



Non-Invasive Archaeological Survey at Gyanvapi Mosque

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Why in News?

Recently, the [Supreme Court of India](#) directed the [Archaeological Survey of India \(ASI\)](#) to conduct a detailed **non-invasive survey** of the [Gyanvapi mosque](#) in Varanasi, Uttar Pradesh to determine if the mosque was built atop a temple.

What is the Purpose of the Survey?

- The petitioners argued that the mosque was built on the **foundation of the temple** and that there were several Hindu idols and structures hidden inside the mosque.
- The court directed the ASI to form a five-member committee of experts to conduct a comprehensive physical survey of the entire Gyanvapi compound using **non-invasive techniques such as ground-penetrating radar (GPR) and carbon dating**.
- The survey is expected to reveal whether there are any traces of a temple or other Hindu structures below or within the mosque and to **establish the age and origin of the existing structures**.
- The court also appointed an observer to monitor and supervise the survey process and report any irregularities or violations.

What are Non-Invasive Methods in Archaeological Prospecting?

- Non-invasive methods are used when investigations are **undertaken inside a built structure and no excavation is permitted**.
- **Types of Methods:**
 - **Active Methods:** Inject energy into the ground and measure the response. The methods provide an estimate of the ground's material properties, such as density, electrical resistance, and wave velocity.
 - **Seismic Techniques:** Use shock waves to study subsurface structures.
 - **Electromagnetic Methods:** Measure electromagnetic responses after energy injection.
 - **Passive Methods:** Measure existing physical properties.
 - **Magnetometry:** Detect magnetic anomalies caused by buried structures.
 - **Gravity Surveying:** Measure gravitational force variations due to subsurface features.
 - **Ground-Penetrating Radar (GPR):**
 - ASI will use GPR to produce a **3-D model of buried archaeological features**.
 - GPR operates by introducing a short radar impulse from a surface antenna and records time and magnitude of return signals from the subsoil.
 - Radar beam spreads like a cone, causing reflections before the antenna passes over the object.
 - Radar beams spread out in a cone, leading to reflections that may not directly correspond to physical dimensions, creating false images.
 - **Carbon Dating:**
 - Determine organic material age by measuring carbon content.

What are the Limitations of Various Methods in Archaeological Surveys?

- Similar **physical properties of different materials** can generate the same response, leading to ambiguity in identifying targets.
- **Data collected is limited and contains measurement errors**, making it challenging to accurately estimate the spatial distribution of properties.
- Archaeological structures are often made of **heterogeneous materials with complex geometry, making data interpretation challenging**.
- Geophysical tools **might not accurately reconstruct target images**, especially in complex scenarios.
- In cases like disputes over religious sites, **emotional and political factors can influence interpretations and decisions**.

Archaeological Survey of India (ASI)

- ASI, under **the Ministry of Culture**, is the **premier organization for the archaeological research and protection of the cultural heritage** of the nation.
- It administers more than 3650 ancient monuments, archaeological sites and remains of national importance.
- Its activities **include carrying out surveys of antiquarian remains, exploration and excavation of archaeological sites, conservation and maintenance** of protected monuments etc.
- It was **founded in 1861 by Alexander Cunningham**- the first Director-General of ASI. Alexander Cunningham is also known as the **“Father of Indian Archaeology”**.

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