

Astrosat Our Foray into Space Observatory

By [Rajkishore](#) | Oct 25, 2018

India's premier space research organization ISRO has [many feathers](#) on its cap since its inception in 1962. Beyond the usual proud suspects for a quiz question maker about the launches of first satellite [Aryabhata 1](#) in 1975, [Chandrayaan](#) in 2008 and [Mars Orbiter](#) in 2013, something very interesting that happened in September 2015 which, I guess, almost missed the science teacher's radar. India launched ASTROSAT, its 1st major space observatory.

What is a space observatory?

Take the example of physicians (including quacks!). They (visually) observe the signs of their patients, diagnose the ailment and treat it accordingly. But eyes have very limited utility. A microscope, an X Ray machine, a CT scan or an MRI machine - they add more to the simple visual observation. These modern 'eyes' are now a prerequisite for precise & accurate diagnosis. They also debunk the quacks in no time. What is true for a physician as far as their tools & means are concerned, the same can be said about astronomers. Night sky watching was a visual past-time from time immemorial. The folklore around stargazing is imaginative and deeply diverse, seeped in local culture. Modern astronomy needed its #breakfree movement. Improvements in the tools of observation (read telescope) ultimately debunked the grand narrative of perfectly shaped 'heavenly' bodies that are earth-centric. What microscope did to biology & medical science, the telescope started the same for astronomy. But then, all the observations done through giant telescopes spread across many places on earth could capture only a glimmer of what is on offer. The universe is much more interesting than the usual stars, planets and human made satellites that we can see through the telescope. The other distant stars, galaxies, supernovae, super galaxies they talk a different electromagnetic spectral language than the usual visible spectrum (the 400nm to 800nm range), what our eyes & even the powerful optical telescopes are accustomed to seeing. They cannot see X rays coming from the galaxies, they cannot detect the UV or IR radiation. What is beneficial for the human kind's survival - the protective ozone layer - is a biggest obstacle for astronomic research. We had the instruments, but the earth's atmosphere was a drawback. That is when the art & technology of launching mini observatories in space came handy. The NASA & ESA let the floodgates open with the launch of Hubble Space Telescope & Chandra X space telescope, thereby revolutionizing the field of multiwavelength astronomy like never before. The era of observatories in space just began.

See the image shared below, courtesy [NASA](#). The same night sky when seen under different wavelengths adds lot more to our understanding of the distant objects that drew an awe in us.

Astrosat was India's moment to join the elite league of space astronomy.

As T V Padma writes in *Nature*:

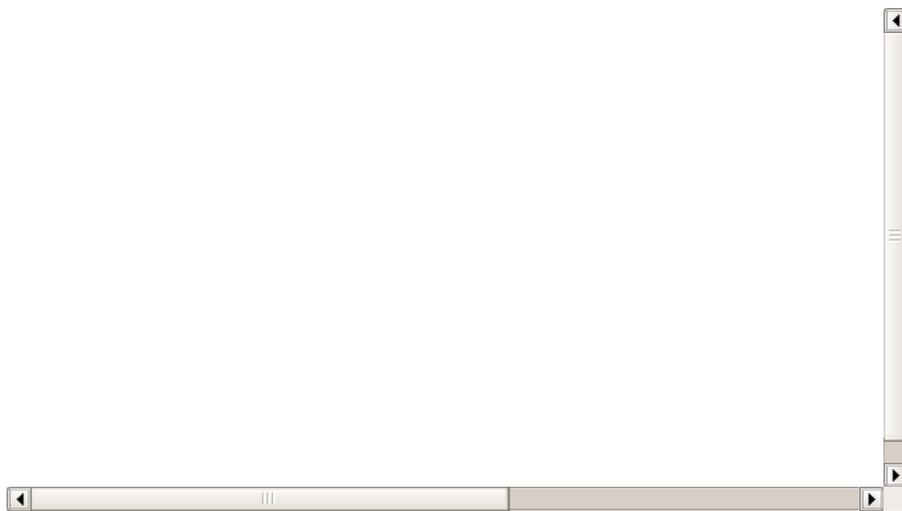
"India has had ground-based telescopes for decades, including the Giant Metrewave Radio Telescope near Pune and the Indian Astronomical Observatory in the Himalayan cold desert of Ladakh. But although these can detect radio waves and infrared radiation, which easily penetrate Earth's atmosphere, they cannot monitor higher frequencies that the atmosphere tends to block — most ultraviolet light, for example, and all X-rays and γ -rays. Without a space telescope of their own, Indian scientists have had to rely on ones operated by NASA and the European Space Agency (ESA) to study such radiation bands, which carry information about exotic neutron stars, newly born or exploding stars and the spiralling hot gases around black holes.

"Often, as we do not know the exact specifics of the telescope design, we are not able to tune our research proposals accordingly," says Varun Bhalerao, an astrophysicist at India's Inter-University Centre for Astronomy and Astrophysics (IUCAA) in Pune.

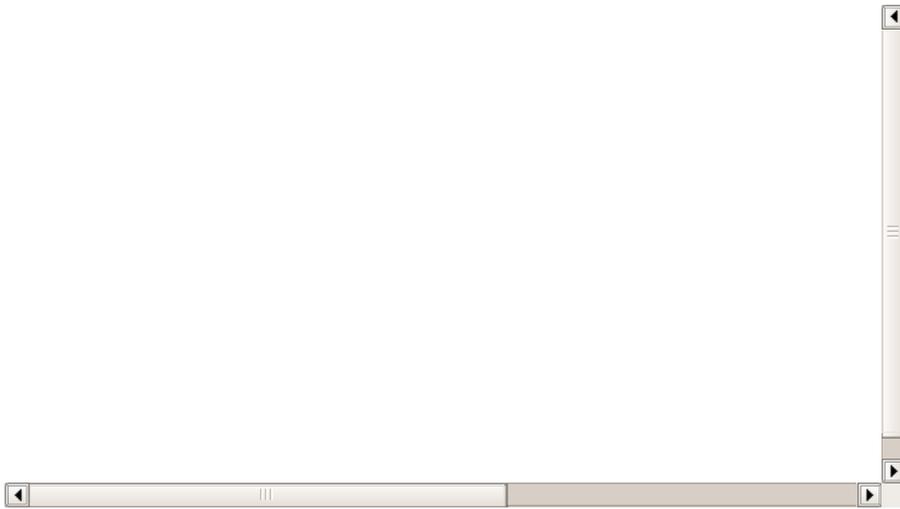
Indian astronomers have long been at a disadvantage for X-ray and ultraviolet studies, says Somak Raychaudhury, who is the director of the IUCAA and has been involved with ASTROSAT since its inception. Orbiting 650 kilometres above Earth, ASTROSAT will collect data on this portion of the light spectrum, giving Indian scientists faster — and guaranteed — access to the information."...

To make telescopes which can withstand thrust of a rocket launch & operate at extreme vacuum at 650km from earth, it indeed was a culmination of decades of expertise & experience. A project that was conceptualized in 1996, ready with report in 2002, got its budget approved in 2004, it was supposed to be launched by 2009. On Science Express, the world's most visited science exhibition train, the author & his fellow communicators were privileged to share the story of Astrosat to the wagon dedicated to astronomy. A miniature model (& the Chandrayaan model) that was on display has always evoked the question from the visitors 'Why study space that too at a cost of 178Cr?'.

[Neil deGrasse Tyson](#), a true heir to Carl Sagan's school of science communication also the director of Hayden Planetarium answers that kind of question so powerfully.



Coming back to the saga of Astrosat, the delay was because of gradual understanding of the kind of payload India wished to put. Here is a primer on it from Arvind Gupta.



Come, let's see stars & galaxies from fresh eyes beyond the usual visible range. Let's expand and explore our vision to stargazing!

Also find two attachments below (one a ISRO booklet with more technical details and the second one for making a paper model of it). Click on it to download.

The author wishes to thank Amol Kate, then a Science Educator at Vikram A Sarabhai Community Science Centre for stoking the curiosity in stargazing.

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