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Why stars feast and fast partly resolved

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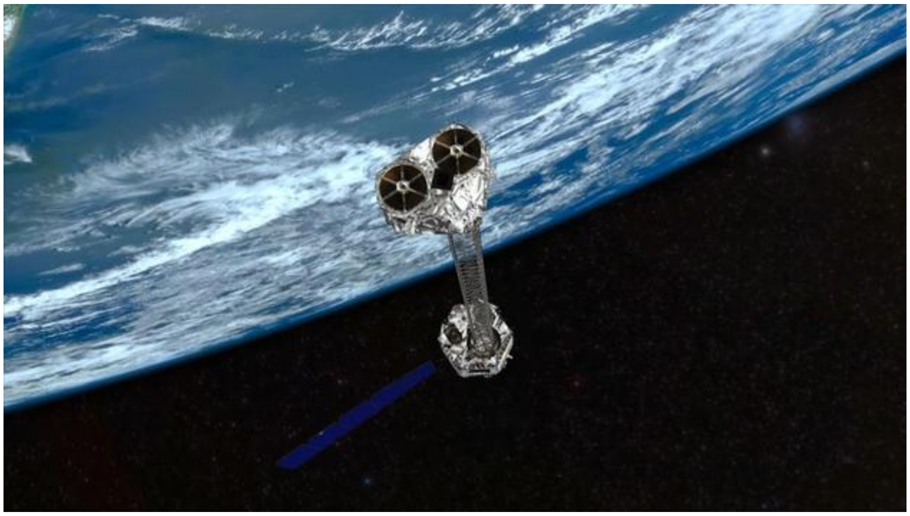
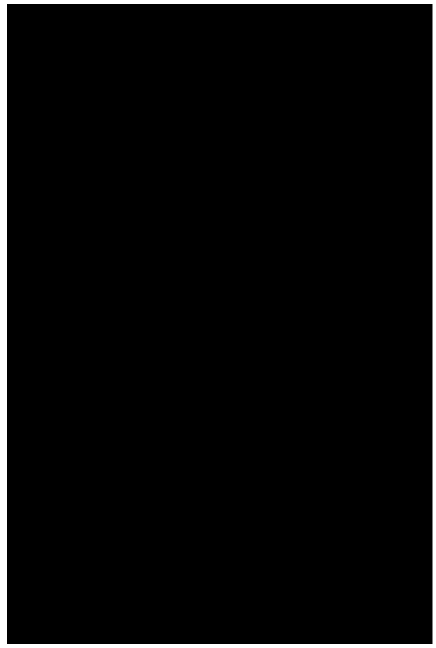


An artist's rendering of NuSTAR.

Varun Bhalerao at the the Inter University Centre for Astronomy and Astrophysics, Pune.



The actual image of the NuSTAR satellite before launch.

Supergiant fast x-ray transients (SGXT) are in the news. SGXT is the name for a certain type of binary star — revolving around each other.

To be specific, they are a pair in which one partner is a big bright star and the other is a highly condensed dark black hole or a neutron star — which attracts mass from the bright star.

As the material spirals into the dark star, it emits x-rays. Hence, it appears to the onlooker that they are shining

Suddenly, without warning, the pair dims to a fraction of its brightness within minutes. This behaviour of shini called "fasting" and "feasting" has puzzled astronomers for a decade now.

This puzzle has now been partly resolved by means of a breakthrough, thanks to the work of an international te Bhalerao of the Inter University Centre for Astronomy and Astrophysics, Pune. The results were published rec *Monthly Notices of the Royal Astronomical Society*.

There were several competing theories as to why the fasting and feasting behaviour happens. One is that the la clumpy wind, and when this wind hits the dense star, it would glow.

The other theory is that the dense star has a high magnetic field and this served as a barrier that would dam the pressure built up and broke the "dam" and the matter carried by the wind would suddenly fall into the compact glow.

Varun Bhalerao's team observed the magnetic field of the dark companion and actually measured it, finding it the damming mechanism to work. "We knew that the key to the puzzle was to measure the neutron star's magn

Dr. Bhalerao's team observed the binary using a space x-ray telescope known as NuStar, a NASA space missic space telescope that can focus on very high energy x-rays.

"NuSTAR is used to study the most extreme environments in the universe, which emit x-rays.

"The x-rays that NuSTAR is sensitive to are similar to the x-rays used in hospitals for diagnoses. Astronomers x-rays'. During my Ph.D at Caltech [California Institute of Technology], I was part of the team that built NuST says.

The actual star-pair they observed, IGR J17544-2619, is an example of such an SGXT. It is a binary located ab years away from the earth. It contains a supergiant star, about 25 times as massive as our Sun, and a compresse about twice as massive as the Sun but compressed to a diameter of just about 30 km. the stars orbit around eacl

The binary shines in x-rays and over a period of months can sporadically become bright or faint. The brightest about one lakh times brighter than the dim state.

The discovery of the mechanism of fasting and feasting process is the breakthrough that many were looking fo given important inputs for further theoretical understanding of these binaries. Says Dr Bhalerao: “This allows u understand how massive stars form, to study how binaries evolve and to calculate details of supernova explosi star is born in the death of a massive star.”

Keywords: Supergiant fast x-ray transients, binary star, black hole, neutron star