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A LOOK AT ONGOING INDIAN SPACE MISSIONS

Background:

- After the successful landing of Chandrayaan-3 on the moon, India's space program has continued to make significant strides, even though activities at the Sriharikota spaceport have been relatively quiet.

Key Achievements Post-Chandrayaan-3:

- **Aditya L1 Mission:** Launched on September 2, 2023, this solar science mission reached its orbit around the Earth-Sun Lagrange point (L1) by January 2024, marking a crucial step in solar observation.
- **Gaganyaan TV-D1:** The first abort mission for India's human spaceflight mission, Gaganyaan, successfully tested the Crew Escape System on October 21, 2023, showcasing the readiness for future manned missions.
- **XPoSat:** Launched on January 1, 2024, this satellite is India's second space-based observatory dedicated to studying polarized radiation from space, enhancing our understanding of cosmic phenomena.
- **INSAT-3DS:** This meteorological satellite, launched on February 17, 2024, is vital for proving the reliability of ISRO's Geosynchronous Satellite Launch Vehicle (GSLV), especially before the upcoming NASA-ISRO Synthetic Aperture Radar (NISAR) mission.
- **Reusable Launch Vehicle (RLV-TD):** ISRO conducted successful landing experiments for its scaled-down Reusable Launch Vehicle, laying the groundwork for future orbital return flight tests.
- **Small Satellite Launch Vehicle (SSLV):** With the successful third development flight on August 16, 2024, ISRO has completed the development phase of SSLV, enabling its transfer to industry for broader use.

Roadmaps and Future Plans:

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- **Gaganyaan Program:** India is focusing heavily on its human spaceflight program, with astronaut candidates undergoing advanced training. The first uncrewed Gaganyaan mission is expected by late 2024, with a crewed mission planned thereafter.
- **Next-Generation Launch Vehicle (NGLV):** ISRO is developing a new heavy-lift launch vehicle to support its ambitious goals, including a future Indian space station and extensive lunar exploration.
- **Lunar Exploration:** ISRO has a 25-year roadmap for lunar exploration, including plans for an Indian on the moon by 2040 and long-duration lunar missions.

Involvement of New Space India Ltd. (NSIL):

- NSIL has been assigned the responsibility for conducting space missions and managing commercial activities.
- This includes collaborations with SpaceX for satellite launches and the development of the LVM-3 rocket in partnership with private entities.

Private Sector Participation:

- **Agnikul Cosmos:** Successfully launched its SoRTeD-01 vehicle, marking the first use of a semi-cryogenic engine in India.
- **Skyroot Aerospace and Others:** Private companies are making significant progress in developing launch vehicles and space technologies, with upcoming missions like Vikram 1.

Regulatory Updates:

- **IN-SPACe:** India's new space regulatory body has been active, issuing important guidelines and licenses, including allowing 100% FDI in space sectors with specific ceilings in certain areas.
 - Overall, India's space program is rapidly evolving, with a strong emphasis on research, development, and collaboration with private companies to achieve its ambitious space exploration goals.
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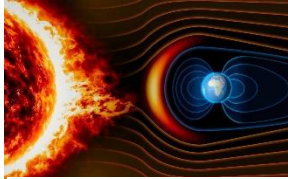
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SOLAR MAGNETIC FIELDS



Recently, the IIA astronomers have pioneered a method to probe the Sun's magnetic fields using data from the Kodaikanal Tower Tunnel Telescope.

Recent Research by the Indian Institute of Astrophysics (IIA):

- The study focused on an active sunspot region with complex features, including multiple umbrae and a penumbra.
- Simultaneous observations were conducted using the Hydrogen-alpha (6562.8 \AA) and Calcium II 8662 \AA spectral lines.
- **Findings:**
 - These observations provided insights into the magnetic field's stratification across different heights of the solar atmosphere.
 - The use of the Tunnel Telescope's unique 3-mirror Coelostat setup enabled precise tracking of the Sun and enhanced data accuracy.

Technological insights:

- **Tunnel Telescope Setup:** The primary mirror (M1) tracks the Sun's movement, while the secondary (M2) and tertiary mirrors (M3) direct and align the sunlight for observation.
 - An achromatic doublet lens focuses the Sun's image with high precision, allowing detailed analysis.
- **Limitations of traditional diagnostic probes:**
 - While **Calcium II 8542 \AA** and **Helium I 10830 \AA lines** are commonly used to infer chromospheric magnetic fields, they have limitations in their applicability across various solar features.
 - The new method using **Hydrogen-alpha** and **Calcium II 8662 \AA lines** offers a more comprehensive understanding of solar magnetic fields.

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About Solar Magnetic Fields:

- The Sun's magnetism is crucial in understanding its various activities and phenomena. Magnetic fields in the Sun are generated by the **movement of electrically charged particles**, specifically **ions and electrons**.
 - These fields influence almost every feature observed on the Sun, including **sunspots, prominences, and coronal loops**.
 - **Layers of the Solar Atmosphere:** The Sun's atmosphere consists of multiple layers: the **photosphere, chromosphere, and corona**.
 - The magnetic fields interlink these layers, channeling energy from the lower to the upper layers, contributing to processes like coronal heating.
 - **Sunspots:** Sunspots are regions on the Sun's surface where magnetic fields are extremely concentrated. These fields break through the surface, leading to cooler areas that appear darker.
 - The sunspot cycle, lasting **approximately 11 years**, results from the recycling of these magnetic fields through the solar interior.
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WHAT ARE GLACIAL LAKES?



The National Disaster Management Authority (NDMA) has finalised a list of 189 “high-risk” glacial lakes for mitigation measures to reduce the risk emanating from them.

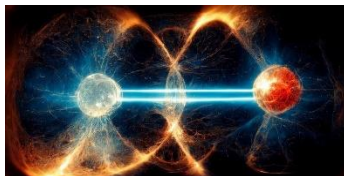
- A glacial lake is a **body of water that originates from a glacier**.
- It **typically forms at the foot of a glacier**, but may form on, in, or under it.
- ISRO categorised glacial lakes into **four broad categories** based on how they were formed — **moraine-dammed, ice-dammed, erosion-based, and ‘others’**.

How do glacial lakes form?

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- As **glaciers** move, they **erode the terrain** under them, leaving **depressions** and **grooves** on the land.
 - When they churn up rock and soil, they **etch ridges of debris** known as **moraines**.
 - Most glacial lakes form when a **glacier retreats** and **meltwater** fills the hole left behind.
 - However, **natural dams**, formed out of **ice** and **terminal moraines**, can also **form glacial lakes**.
 - An **ice dam** forms when a **surging glacier**, which can move up to 100 times faster than an average glacier, may **dam up meltwater** as it **closes off a valley** or **fjord** and prevents it from draining.
 - **Dams** formed by **moraines** can be **dense and stable**, holding **sizable lakes** **behind** them for years.
 - They can also be **leaky**, allowing the lake to **drain slowly** into nearby rivers.
 - Glacial lakes are **crucial sources of freshwater** for rivers.
 - However, they also **pose significant risks**, specifically of **Glacial Lake Outburst Floods (GLOFs)**.
 - GLOFs occur when glacial lakes release large volumes of meltwater due to the failure of natural dams, resulting in sudden and severe flooding downstream.
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WHAT IS QUANTUM NONLOCALITY?



Scientists have demonstrated that a universal standard for measuring and quantifying non-local quantum correlations is not possible.

- While **classical physics** assumes **locality**, the principle of **nonlocality** is a **feature** of many interpretations of **quantum mechanics**.

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- Nonlocality describes the apparent **ability of objects to instantaneously know about each other's state**, even when separated by large distances (potentially even billions of light years), almost as if the universe at large instantaneously arranges its particles in anticipation of future events.
 - Thus, in the quantum world, **despite what Einstein had established** about the **speed of light being the maximum** speed for anything in the universe, **instantaneous action or transfer of information** does appear to be possible.
 - This is in **direct contravention of the "principle of locality"** (or what Einstein called the "principle of local action"), **the idea that distant objects cannot have direct influence on one another**, and that an object is directly influenced only by its immediate surroundings, an idea on which almost all of physics is predicated.
 - **Nonlocality occurs due to the phenomenon of entanglement**, whereby **particles that interact with each other become permanently correlated**, or dependent on each other's states and properties, to the extent that they **effectively lose their individuality** and, in many ways, **behave as a single entity**.
 - Nonlocality suggests that the **"separate" parts of the universe** are actually **potentially connected** in an intimate and immediate way.
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INTERNSHIP INITIATIVES TO MATCH SKILL SETS WITH OPPORTUNITY IN INDIA

About the Internship Scheme Announced in the Union Budget 2024-25:

- The Union Budget 2024-25 had announced the PM's Package for Employment and Skilling with an overall outlay of Rs 2 lakh crore.
- The internship scheme was announced (in the Budget) after the issue of unemployment became contentious during the Lok Sabha polls held earlier this year.
- **Description of the scheme:**
 - **Objective:**



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- In an effort to close the skills gap and help young people find their first jobs, the government would offer one crore youth internships in 500 of the top companies in five years.
- The government is keen to ensure that those at the margins, especially those less skilled and less employable, are able to make the most of this internship scheme.
- **Allowance:** An internship allowance of Rs 5,000 per month along with a one-time assistance of Rs 6,000 will be provided to interns.
- **Funding:**
 - Companies will be required to use their corporate social responsibility (CSR) funding to cover the training cost and 10% of the internship cost.
 - The scheme is projected to cost over Rs 66,000 crore, and each company would have to shell out over Rs 13 crore for it.
- **Concerns:**
 - Although the industry has generally welcomed the internship scheme, certain questions have been raised.
 - **For example**, the eligibility criteria for companies and interns to be selected as part of the plan.
 - Whether it will be mandatory (for companies) and the basic qualifications an individual needs to have to qualify as a beneficiary.
- **Solution:**
 - The government plans to talk to the top 500 companies and mutually agree on a **voluntary quota system** for taking on board interns.
 - The quota system would be based on the CSR expenditure of these companies.

Highlights of the Portal that will Enable Youth to Apply Directly for Internship:

- How will it work?

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- The idea is not to upload any existing database of the country's youth on the portal, because some may not want to participate in this internship scheme.
 - Rather, the employers will post their internship openings, and these will be matched with the data submitted by the candidates, enabling a free flow of information on the portal.
 - **Objective:** The portal will facilitate matching of skill sets of the applicants with the type of internship opportunities provided by the companies.
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GOVT BANS 156 FIXED DOSE COMBINATION DRUGS

Fixed Dose Combination (FDC) Drugs:

- Combination products, also known as fixed dose drug combinations (FDCs), are combinations of two or more active drugs in a single dosage form.
 - They are also referred to as cocktail drugs.
- It is widely accepted that most drugs should be formulated as single compounds.

156 fixed dose combination drugs banned

- The government has banned 156 fixed-dose combination (FDC) medicines, including antibiotics for fevers and colds, painkillers, and multivitamins, citing potential risks to human health.
 - The Union Health Ministry issued a gazette notification under **Section 26 A of the Drugs and Cosmetics Act of 1940**, prohibiting the manufacture, sale, and distribution of these medicines.
 - The ban follows recommendations from an expert committee and the Drugs Technical Advisory Board (DTAB), both of which found no therapeutic justification for the ingredients in these FDCs.
 - The banned drugs include common combinations like anti-allergic medicines with nasal decongestants, antibiotics with acne creams, and migraine medicines with anti-nausea drugs.
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WORLD'S SECOND-LARGEST DIAMOND IN BOTSWANA

Recently, a 2,492-carat diamond, the second-largest ever found, has been unearthed in the Karowe Diamond Mine, northeastern Botswana, by Canadian company Lucara Diamond.



The newly discovered diamond is second to the **3,106-carat Cullinan Diamond**, which was found in South Africa over a century ago.

- **Botswana**, a leading diamond producer, relies heavily on the diamond industry, which constitutes **30% of its GDP and 80% of its exports**.
- The diamond was unearthed using **advanced X-ray transmission technology**, which enhances the recovery of large stones without causing damage.

Diamond characteristics:

- **Formation:** Diamonds form in the Earth's mantle and are brought to the surface through volcanic activity. They are found in volcanic landforms like **dykes** and **sills**.
- **Uses:** Diamonds are utilised in **jewellery, industrial cutting tools, and polishing due to their hardness**.

Major Diamond Locations in India:

- **Panna belt:** Madhya Pradesh
- **Wajrakarur Kimberlite pipe:** Anantapur district, Andhra Pradesh
- **Krishna River basin gravels:** Andhra Pradesh
- **Recent discoveries:** New kimberlite fields in Raichur-Gulbarga districts, Karnataka.
- **Processing:** Modern cutting and polishing are concentrated in Surat, Navasari, Ahmedabad, and Palampur.

Global diamond production:

- **Leading producers:** Russia, Botswana, Canada, Australia, South Africa, and the Democratic Republic of Congo (DRC).
- **Synthetic diamonds:** The US is the largest producer of synthetic industrial diamonds.