



CROSS & CLIMB
MAKING THE ELIGIBLE ENTITLED

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School of Research Based Learning & Competition



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WHAT IS QUANTUM COMPUTING?



• It is a cutting-edge technology leveraging the principles of **quantum mechanics** to solve problems too complex for traditional computers.

- **Quantum mechanics** is a branch of physics dealing with the behavior of particles such as **atoms**, **electrons**, and **photons** at molecular and sub-molecular levels.
- **Quantum mechanics** introduces phenomena like **superposition** and **entanglement**, enabling quantum computing's revolutionary capabilities.
- Quantum computers can solve problems that are **impossible** or **time-prohibitive** for classical systems, such as cryptographic algorithms, simulations, and optimization tasks.

Key Features:

- **Fundamentally Different from Classical Computing:** Quantum computers use **quantum bits (qubits)**, which can exist in states **0**, **1**, or **both** simultaneously (superposition). Classical computers process information in **binary bits** (0 or 1).
- **Superposition** enables qubits to hold multiple states at once, allowing quantum computers to perform exponentially more calculations compared to classical systems.
 - Example: Like a spinning coin, a qubit can represent both heads and tails until measured.
- **Entanglement** is a phenomenon where qubits remain intrinsically linked, regardless of distance.
 - Changing the state of one qubit instantly affects its entangled counterpart, enhancing computational speed.

Milestones in Quantum Computing:

- **Origin:** Proposed in **1982** by Richard Feynman to simulate quantum systems, as classical computers struggled with such complexity.

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- **Breakthrough algorithms: Shor's Algorithm (1994):** Revolutionized cryptography by factoring large numbers exponentially faster than classical methods.
- **Technological advancements**
 - **IBM Q System One (2019):** The first circuit-based commercial quantum computer.
 - **Google Sycamore Processor (2019):** Demonstrated **quantum supremacy** by solving a task in 200 seconds, which would take classical supercomputers 10,000 years.
 - **Google Willow Quantum Chip (2023):** Introduced scalable error-corrected qubits, finishing calculations in minutes that would otherwise take billions of years for classical systems.

PRADHAN MANTRI RASHTRIYA BAL PURASKAR



Pradhan Mantri Rashtriya Bal Puraskar is organized to celebrate the energy, determination, ability, zeal and enthusiasm of our children.

- It is the highest civilian honor for children in India.
- The Pradhan Mantri Rashtriya Bal Puraskar organized by the Ministry of Women and Child Development Government of India
- It is **awarded annually** to children for exceptional achievements in **seven categories**:
- Art & Culture, Bravery, Innovation, Science & Technology, Social Service, Sports, and Environment.

Eligibility:

- A child should be an Indian Citizen.
- A child above the age of **5 years and not exceeding 18 years** (as of 31st July of respective year).



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- The act/incident/achievement should have been **within 2 years of the last date** of receipt of application/nomination for the year of consideration.
- Number of Award will be 25, however, any relaxation to this maximum number may be permitted at the discretion of the National Selection Committee.
- Each awardee will receive a medal, certificate and citation booklet.

GREENLAND



Recently, the US President-elect Donald Trump has once again expressed interest in buying Greenland.

- It is the world's largest (non-continent) island, located between the continents of **North America and Europe in the North Atlantic Ocean**.
- It is geographically considered a part of the North American continent.
- It is surrounded by the **Arctic Ocean to the north**; by the Greenland Sea to the east; by the North Atlantic Ocean to the southeast; **Davis Strait** to the **southwest** and **Baffin Bay** to the west.
- Greenland was once a Danish colony and is now an **autonomous province of Denmark**.
- **Climate:** Greenland is in the polar zone, where winter temperatures reach as low as -50°C and summer temperatures rarely exceed 10–15°C. Due its size, however, temperatures can vary considerably from one part of the country to another.
- **Highest Point:** Gunnbjorn's Fjeld
- **Capital:** Nuuk

Why it matters to USA?

- Its strategic importance rose during the Cold War, and the US has a large air base there, the **Pituffik Space Base**, earlier the Thule Air Base. From Greenland, the US can monitor and prevent any missile coming towards it from Russia, China, or even North Korea.



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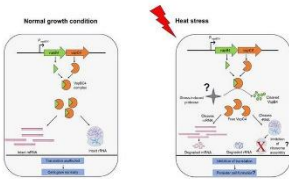


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- Greenland is rich in **rare earth minerals**, which are used in mobile phones, electric vehicles and other consumer electronics, but also in bombs and other weapons.
- As global warming leads to melting of ice, **new waterways can open in the Arctic region**, and all major powers are keen to boost their presence here.

WHAT ARE ARCHAEA?



- Archaea, which means "**ancient things**" in Greek, are one of the oldest forms of life on Earth and belong to a group called the third domain of life.
- Archaea (singular archaeon) are a **primitive group of microorganisms**.
- They were originally discovered and described in **extreme environments**, such as hydrothermal vents and terrestrial hot springs. They were also found in a diverse range of **highly saline, acidic, and anaerobic environments**.
- These slow-growing organisms are also **present in the human gut (about 1–2% of the microorganisms in the human gut)**, and have a potential relationship with human health.
- They are known for producing antimicrobial molecules, and for anti-oxidant activity with applications in eco-friendly waste-water treatment.
- Archaea are extremely difficult to culture due to challenges in providing natural conditions in a laboratory setting.

Key points of the research:

- Researchers studied a specific TA system in a heat-loving archaeon called **Sulfolobus acidocaldarius** to understand how it helps these organisms.
- **acidocaldarius**, which lives in hot volcanic pools like **Barren Island in the Andaman & Nicobar Islands** in India and some other volcanic areas in the world, that can get as hot as 90 degrees Celsius, the research highlights its unique challenges and how it survives.

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- The detailed analysis of the **VapBC4 TA system** that helps **survival in the high temperature environment**, shows its important role during heat stress.
 - It is revealed that several functions of the VapC4 toxin, such as stopping protein production, helping the organism form resilient cells, and influencing biofilm creation.
 - When the cell faces heat stress, a stress-activated protease may break down VapB4 protein. Once VapB4 is gone, the VapC4 toxin is released and **can stop protein production**.
 - This block in protein production is part of a survival strategy that helps cells form "persister cells" during stress.
 - These persister **cells go into resting state**, conserving energy and avoiding making damaged proteins. This dormancy helps them survive tough conditions until the environment improves.
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INDIA'S PUSH FOR SELF-RELIANCE IN IT HARDWARE MANUFACTURING

- India's heavy reliance on imported IT hardware, such as laptops and PCs, has driven the government to explore strategies to boost domestic manufacturing.
- This includes linking import permissions to domestic capacity expansion and introducing a credit system for imports once production meets critical thresholds.

Strategic Policy Measures:

- **Import Restrictions Tied to Domestic Manufacturing:**
 - The government plans to emulate the successful strategy used in the tyre manufacturing sector.
 - In 2020, restrictions on new pneumatic tyre imports led to global players like Bridgestone, Michelin, and Goodyear investing over ₹1,100 crore in local facilities.
 - A similar conditional easing of import norms is being considered for laptops and PCs, tied to commitments for domestic production.

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India's Import Dependency:

- In FY24, India imported electronic components worth \$34.4 billion, making it the fifth-largest imported commodity.
- Imports from **China (\$12 billion)** and **Hong Kong (\$6 billion)** accounted for over 50% of total electronic imports.
- Over the last five years, imports from China and Hong Kong have far exceeded those from South Korea, Japan, Taiwan, and ASEAN nations combined.

Domestic Production Challenges:

- **Slow Progress in IT Hardware Manufacturing:**
 - Despite initiatives like the revamped **Production Linked Incentive (PLI) scheme** (2023), domestic production of laptops and tablets has yet to scale up significantly.
 - **27 companies**, including Dell, HP, Lenovo, and Foxconn, have been approved under PLI 2.0 but are still in the early stages of production.
- **Extended Import Authorizations:**
 - Import restrictions under the **Import Management System (IMS)** have been extended until December 31, 2025, to prevent shortages and price hikes.

Way Forward:

- To reduce import dependency and achieve self-reliance, the government is pursuing a multi-faceted approach:
 - **Strengthening Local Manufacturing:**
 - Accelerating PLI incentives and enforcing policies that link imports with domestic capacity expansion.
 - **Diversifying Trade:**
 - Exploring alternative supply chains to reduce dependence on China and Hong Kong.
 - **Encouraging Investments:**

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- Creating a favourable ecosystem for both domestic and foreign players to invest in manufacturing facilities.
 - **Balancing Global Commitments and Domestic Needs:**
 - Aligning policies with WTO obligations while protecting strategic interests.
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SUPREME COURT RESTRAINS ED FROM ACCESSING SEIZED DIGITAL DEVICES

In a landmark decision, the SC has prohibited the Enforcement Directorate (ED) from accessing and copying data from electronic devices seized during a raid on Santiago Martin, known as the "lottery king," his relatives, and employees.

The decision emphasises the **protection of fundamental rights**, including the right to **privacy**, and could influence future guidelines on digital device seizures.

What is the Enforcement Directorate (ED)?

- **Background:**
 - The origin of the Directorate can be traced back to **1956**, when an 'Enforcement Unit' was formed, in the Department of Economic Affairs, for handling Exchange Control Laws violations under Foreign Exchange Regulation Act, 1947.
 - **In 1957**, this Unit was renamed as 'Enforcement Directorate' and the administrative control of the Directorate was transferred from Department of Economic Affairs to Department of Revenue in 1960.
- **About:**
 - ED is a **specialised financial investigation** agency under the Department of Revenue, Ministry of Finance, which enforces the following laws:
 - **Foreign Exchange Management Act, 1999 (FEMA)** - A Civil Law.
 - **Prevention of Money Laundering Act, 2002 (PMLA)** - A Criminal Law.
 - The ED (Headquartered at New Delhi) is governed under the Central Vigilance Commission (CVC) Act, 2003.
- **Composition:**

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- It is composed of officers from the Indian Revenue Service, the Indian Police Service and the Indian Administrative Service, as well as officers promoted from its own cadre.
- It is headed by the **Director of Enforcement**, who is appointed by the Central government and has been provided security of **two-year tenure** in office by the CVC Act, 2003.

Conclusion:

- The Supreme Court's order underscores the growing importance of safeguarding digital privacy in legal investigations.
 - As the case progresses, it may establish new standards for **balancing law enforcement objectives with constitutional rights**, particularly in an era where personal and business data is increasingly digitised.
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GOVERNOR

- The Governor in India is the **chief executive head** of a State.
- It is based on the Canadian model as an **independent constitutional authority**.
- The Governor is **appointed by the President of India** under her/his **warrant and seal**, not elected directly or indirectly.
- S/he holds office at the **pleasure of the President** but enjoys independence in her/his role.
- Emoluments, allowances, and privileges are determined by **Parliament**
- Conventionally, the President consults the **Chief Minister** of the concerned State to ensure smooth governance.

Supreme Court Judgments:

- **Surya Narain v. Union of India (1982)**: The pleasure of the President is not justiciable.

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- **Hargovind Pant v. Raghukul Tilak (1979):** The Governor's office is an **independent constitutional office** and not an employment under the Central government.
- **Protections and Immunities:**
 - Under **Article 361**, the Governor enjoys **personal immunity from legal liability** for official acts.
 - **Criminal proceedings** are not allowed during their tenure, and they cannot be arrested or imprisoned.
- **Oath of Office:** The Governor takes an oath to:
 - **Faithfully execute** the office.
 - **Preserve, protect, and defend** the Constitution.
 - Serve the **well-being of the State's people**.
 - Administered by the **Chief Justice** of the concerned state's High Court.

Recent Appointments:

- **Ajay Bhalla**, former Union Home Secretary, has been appointed as the **Governor of Manipur**.
 - **General V.K. Singh (Retd.)**, a former Union Minister, has been appointed as the **Governor of Mizoram**.
 - **Arif Mohammed Khan** has been transferred from **Kerala to Bihar**, with **Rajendra Vishwanath Arlekar**, the incumbent Bihar Governor, appointed as the new **Kerala Governor**.
 - **Hari Babu Kambhampati**, the Governor of Mizoram, has been appointed as the **Governor of Odisha**.
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