



# Muons Penetrate Ancient Xi'an Fortress Wall

## Why in News?

As per a new study, researchers are **examining the fortress wall of Xi'an, an ancient city in China**, by using tiny outer space particles Muons that can penetrate hundreds of metres of stone surfaces.

- Scientists have used a muon detector, called **CORMIS (Cosmic Ray Muon Imaging System)**, to examine the **wall of Xi'an city**.

## What are Muons?

### ▪ About:

- Muons are subatomic particles raining from space. They are **created when the particles in Earth's atmosphere collide with cosmic rays**.
  - [Cosmic rays](#) are the **clusters of high-energy particles** that move through space at almost the **speed of light**.
- According to Scientific American magazine, **"about 10,000 muons reach every square metre of the Earth's surface a minute"**.

### ▪ Properties:

- These particles **resemble electrons but are 207 times as massive**. Therefore, they are sometimes called **"fat electrons"**.
- Because muons are so heavy, **they can travel through hundreds of metres of rock or other matter before getting absorbed** or decayed.
  - In comparison, **electrons can penetrate through only a few centimetres**.
- Also, muons are highly unstable and **exist for just 2.2 microseconds**.

## What is Muography?

### ▪ About:

- The method of scanning large structures owing to the penetration power of muons is called Muography.

### ▪ Applications of Muography:

- **Archaeology:**
  - With unique advantages, **muography has gained increasing attention from archaeologists** as a novel and innovative tool to **investigate large-scale archaeological sites**.
    - Example: The first use of muography was in the late 1960s when a **Nobel Prize-winning physicist named Luis Alvarez** teamed up with Egyptologists to look for **hidden rooms in the Pyramid of Khafre in Giza**.
- **Other Applications:**
  - Muography has also found use in **customs security, internal imaging of volcanoes and others**.
    - In 2015, scientists used the technique to look inside the [Fukushima nuclear reactors](#) after the **2011 earthquake** and [tsunami in Japan](#).
    - It is also being used by researchers to analyze [Mount Vesuvius](#), a **volcano in Italy**.

[Source: IE](#)

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