DAILY CURRENT AFFAIRS 22-04-2025

GS-1

1. **Magai River**
2. **Mahadev Koli Tribe**

GS-3

3. **James Webb Space Telescope**
4. **Surface Mount Technology**

Magai River

Syllabus: GS-1; Geography- Rivers, GS-4; Ethics

Context

- Tired Of Waiting, UP Villagers Building 108-Ft Bridge With Crowd funding.

About

- **Origin**: Dubawan village, Azamgarh district, Uttar Pradesh, India.
- **Course**: Flows through Azamgarh, Mau, and Ghazipur districts.
- **Confluence**: Joins the Tamsa River near Bhikharipur in Ballia district; the Tamsa later merges with the Ganges.

Villages Along Its Banks

- Muhammad Pur, Hata (Mohammadabad), Silaich, Karimuddinpur, Mahend, Nasrat Pur, Madhuban, Malikpura.

Significance

- Supports **pan (betel) leaf cultivation, a major local crop.**
- Critical for **irrigation** and **rural connectivity** in eastern UP.

Recent Development

- The 105-foot crowdfunded bridge over the Magai, built by Kyampur Chhavni residents, highlights community resilience against infrastructural delays.

- Retired Army engineer Ravindra Yadav led the effort, contributing 10 lakh rupees and technical expertise.

Mahadev Koli Tribe

Syllabus: GS-1; Tribes of India

Context

- Forest knowledge of Maharashtra's Mahadev Koli tribe can help fight climate change: study.

About

- The **Mahadev Koli** are a **Scheduled Tribe (ST)** primarily residing in **Maharashtra** (Ahmednagar, Pune, Satara, Kolhapur) and parts of **Madhya Pradesh**. They are a **sub-group of the Koli community**, known for their **agricultural and forest-based livelihoods**. Recent studies highlight their **rich traditional ecological knowledge (TEK)**, making them crucial for **climate resilience** and **biodiversity conservation**.

Key Characteristics

(A) Geographical Distribution

- **Western Maharashtra**: Akole block (Ahmednagar), Pune, Satara, Solapur.
- **Vidarbha region** & bordering areas of **Madhya Pradesh**.
- **Habitat**: Forested regions of the **North Western Ghats** (a **UNESCO Biodiversity Hotspot**).

(B) Socio-Cultural Aspects

- **Language**: Marathi & Koli dialects.
- **Religion**: Hindu, primarily worshipping **Lord Shiva (Mahadev)**.
- **Livelihood**:
  - Traditionally **agriculturists** (jowar, bajra, pulses).
  - **Forest-dependent** (medicinal plant collection, honey gathering).
  - Some engage in **fishing** (due to broader Koli community links).
- **Social Structure**: Clan-based (**exogamous kuls**).

(C) Economic Condition

- **Challenges**:
  - Small landholdings → **dependence on rain-fed farming**.
  - **Seasonal migration** for labor (MGNREGA, construction).
- **Government Support**:
  - ST status → **reservations, scholarships, land rights under FRA 2006**.

Ecological Knowledge & Climate Resilience (Recent Study by WOTR)

A **2023 study** by the **Watershed Organisation Trust (WOTR)** highlights:

(A) Medicinal Expertise

- Use **51 native tree species** (41 genera, 25 families) for treating:
  - Fever, dysentery, joint pain, snake bites, skin infections.
- **Example**: *Kadamb* (Neolamarckia cadamba) for fever, *Bibba* (Semecarpus anacardium) for arthritis.

(B) Climate Adaptation Skills

- Detect **micro-climatic changes** (e.g., shifts in flowering seasons).
- **Real-time ecological monitoring** – gaps not covered by satellite data.
- **Published in Springer's book** on climate mitigation strategies.

(C) Policy Relevance

- **Why Important?**
  - Their TEK is **scientifically valid** but **underrepresented in climate policies**.
  - Aligns with **SDG 13 (Climate Action)** & **SDG 15 (Life on Land)**.
- **Key Suggestion**: Integrate TEK into **national adaptation plans**.
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Governance & Challenges

(A) Government Schemes

- **Forest Rights Act (FRA), 2006** – Ensures land & resource rights.
- **Tribal Sub-Plan (TSP)** – Funds welfare programs.
- **National Mission on Himalayan Studies (NMHS)** – Documents tribal knowledge.

(B) Key Issues

- **Land Alienation** – Lack of formal land titles.
- **Healthcare & Education Gaps** – Low literacy, limited infrastructure.
- **Climate Threats** – Declining medicinal plant availability.
- **Policy Exclusion** – TEK remains undocumented in scientific literature.

James Webb Space Telescope

Syllabus: GS-3; Science & Technology

Context

- James Webb telescope reveals hidden past of the 'Crystal Ball Nebula'

About

- The **James Webb Space Telescope (JWST)** is a large, space-based observatory developed by **NASA**, in collaboration with the **European Space Agency (ESA)** and the **Canadian Space Agency (CSA)**. It is the most powerful and complex space telescope ever built, designed to study the universe in **infrared light**.

Key Features of JWST:

- **Primary Mirror:** 6.5 meters (21.3 feet) in diameter, made of 18 hexagonal gold-coated beryllium segments.
- **Sunshield:** A five-layered, tennis court-sized shield that protects the telescope from the Sun's heat, keeping it at cryogenic temperatures (below -223°C / -370°F).
- **Orbit Location:** Positioned at the **Lagrange Point 2 (L2)**, about **1.5 million km (1 million miles)** from Earth.
- **Wavelength Coverage:** Primarily observes in **infrared** (0.6 to 28.5 microns), allowing it to see through dust clouds and detect the earliest galaxies.
- **Scientific Instruments:**
    - **NIRCam** (Near-Infrared Camera)
    - **NIRSpec** (Near-Infrared Spectrograph)
    - **MIRI** (Mid-Infrared Instrument)
    - **NIRISS** (Near-Infrared Imager and Slitless Spectrograph)

Mission Objectives:

- **Study the First Galaxies:** Observe the formation of the first stars and galaxies after the Big Bang (~13.5 billion years ago).
- **Exoplanet Atmospheres:** Analyze the chemical composition of exoplanet atmospheres for signs of habitability.
- **Star and Planet Formation:** Investigate how stars and planetary systems form inside dust clouds.
- **Solar System Exploration:** Study objects within our own solar system, such as planets, moons, and asteroids.

Achievements So Far:

- Detected the **oldest known galaxies** (from ~300 million years after the Big Bang).
- Provided detailed spectra of **exoplanet atmospheres**, including water vapor and CO_2.
- Captured stunning images of **nebulas, star clusters, and distant galaxies**.
- Studied **Jupiter, Saturn, and other solar system objects** in new detail.

Comparison with Hubble:

Feature	Hubble Space Telescope	James Webb Space Telescope
Launch Year	1990	2021
Wavelength	Ultraviolet, Visible, Near-Infrared	Near & Mid-Infrared
Mirror Size	2.4 meters	6.5 meters
Orbit	Low Earth Orbit (~547 km)	L2 Point (~1.5 million km)
Primary Focus	Visible universe, deep fields	Early universe, infrared astronomy

About- Crystal Ball Nebula

- The **Crystal Ball Nebula** (also known as **NGC 1514**) is a **planetary nebula** located in the constellation **Taurus**, approximately **800 light-years** from Earth.
- It was discovered by **William Herschel** in **1790**. Unlike many other planetary nebulae, which appear as faint, symmetrical shells, NGC 1514 has a unique **bipolar (two-lobed) structure** with a bright central star illuminating the surrounding gas.

Key Features:

- **Type: Bipolar Planetary Nebula** (unlike the more common spherical or elliptical shapes).
- **Central Star:** A **binary star system** consisting of a **hot white dwarf** and a **cooler companion star** (likely a giant or subgiant).
- **Structure:**
  - Two large, faint **ionized gas lobes** extending outward.
  - A bright inner shell with **complex filamentary structures**.
  - Glowing due to **ultraviolet radiation** from the central star.
- **Discovery Significance:** Herschel realized that nebulae could be formed by **dying stars**, not just unresolved star clusters.

Observational Details:

- **Apparent Magnitude:** ~10.9 (visible with medium-sized telescopes).
- **Diameter:** ~2.5 light-years.
- **Emission Lines:** Strong in **Oxygen-III (OIII)** and **Hydrogen-alpha (Hα)**, making it appear greenish in images.

Scientific Importance:

- **Binary Star Influence:** The nebula's unusual shape is believed to be caused by **interactions between the two central stars**, shaping the ejected material.
- **Studying Stellar Evolution:** Helps astronomers understand how **low to intermediate-mass stars (1-8 solar masses)** shed their outer layers at the end of their lives.
- **Infrared Observations:** The **Spitzer Space Telescope** and **WISE** detected **dust rings** around the central star, suggesting previous mass-loss episodes.

Comparison with Other Planetary Nebulae:

Feature	Crystal Ball Nebula (NGC 1514)	Ring Nebula (M57)	Helix Nebula (NGC 7293)
Shape	Bipolar (two-lobed)	Ring-like	Spiral/Helix
Central Star	Binary system (white dwarf + giant)	Single white dwarf	Single white dwarf
Distance	~800 ly	~2,300 ly	~655 ly
Discovery Year	1790	1779	1824

Surface Mount Technology

Syllabus: GS-3; Science & Technology

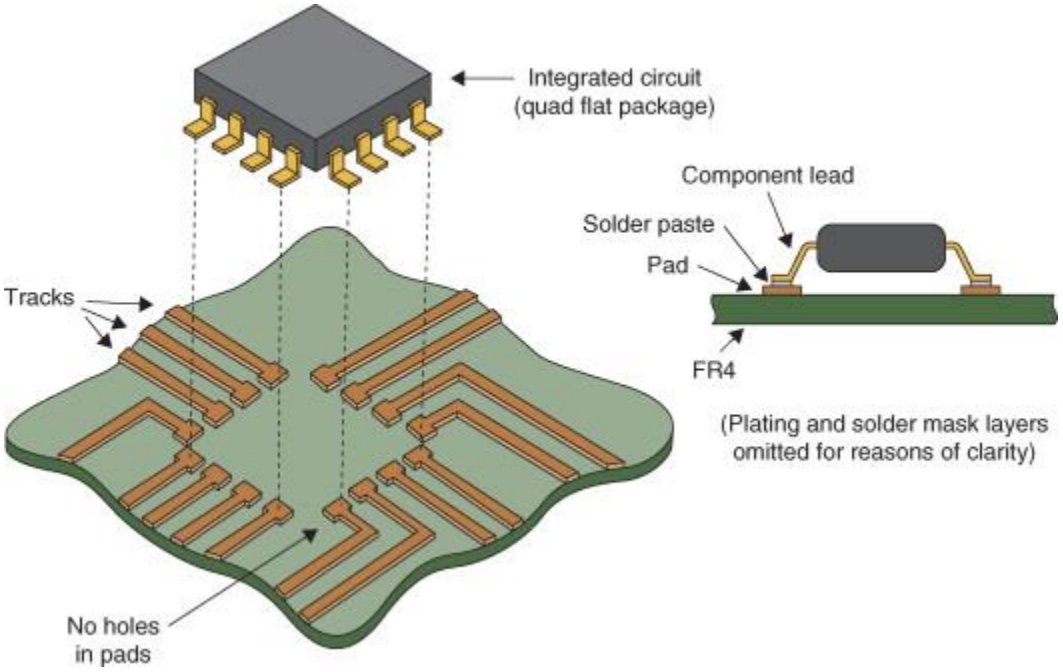
Context

- Union Minister for Electronics and Information Technology, Railways, and Information & Broadcasting, Vaishnaw Inaugurates VVDN's Largest Surface Mount Technology Line & Mechanical Innovation Park In Manesar.

About

- **Surface Mount Technology (SMT)** is a method of **assembling electronic circuits** where components are mounted directly onto the surface of a **printed circuit board (PCB)** rather than inserted into holes.

- It is widely used in modern electronics due to its efficiency, compactness, and reliability.



Key Features of SMT

- **Smaller Components** – SMT components (SMDs - Surface Mount Devices) are much smaller than traditional through-hole components, allowing for higher component density.

- **Higher Automation** – SMT is highly automated, reducing labor costs and increasing production speed.
- **Better Performance** – Shorter lead lengths reduce parasitic inductance and capacitance, improving high-frequency performance.
- **Cost-Effective** – Reduced material usage and faster assembly lower manufacturing costs.
- **Dual-Sided Mounting** – Components can be placed on both sides of the PCB, saving space.

Advantages of SMT

- **Miniaturization** – Enables smaller and lighter electronic devices.
  Higher Speed & Performance – Better for high-frequency applications (e.g., smartphones, IoT devices).
  Reduced Manual Labor – Mostly automated, reducing human errors.
  Lower Production Costs – Due to bulk manufacturing and less material usage.

Disadvantages of SMT

- **Difficult Manual Repair** – Tiny components make repairs harder compared to through-hole technology.
  Thermal Stress Issues – Solder joints may crack under extreme temperature changes.
  Not Ideal for High-Power Components – Some large/heavy components still require through-hole mounting.

Applications of SMT

- **Consumer Electronics** (Smartphones, Laptops, Tablets)
- **Medical Devices** (Portable monitors, diagnostic equipment)
- **Automotive Electronics** (ECUs, sensors, infotainment systems)
- **Aerospace & Defense** (Avionics, communication systems)
- **Industrial Automation** (Robotics, control systems)

Comparison with Through-Hole Technology (THT)

Feature	SMT	THT
Size	Smaller	Larger
Automation	High	Low to Moderate
PCB Space	Uses both sides	Mostly single-sided
Cost	Lower for mass production	Higher due to manual work
Repairability	Difficult	Easier

Why is SMT Important for India?

- **Boost to Electronics Manufacturing** – Aligns with initiatives like **Make in India** and **Production Linked Incentive (PLI) Scheme**.
- **Growth of Semiconductor Industry** – Supports India's push for self-reliance in electronics.
- **Employment Generation** – Expands opportunities in PCB assembly and electronics manufacturing.