

Magnetars and Related AstroSat's Discovery

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Why in News?

<u>AstroSat</u>, India's first multi-wavelength space-based observatory, has detected bright sub-second **X-ray bursts** from a new and unique <u>neutron star</u> with an ultrahigh magnetic field (magnetar).

 Scientists performed the timing and spectral analysis of this magnetar using two instruments onboard AstroSat: the Large Area X-Ray Proportional Counter (LAXPC) and Soft X-Ray telescope (SXT).

What are Magnetars?

- Magnetars are neutron stars having an ultrahigh magnetic field that are much stronger than
 the terrestrial magnetic field (over one quadrillion times stronger than the magnetic field of
 Earth).
 - High-energy electromagnetic radiation emitted by magnetars results from the decay of their powerful magnetic fields.
- They display strong temporal variability, typically including a slow rotation, a rapid spin-down, bright but short bursts going on up to months-long outbursts.
- One such magnetar, called SGR J1830-0645, was discovered in October 2020 by NASA's Swift spacecraft.
 - It is relatively young (about 24,000 years) and an isolated neutron star.

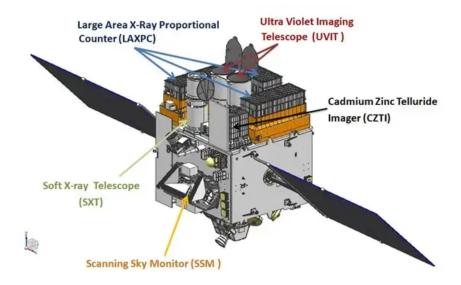
Note

A neutron star is a **dense and compact stellar object that forms from the remnants of a massive star's core** after a **supernova explosion**. These stars are among the densest objects known in the universe, packing an **immense mass into a relatively small size**.

■ The **discovery of pulsars in 1967** provided the first evidence of the existence of neutron stars. Pulsars are neutron stars that emit pulses of radiation once per rotation

What is AstroSat?

- About: AstroSat is the first dedicated Indian astronomy mission aimed at studying celestial sources in X-ray, optical and UV spectral bands simultaneously.
 - It was launched in September, 2015 onboard <u>PSLV-C30</u> from Satish Dhawan Space Centre, Sriharikota.
 - Mission operations center at ISTRAC Bengaluru manages the task of operating AstroSat.
- Payload:



- Major Scientific Observations of AstroSat:
 - Spotted **stars forming in gas streams**, offering insights into how galaxy clusters behave.
 - It found over **75,000 young stars in the Andromeda Galaxy's bulge,** a first discovery.
 - <u>Black holes</u> in a binary system were seen spinning almost as fast as possible by LAXPC and SXT payloads.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

- Q. Recently, scientists observed the merger of giant 'blackholes' billions of light-years away from the Earth. What is the significance of this observation? (2019)
- (a) 'Higgs boson particles' were detected.
- (b) 'Gravitational waves' were detected.
- (c) Possibility of intergalactic space travel through 'wormhole' was confirmed.
- (d) It enabled the scientists to understand 'singularity'

Ans: (b)

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