



Early Galaxy Detected by AstroSat

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Why in News

A team of Scientists from the **Inter University Centre for Astronomy and Astrophysics (IUCAA)** has discovered one of the earliest galaxies called **AUDFs01** using **AstroSat**.

- The galaxy is located in the **Hubble Extreme Deep field, 9.3 billion light-years** away from Earth.
- The team comprises scientists from **India, Switzerland, France, USA, Japan and Netherlands**.

Hubble eXtreme Deep Field (XDF) :

It is a portion of space that contains approximately 5,500 galaxies, the oldest of which are seen as they were 13.2 billion years ago, recorded by the Hubble Space Telescope for over 10 years.

Hubble Space Telescope :

The HST or Hubble is a space telescope that was launched into **Low Earth orbit** in 1990 and remains in operation. It is one of the largest and most versatile space telescopes till date.

Key Points

- The galaxy was discovered using **UltraViolet Imaging Telescope (UVIT)** on Astrosat. AstroSat detected **Extreme Ultraviolet light** from the galaxy.
- Earlier, **NASA's Hubble Space Telescope (HST)**, which is **significantly larger than UVIT**, did not detect any UV emission from this galaxy because **it is too faint**.
- AstroSat/UVIT was able to achieve this unique feat because the **background noise in the UVIT detector is much less** than the ones on HST.

- These observations lasted for more than **28 hours in October 2016**, but it took nearly **two years since then to carefully analyse the data** to ascertain that the emission is indeed from the galaxy.

AstroSat

- It is a **multi-wavelength astronomy mission** on an **IRS-class** (Indian Remote Sensing-Class) satellite in a 650-km, near-equatorial orbit.
- It was launched by the Indian launch vehicle **PSLV** from **Satish Dhawan Space Centre, Sriharikota** on **September 28, 2015** by **ISRO**.
- It is the **first dedicated Indian astronomy mission** aimed at studying celestial sources in X-ray, optical and UV spectral bands simultaneously with its **five unique X-ray and ultraviolet telescopes working in tandem**.
- One of the unique features of AstroSat mission is that it enables the **simultaneous multi-wavelength observations of various astronomical objects** with a single satellite.
- The **Ground Command and Control Centre** for ASTROSAT is located at **ISRO Telemetry, Tracking and Command Network (ISTRAC)**, Bangalore, India.

Detection of an Early Galaxy

- Before the Big Bang, the universe **consisted only of particles like electrons and protons**. As the universe started to cool, the protons and neutrons began combining into **ionized atoms** of hydrogen (and eventually some helium).
- Creation of neutral atoms allowed light to pass through the universe and thus, **made it transparent**, but it was still dark due to absence of any stars (dark ages).
- A few hundred million years later, the dark age ended **when the first stars and galaxies formed**.
- The creation of stars and galaxies released an immense amount of energy that **re-ionized neutral atoms** and emitted UV lights.
- These **early UV lights are detected** for detecting the earliest astronomical objects.
- The probability that a fraction of extreme-UV photons escape the host galaxy and are caught by a telescope on Earth is almost zero. That's why they are **detected using telescopes placed in space** like HST and AstroSat.

Way Forward

The detection of UV emission from AUDFs01 can help reveal details about the Big Bang, the end of dark ages and the formation of early stars and galaxies and thus give a boost to the ongoing cosmological research.

Source: IE