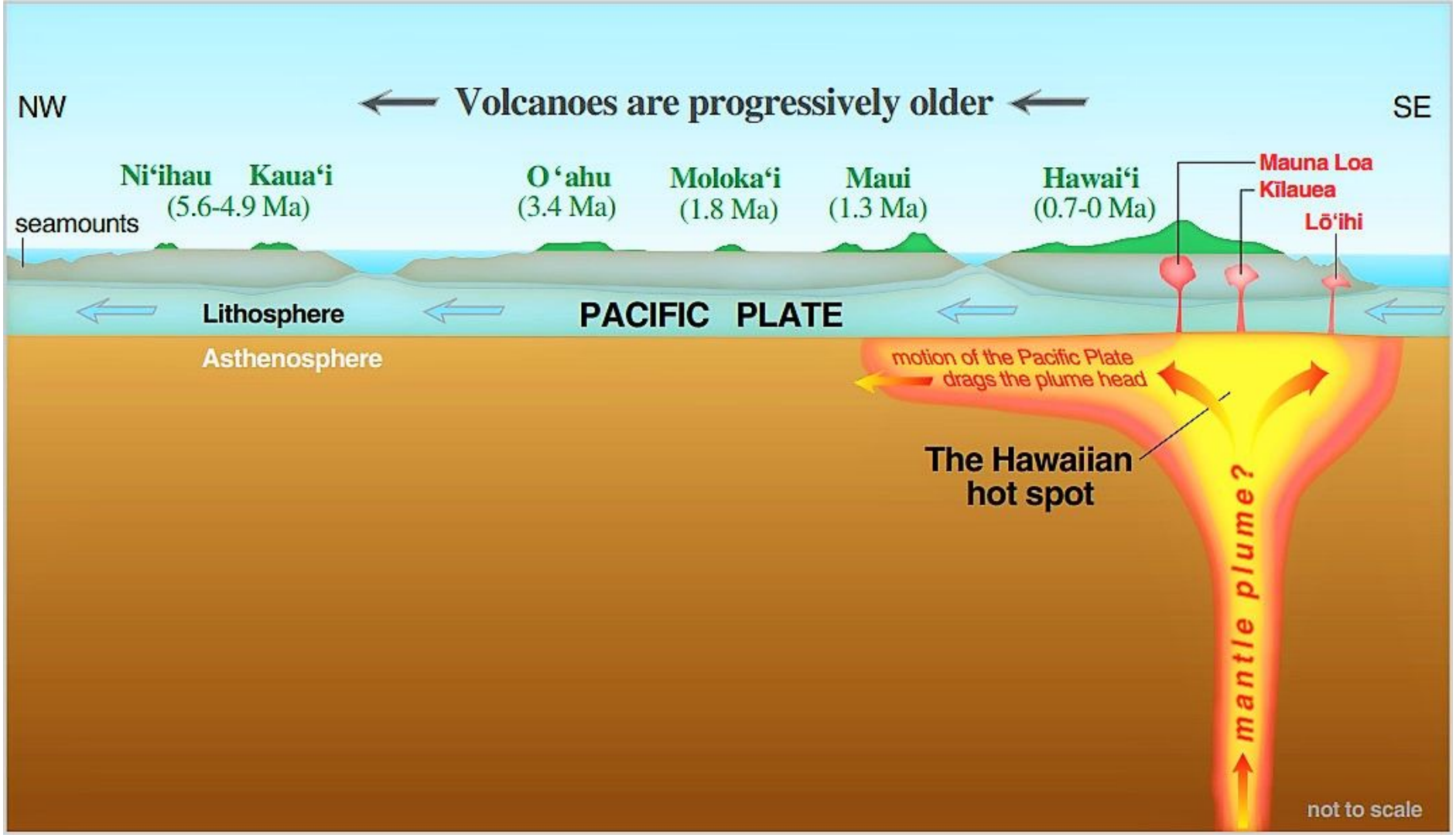

NW
Volcanoes are progressively older
SE
Ni‘ihau
Kaua‘i
(5.6-4.9 Ma)
O ‘ahu
(3.4 Ma)
Moloka‘i
(1.8 Ma)
Maui
(1.3 Ma)
Hawai‘i
(0.7-0 Ma)
Mauna Loa
Kīlauea
Lō‘ihi
seamounts
Lithosphere
PACIFIC PLATE
Asthenosphere
motion of the Pacific Plate
drags the plume head
The Hawaiian
hot spot
mantle plume?
not to scale

Kilauea Volcano: A Dynamic Natural Wonder

Overview of Kilauea 🌋

Location: Situated on the Big Island of Hawaii, Kilauea is renowned as one of the most active volcanoes globally.
Geological Formation: Part of the Hawaiian-Emperor seamount chain, it results from the Pacific tectonic plate's movement over a hotspot.

Volcanic Activity 🔥

Eruption Characteristics: Known for frequent eruptions, primarily of basaltic lava, which continuously reshapes the landscape.
Environmental Impact: Eruptions release volcanic gases like sulfur dioxide, affecting air quality and climate

What is quantum computing?

What are qubits and how do they work in quantum computing? How does a quantum computer solve problems faster than classical computers in specific tasks? Which challenges remain in building practical and scalable quantum computers?

EXPLAINER

Tejasri Gururaj

The story so far:

Quantum computers are the talk of computer town. Their potential to solve complex problems much faster than classical computers is an intriguing proposition that stands to transform several industries. A quantum computer is based on the principles of quantum mechanics, an area of physics that deals with the smallest particles in the universe. In 1982, Richard Feynman proposed the idea of developing a computer that could simulate both quantum and classical physics but researchers realised classical computers, the computers of today, would struggle with the complexity of quantum systems. Thus the idea of a quantum computer was born.

What are the basics of quantum computing?

Classical computers work on the principles of classical physics. Their fundamental computing unit is the bit. Each bit represents one piece of information with two possible values, 0 or 1. It's possible to represent all types of information as a combination of 0s and 1s using the binary system.

Quantum computers rely on quantum bits, or qubits, to perform computations. Unlike classical bits, qubits can exist in the states 0, 1 or in a state that's partly 0 and partly 1. 'State' refers to all the possible values the qubit can have.

The ability of qubits to be in two states is known as superposition. It's one of two fundamental principles that animate quantum computers. Imagine a spinning coin: while it's spinning, it can be both heads or tails, and it isn't until the coin collapses that you can see which it is. A qubit is like a spinning coin that holds both values simultaneously.

When a qubit is measured, it collapses to one of the values, 0 or 1. This means

Breaking boundaries: In 2019, IBM unveiled the world's first circuit-based commercial quantum computer, Q System One. IBM RESEARCH

information, a qubit can hold two. Because of this, quantum computers can perform multiple computations simultaneously, with the measurement revealing one of the possible outcomes of the computations.

The second fundamental principle upon which quantum computers are based is called entanglement. This phenomenon allows qubits to be intrinsically linked no matter how far apart they physically are. Measuring the state of one of the qubits will immediately yield information about the state of the other. Say you have a pair of gloves. Each glove is put in a separate box and sent to different locations, and you don't know which box has which. But once a box is opened to reveal the left glove, you instantly know the other box has the right glove.

The instantaneous correlation between qubits speeds up computations that would take far longer with classical computers.

Superposition and entanglement are exclusive to quantum mechanics and central to the potential that quantum computers have to offer.

How far have quantum computers

Quantum computers are technologically superior but this doesn't automatically mean they will be better than classical computers at all tasks. Over the years, experts have developed specific tasks that prove quantum computers are capable of greater feats.

In 1994, Bell Labs computer scientist Peter Shor created the Shor's algorithm. It could find the factors of large numbers in moments rather than the millions of years required by classical computers. This has major implications for data security. Current methods to secure data involve locking the data and hiding the key in the solution of a difficult mathematical problem.

Large-number factorisation is one such problem and classical computers require enormous amounts of resources to solve it. But using Shor's algorithm, a quantum computer could quickly get the key and open the locks.

The state of quantum computing has come a long way since. In 2019, for example, IBM unveiled the world's first circuit-based commercial quantum computer, Q System One. Circuit-based designs are believed to be the most versatile for general quantum-computing applications. Q System One uses circuits manipulate qubits, analogous to how classical computers use logic gates.

In the same year, researchers at Google reported in a paper in *Nature* that their 53-qubit 'Sycamore' processor had achieved quantum supremacy: when it can solve a problem that would take classical computers an unreasonable amount of time. The paper claimed Sycamore completed a task in 200 seconds that would have taken a supercomputer 10,000 years.

Earlier this month, Google unveiled a quantum chip called Willow, purportedly the world's first quantum processor in which error-corrected qubits improve as they scale. Quantum states are easily prone to errors due to interactions with the environment, so quantum computers need error correction to hold information long enough to perform useful calculations with them.

Willow, Google has said, can finish a standard test in five minutes whereas the same calculation could take today's best supercomputers 10 trillion trillion years.

What are the present limitations?

The advancements are flying thick and fast but there are still many significant challenges to overcome before quantum computers can become commonplace.

The chief concern is that building quantum computers remains expensive and complex. Keeping many qubits stable is also difficult because of error rates and decoherence (when a qubit loses superposition because of noise from its surroundings). The problems for which we really need quantum computers – like discovering new drugs or cracking mysteries in astronomy – also require millions of qubits.

All said, their potential to be useful is clear. This is why India launched the National Quantum Mission in 2023. The government has set aside ₹6,000 crore for the mission to be spent over eight years, among other things to develop quantum computers.

Tejasri Gururaj is a freelance science writer and journalist with a master's degree in

THE GIST

- Quantum computers rely on two key principles of quantum mechanics: superposition, where qubits can exist in multiple states, and entanglement, where qubits are linked, allowing them to share information instantly.
- Key milestones include Shor's algorithm, Google's Sycamore achieving quantum supremacy, and recent advancements such as the quantum chip Willow improving error correction.
- High costs, keeping qubits stable, and the need for large-scale qubits remain significant challenges, but initiatives like India's National Quantum Mission signal strong efforts to unlock their potential.

Topic → Quantum Computing: Unraveling Its Enigmatic Potential

Introduction to Quantum Computing

At its core, quantum computing leverages the principles of quantum mechanics, enabling computations at speeds and efficiencies previously thought impossible.

Historical Context: The genesis of quantum computing can be traced back to the early 1980s when physicist Richard Feynman proposed a novel approach to computational challenges posed by quantum systems.

Unlike classical computers, which utilize bits (0s and 1s), quantum computers employ qubits, capable of existing in multiple states simultaneously due to superposition.

Fundamental Principles of Quantum Computing

Understanding quantum computing requires a grasp of two fundamental principles: superposition and entanglement.

Superposition

Definition: Superposition allows qubits to exist in a state of 0, 1, or both simultaneously. This is akin to a spinning coin, which embodies both heads and tails until it lands.

Implications: This property empowers quantum computers to process vast amounts of information simultaneously, exponentially increasing their computational power.

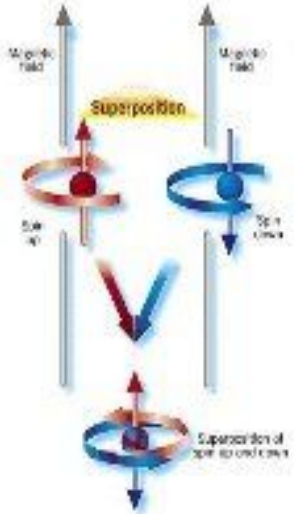
Entanglement

Definition: Entangled qubits exhibit a unique linkage, such that the state of one qubit can instantaneously affect the state of another, regardless of the distance separating them.

Analogy: Picture a pair of gloves sent to different locations; knowing the state of one glove informs you of the other. This interconnectedness enhances computational efficiency.

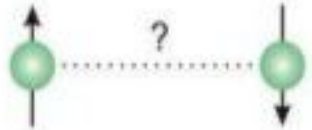
Quantum Properties

Superposition



Simultaneus "existence" (pre-measurement) of different states

Entanglement



observed "here"

affected "over there"

Correlation of two different systems

Notable Advancements in Quantum Technology

The strides made in quantum computing are nothing short of revolutionary.

Shor's Algorithm:

Developed by Peter Shor in 1994, this algorithm revolutionizes data security by enabling quantum computers to factor large numbers at lightning speed. Classical computers would take eons to perform similar tasks.

IBM Q System One:

Unveiled in 2019, it represents a significant advancement in quantum computing architecture, utilizing quantum gates to manipulate qubits, thereby mimicking classical logic gates.

Google Sycamore:

Google’s 53-qubit processor achieved quantum supremacy by completing a task in a mere 200 seconds, a feat that would take classical supercomputers approximately 10,000 years.

Recent Breakthroughs

Willow: Google recently announced Willow, a quantum chip that employs error-corrected qubits, enhancing stability during calculations. It can perform complex tasks in five minutes, a process that would take current supercomputers trillions of years!

Challenges and Future Prospects

Despite the technological prowess, quantum computing faces significant hurdles:

Cost and Complexity: Building quantum computers is an expensive endeavor, requiring sophisticated technology and expertise.
Error Rates: Maintaining stable qubits is vital for reliable computations, yet qubits are susceptible to decoherence and environmental noise.
Need for Scalability: Real-world applications, such as drug discovery and complex simulations, demand millions of qubits.

National Quantum Mission

In response to the burgeoning field, India launched the National Quantum Mission in 2023, earmarking ₹6,000 crore for quantum research and development over eight years, emphasizing the global race in quantum technology.

केन्द्रीय बजट
UNION BUDGET 2020

Budget 2020 announced Rs 8,000 crore over the next 5-yrs in the National Mission on Quantum technology and its applications

- The areas of focus for the NM-QTA Mission will be in fundamental science, translation, technology development and towards addressing issues concerning national priorities
- The mission can help prepare next generation skilled manpower, boost translational research and also encourage entrepreneurship and start-up ecosystem development.
- Quantum principles will be used for engineering solutions to extremely complex problems in computing, communications, sensing, chemistry, cryptography, imaging and mechanics

- Their applications which will be boosted include those in aero-space engineering, numerical weather predictions, simulations, securing the communications & financial transactions, cyber security, advanced manufacturing, health, agriculture, education
- It can bring India in the list of few countries with an edge in this emerging field will have a greater advantage in garnaring multifold economic growth and dominent leadership role

Why are activists opposing EC's election rule amendment?

How has the Election Commission defended its decision to limit access to election documents?

Sreeparna Chakrabarty

The story so far:

The Centre on December 20 amended the Conduct of Election Rules to restrict access for the public to a section of poll documents. This was done by the Union Law Ministry following a recommendation from the Election Commission (EC). While the EC said the amendment aims to restrict access to electronic data, the Opposition and transparency activists have been up in arms, branding it as an attack on the right to information and electoral freedom.

What is the Conduct of Election Rules?

The Conduct of Election Rules,1961, is a set of rules which provide for provisions on how to conduct the elections as per the Representation of People Act.

What is the amendment?

This amendment was brought into effect through a notification issued by the Ministry of Law and Justice on December 20. Rule 93(2)(a) of the 1961 Conduct of Election Rules had earlier stated that "all other papers relating to the election shall be open to public inspection" but after the amendment, it reads, "all other papers as specified in these rules relating to the election shall be open to public inspection."

Why has the amendment been brought in now?

The move comes after a recent direction to the EC by the Punjab and Haryana High Court to share all documents related to the Haryana Assembly election, including treating CCTV footage also as permissible under Rule 93(2) of the Conduct of Election Rules, to petitioner Mahmoud Pracha.

According to a senior official of the EC, "The rule mentioned election papers. The election papers and documents does not specifically refer to electronic records. In order to remove this ambiguity and considering the serious issue of violation of secrecy of vote and potential misuse of CCTV footage of inside the polling station using artificial intelligence by a single person, the rule has been amended. The EC argues that sharing of CCTV footage may have serious repercussions, especially in sensitive areas where secrecy is important. All election papers and documents are otherwise available for public inspection."

Why are the transparency activists protesting?

According to transparency activist Anjali Bharadwaj, Rule 93 is akin to the Right to Information Act as far as elections are concerned and, any change hurts the citizen's right to know about the process.

Venkatesh Nayak, Director Commonwealth Human Rights Initiative explained further that "upon initial examination, the amendment appears to be aimed at restricting citizen-voters' right to access a large number of documents created during Parliamentary and State Assembly elections many of which are not specifically mentioned in the Conduct of Election Rules, instead, they are mentioned in the handbooks and manuals published by the Election Commission from time to time".

He said that given the controversy about voter turnout in recent Lok Sabha and Assembly polls, access to the Presiding Officers' diaries which contain detailed data about voter turnout and the number of tokens they distribute to voters who are in the queue at the hour scheduled for closing of polling are not mentioned specifically in the Conduct of Election Rules. "The amendment seeks to prevent access to such documents and many other reports and returns that are filed by various election officials".

What does the Opposition say?

The Congress claimed that a change in rules regarding the conduct of elections vindicated their assertions regarding the rapidly eroding integrity of the electoral process managed by the EC.

The Congress moved the Supreme Court against the amendments on Tuesday.

Congress President Mallikarjun Kharge has said it was part of a "systematic conspiracy to destroy the institutional integrity of the EC", while the Samajwadi Party and the Left parties accused the EC of "undermining multi-party democracy" by taking "unilateral" decisions without consulting all political parties.

THE GIST

- The Centre amended the Conduct of Election Rules on December 20 to restrict public access to certain election-related documents, following a recommendation from the Election Commission.
- The amendment has sparked controversy, with the Opposition and transparency activists accusing the EC of undermining transparency, the right to information, and electoral freedom.

Topic → The Recent Amendment to the Conduct of Election Rules: A Deep Dive

Introduction

On December 20, a significant change was made to the Conduct of Election Rules, stirring up a storm of controversy. The Union Law Ministry, following a recommendation from the Election Commission (EC), amended the rules to restrict public access to certain poll documents. While the EC claims this is a necessary step to protect electronic data, critics argue it undermines the right to information and electoral freedom. **What are the Conduct of Election Rules?**

Historical Context

The Conduct of Election Rules, established in 1961, are a set of guidelines that dictate how elections should be conducted in India, in accordance with the Representation of People Act. These rules have been the backbone of electoral processes, ensuring transparency and fairness.

Purpose of the Rules

The primary aim of these rules is to provide a framework for conducting free and fair elections. They outline everything from the nomination process to the counting of votes, ensuring that the electoral process is transparent and accountable.

The Amendment Explained

Details of the Amendment

The recent amendment specifically alters Rule 93(2)(a) of the Conduct of Election Rules. Previously, it stated that “all other papers relating to the election shall be open to public inspection.” Post-amendment, it now reads, “all other papers as specified in these rules relating to the election shall be open to public inspection.” This seemingly minor change has raised significant eyebrows.

Implications of the Change

By narrowing the scope of what documents are available for public inspection, the amendment could limit access to crucial information that voters and civil society rely on to hold the electoral process accountable. This has led to fears that the amendment could be a step towards greater opacity in the electoral process.

Why Now?

Court Directives and Their Impact

The timing of this amendment is particularly noteworthy. It follows a directive from the Punjab and Haryana High Court, which ordered the EC to share all documents related to the Haryana Assembly election, including CCTV footage. This court ruling seems to have prompted the EC to clarify the rules regarding what can be shared.

The EC's Justification

According to a senior official from the EC, the amendment was necessary to eliminate ambiguity regarding electronic records. They argue that sharing CCTV footage could lead to serious violations of voter secrecy and potential misuse of data, especially in sensitive areas. The EC maintains that all other election papers remain available for public inspection.

Reactions from Various Stakeholders

Opposition's Response

The opposition parties, particularly the Congress, have been vocal in their criticism of the amendment. They argue that this change is indicative of a broader erosion of the integrity of the electoral process. Congress President Mallikarjun Kharge has labeled it a “systematic conspiracy” to undermine the EC’s institutional integrity.

Transparency Activists' Concerns

The Right to Information

- Transparency activists, like Anjali Bharadwaj, have drawn parallels between Rule 93 and the Right to Information Act, asserting that any changes to this rule directly impact citizens' rights to know about the electoral process.
- They argue that the amendment restricts access to vital documents that ensure transparency.

Potential Consequences

Venkatesh Nayak, Director of the Commonwealth Human Rights Initiative, has pointed out that the amendment could prevent access to important documents, such as Presiding Officers' diaries, which contain data on voter turnout. This could hinder efforts to ensure accountability in the electoral process.

Conclusion

The amendment to the Conduct of Election Rules has sparked a heated debate about transparency and accountability in India's electoral process. While the EC argues that the change is necessary for protecting sensitive data, critics see it as a dangerous step towards limiting public access to information. As citizens, it's crucial to stay informed and engaged in these discussions to safeguard our democratic rights.

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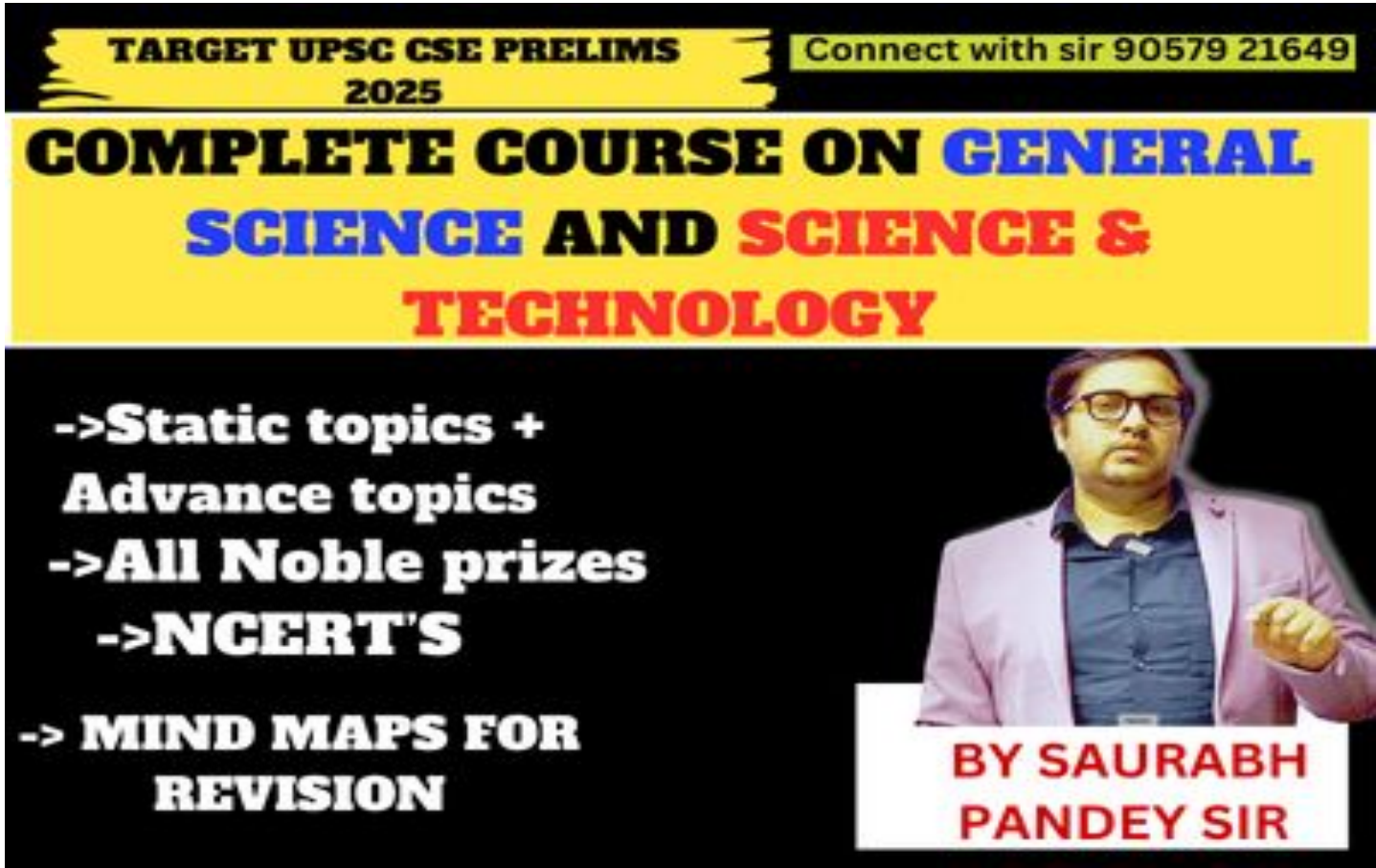

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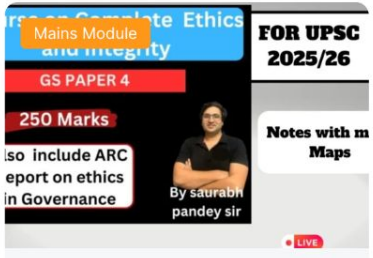

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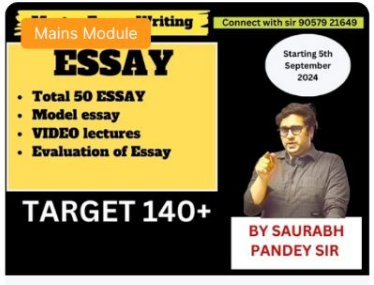

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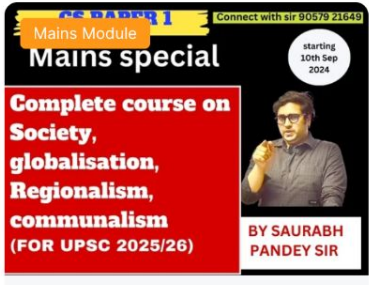

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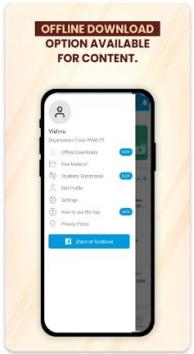

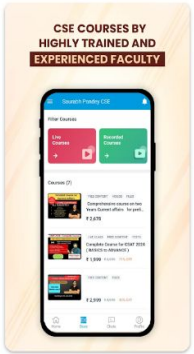

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Q. Banaskantha’s Masali recently seen in news is associated with which among the following. (IE)

A) India’s first village to have achieved net zero emission.

B) India’s first village to have all women panchayat.

C) India’s first border solar village .

D) India’s first village to have zero budget farming.

Ans: C

Target Mains -2025/26 -

Q Explain the factors responsible for high intra plate volcanism in pacific ocean region.