

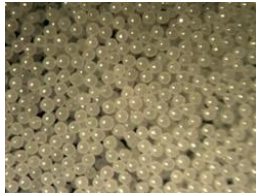
BLAZE STAR



The upcoming explosion of "Blaze Star" (T Coronae Borealis), a rare celestial event, will be visible to the naked eye for the first time since 1946. This event highlights the dynamic nature of the universe and the complex processes governing stellar evolution.

- It is officially known as **T Coronae Borealis (T CrB)**, is a dim star located 3,000 light-years away from our solar system.
- It is found in the constellation **Corona Borealis** (the "Northern Crown").
- The Blaze Star is a rare example of a **recurrent nova**, occurring once in every 80 years.
- **Stellar components:** The nova involves a binary star system comprising a **white dwarf** and a **red giant**.
 - The **white dwarf** draws material from the red giant, leading to periodic explosive increases in brightness.
 - The explosion occurs when the red giant's surface temperature escalates dramatically, causing it to shed material onto the white dwarf, which then ignites a **thermonuclear explosion**.
- The upcoming stellar explosion is expected to be visible with the naked eye and shine as brightly as **Polaris, the North Star**, for about a week.
 - NASA predicts this event to occur sometime between **now** and **September** of 2024.
- Past notable eruptions of T CrB were recorded in the years **1946** and **1866**, with earlier documented observations dating back to **1787** and **1217**.
- **Frequency and Impact:** Novae like T CrB occur once every few decades to a century, differing from supernovae in scale, frequency, and consequences.
 - Unlike supernovae, novae do not destroy the star system but allow it to reset and repeat the cycle.

ZIRCON MINERAL



The study of zircon crystals has revealed that Earth had the necessary conditions to support life much earlier than previously thought. It reveals the early interaction of water and land, challenging existing theories of a water-covered Earth.

- Zircon is a mineral belonging to the **group of nesosilicates**. Its chemical name is **zirconium silicate** and the chemical formula is **ZrSiO₄**.
- **Properties:** Zircon crystals are notable for their high refractive indices and strong lustre.
 - They are naturally occurring in a variety of colours, including clear, green, red, yellow and brown.

Geological significance: Zircon is used for **radiometric dating** due to its **trace uranium** content, allowing precise age determination.

- Its high resistance to weathering makes it valuable for studying **sedimentary** and **metamorphic rock history**, providing insights into geological and crustal development over billions of years.
- Zircon grains are important for studying early Earth conditions. They can preserve **isotopic signatures** that provide insights into the environment and temperatures of ancient Earth.
- Zircon crystals found in the **Jack Hills** in Western Australia's Midwest can be up to 4.4 billion years old, providing insight into early Earth.

Findings: The study of oxygen isotopes in zircon crystals reveals the **presence of fresh water** and dry land on early Earth, challenging existing theories of a water-covered Earth.

- This interaction may have created conditions conducive to life, with the water cycle operating at least 4 billion years ago.

“NONE OF THE ABOVE” (NOTA) OPTION



The "None of the Above" (NOTA) option has emerged as the runner-up in Madhya Pradesh's Indore constituency, securing a record-breaking 2,18,674 votes, the highest-ever tally.

- It is a voting option on the ballot that **allows voters to indicate disapproval** of all contesting candidates without choosing any of them.
- NOTA empowers the electors to **express their negative opinions** and a lack of support for the contenders.
- It gives them the **right to reject while maintaining the secrecy** of their decision.

When was it first used?

- NOTA was used for the first time in the **2013 Assembly elections in five states**- Chhattisgarh, Mizoram, Rajasthan, Delhi and Madhya Pradesh-and later in the 2014 General Elections.
- It was **introduced into the electoral process following the 2013 Supreme Court directive** in the PUCL versus Union of India case.

Does NOTA Vote Count?

- The Election Commission clarified that votes cast as NOTA are counted, but are **considered ‘invalid votes’**.
- Even if NOTA votes get the most number of votes in a constituency, the next candidate with the **second-most number of votes is declared the winner**.
- Therefore, votes made to NOTA **do not change the outcome of an election**.

Current Petition: The Supreme Court is considering a petition to frame guidelines for elections to be declared "null and void" if NOTA receives the highest number of votes in the constituency.

A NEWFOUND PROTEIN CALLED 'NEO'



Recent research has discovered a novel protein, referred to as "Neo," which plays a critical role in bacterial defence mechanisms against viral infections, particularly bacteriophages.

- **Discovery of 'Neo':** It was reported by researchers led by Stephen Tang and Samuel Sternberg in a 2023 preprint paper on **bioRxiv** while working on **Klebsiella pneumoniae**.
- **Mechanism:** Bacteria defend themselves from viral infection (against bacteriophages) using diverse immune systems, many of which sense and target foreign nucleic acids. **Defense-associated reverse transcriptase (DRT)** systems are one of them.
 - In the **DRT-2 system**, the bacteria undergo de novo gene synthesis via rolling-circle reverse transcription (RT) of a non-coding RNA (ncRNA).
 - In uninfected bacterial cells, the ncRNA and RT enzyme lead to the synthesis of a repetitive single-stranded cDNA.
 - The presence of phage triggers the second-strand cDNA synthesis, leading to the production of **long double-stranded DNA**.
 - This double-strand cDNA generates messenger RNAs that encode a stop codon-less, **never-ending open-reading frame (neo)** whose translation (neo protein) causes potent growth arrest (cell dormancy) of bacteria. It protects the larger bacterial population from the spread of phage.
- **Significance in Biotechnology and Medicine:**
 - It represents a potential **biotechnological tool** for controlling viral infections.
 - Retroelements in the **human genome** and **bacterial reverse transcriptases** have a common evolutionary history as well as share functional mechanisms.
 - Bacterial reverse transcriptases, believed to be the **precursors** of their **eukaryotic counterparts**, exhibit analogous mechanisms.
- **Reverse transcriptase:**

- The ability of cells to create **DNA copies from RNA** is called **reverse transcription**. It is performed by the enzyme called **reverse transcriptase**.
 - Reverse transcriptase, discovered by **Howard Temin** and **David Baltimore** in 1970, has revolutionised research methods in molecular biology and is crucial in studying and managing RNA viruses like HIV.
 - Reverse transcriptase is used in molecular biology to **clone genes**, perform **PCR**, and analyse genomes.
 - It is also used in diagnostics to **detect** and **quantify viral loads**, such as in the case of **SARS-2**. It also has helped track the virus's spread, paving the way for surveillance, better public healthcare, and vaccine development.
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COALITION GOVERNMENT AND ECONOMIC REFORMS IN INDIA

Why in news?

The NDA has won a historic third term at the Centre, but the BJP fell short of the 272-seat majority, necessitating a coalition government.

Previously, the BJP's majority in the last two Lok Sabhas marked the first time since economic reforms began (in 1991) that a single party had a majority mandate. This was expected to positively impact India's economic reform trajectory.

Coalition Governments and Weak Economic Reforms Since 1991

- Since 1991, India's shift from a planned economy to an open economy saw all governments being coalition-based, with the leading party never achieving the majority mark of 272.
- As per the Montek Singh Ahluwalia (former Deputy Chairman of the erstwhile Planning Commission), this inherent weakness resulted in a "**strong consensus for weak reforms**".
- While there was general agreement on the need for economic reforms, coalition parties often diverged on the specifics, leading to diluted reform measures.

Can a coalition government derail India's economic reforms trajectory?

- This is not true in Indian context as many notable reforms were brought by the previous coalition governments.
 - **Coalition govt and economic reform - strong consensus for weak reforms**
 - Coalition govts in India have historically faced challenges in implementing strong economic reforms due to differing priorities among coalition partners.
 - **Diverse Interests**
 - Coalition partners often have varied political and economic agendas, leading to compromises and diluted reforms.
 - This can slow down or alter the trajectory of economic reforms.
 - **Consensus Building**
 - While coalition governments can foster broader consensus, the need to appease various factions might lead to weaker reform measures.
 - Achieving a unified stance on complex economic issues becomes difficult.
 - **Policy Stability**
 - Frequent changes in coalition partners or internal disagreements can lead to policy instability, affecting investor confidence and long-term economic planning.
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DECODING THE LOK SABHA ELECTION VERDICT 2024

Analysing the Lok Sabha Election Results 2024:

- **Return of Coalition politics at the Centre:**
 - **In the last 10 years**, a single political party (BJP) led a majority government at the Centre, crossing the halfway mark in the Lok Sabha elections of 2014 and 2019.
 - Now, it will have to depend on its pre-poll allies, the top four being the **TDP, JD(U), Shiv Sena led by Eknath Shinde, and LJP (Ram Vilas) led by Chirag Paswan.**

- **Rise of regional leaders and impact on regional politics:**
 - From the North to the South, East to West, regional leaders have re-emerged to exert influence in the national polity.
 - **The verdict in Maharashtra** suggests that the people have stood by Sharad Pawar and Uddhav Thackeray, who suffered BJP-supported splits in their parties. The state goes to Assembly polls later this year in October.
- **Recalibration of power balance, among BJP-RSS and within BJP:**
 - Given that the Lok Sabha elections in 2024 were centred around PM Narendra Modi, with a high-decibel ‘Modi ki guarantee’ campaign, **the burden of a lower tally will inevitably fall on him.**
 - **BJP-RSS relations** during the NDA government under Atal Bihari Vajpayee and Narendra Modi had been starkly different.
 - RSS, the ideological parent of the BJP, which works quietly on the ground for the party, may start participating in government affairs along with setting political agenda for BJP.

What will be the Changes on the Nature and Working of 18th Lok Sabha/ Other Institutions?

- **The opposition benches will have a much larger voice:**
 - The lower numbers of the BJP will mean **greater representation for Lok Sabha members from the opposition in various Parliamentary panels** such as the Standing Committees and Select Committees.
 - As **speaking time on an issue** is divided in proportion to the strength of parties in Lok Sabha, the INDIA bloc will be allotted almost 26 minutes for an hour for discussion on a particular issue.
 - **It will promote adequate debate and discussion on an issue in Lok Sabha and prevent routing of legislation as a Money Bill.**

- **Federalism will matter more:** The opposition views the frequently used slogan "double-engine sarkar" to win support in state Assembly elections as an attack on federalism - a fundamental principle of the Constitution.
- **Greater accountability:**
 - A coalition provides more room for institutions to innovate and resist the political executive's top-down policies, improves checks and balances, and oxygenates the ecosystem.
 - Hence, **accountability is likely to increase in all institutions** from the judiciary to the auditor, from financial regulators to the election watchdog, and even the investigative agencies.

Impact of Coalition Politics at the Centre:

- **Dealing with partners:**
 - Now, BJP will have to listen to its allies, because they will be key to the stability of the government at the Centre.
 - The new and old allies will seek Cabinet berths, which could **impinge on the BJP-led government's flexibility in policy-making** especially on the issues such as
 - Uniform Civil Code,
 - Delimitation of constituencies,
 - Judicial reforms, and
 - One-Nation, One-Election
 - In short, the party will have to devise mechanisms to accommodate the sensitivities of other parties with their own ethos and ideologies.
- **Structural reforms:**
 - Coalitions have performed better when it comes to structural reforms, which have always required time for all parties involved to be convinced.
 - **For example**, the BJP (over the last 10 years), despite enjoying an absolute majority in Lok Sabha,

- **Failed to push through legislation on land and farms.**
 - **The four labour codes** passed by Parliament in 2019 and 2020 have remained on the back burner.
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WHAT IS MINUTEMAN III?



The US recently conducted an unarmed Minuteman III intercontinental ballistic missile test from the Californian Vandenberg Space Force Base.

- The LGM-30G Minuteman III is a **solid-fueled, intercontinental ballistic missile (ICBM)**, which the **United States Air Force (USAF)** first **deployed in the 1960s**.
 - It is the **sole land-based component of the S. nuclear triad**.
 - It was designed and manufactured by the **Boeing Corporation**.
 - Originally, it was only supposed to be kept in service for about ten years, but instead, it has been modernized as its **replacement, the Ground-Based Strategic Deterrent (GBSD), is due to become available for use in 2029**.
 - It was the **first U.S. missile fitted with** multiple independently targetable re-entry vehicles (**MIRVs**).
 - The United States currently has an estimated 440 Minuteman III missiles in its arsenal.
 - **Features:**
 - It is a **three-stage, solid-fuel missile**.
 - The missile is 18.2 m long with a diameter of 1.85 m and a launch weight of 34,467 kg.
 - It has a maximum **range of 13,000 km** and is **capable of carrying** a payload of **three re-entry vehicles**.
 - It **now carries a single nuclear warhead** pursuant to arms control agreements between the United States and Russia.
 - It has a **fast launch time**, nearly **100 percent testing reliability**, and backup airborne launch controllers to preserve retaliatory capabilities.
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