Satellites: A Boom or a Boon for Future Space Enthusiasts?

“Somewhere, something incredible is waiting to be known.” This brilliant quote by Carl Sagan is the heart of space exploration, the search for the unknown is what drives the passion of thousands of humans who look up at the night sky and wonder.

Although studies from earth using optical and radio telescopes had accumulated much data on the nature of celestial bodies, it was not until after World War II that the development of powerful rockets made direct space exploration a technological possibility. The first artificial satellite, *Sputnik I,* was launched by the USSR October 4,1957. This launch inspired the use of Artificial Satellites for things political, military, technological, and scientific. The launch of Sputnik I also began what was called the "space race" between the United States and the Soviet Union in addition to the beginning of space exploration.

Today, thousands of artificial satellites orbit Earth. Satellites are launched into space to do a specific job. The type of satellite that is launched to monitor cloud patterns for a weather station will be different from a satellite launched to send television signals for Sky TV. The satellite has to be designed specifically to fulfil its function. Astronomical satellites have been an amazing source of clear, precise and wonderful data, peering deeper into the universe than our ground based telescopes can.

Placing telescopes in space inside of satellites offers three distinct advantages: It opens up spectral regions that cannot be observed from the ground. The Earth's atmosphere is opaque at most wavelengths across the electromagnetic spectrum, like large tracts of ultraviolet, x-ray, gamma ray, and millimeter waves.

It offers an environment where the optical and infrared noise is very low. The Earth and its atmosphere are at a temperature of about 300 Kelvin and

emit thermal radiation in the infrared band. All astronomical sources are therefore seen against a bright background of thermal infrared radiation. The background is a million times darker in space.

It also allows telescopes to operate outside the blurring effects of the Earth's atmosphere, where in principle they can achieve their resolution limit. They provide ultra-sharp optical images.

While the bulk of space exploration initially was directed at the earth-moon system, the focus gradually shifted to other members of the solar system. Today most space exploration is done by unmanned space probes. Space probes are not really satellites, but are similar to orbiting satellites in design and function.

On their journeys, space probes send back detailed pictures and other data of faraway planets and other stellar phenomena. Space exploration satellites are responsible for many of astronomy's most important achievements. Jupiter's rings, for example, were discovered by a space exploration satellite.

Space exploration satellites must be built to last because it takes so long for the satellites to reach their destinations, and they are different from astronomy satellites because they do not operate from Earth orbit; they are actually sent out into deep space on their own. Moreover, they have a lower cost than manned space missions and they can go where astronauts cannot. These include missions that get close enough to the sun to where heat and radiation levels would kill a human.

All of these technological advancements have been a major boon for astronomers, providing them with essential data which has been imperative for the progress in space exploration and for yielding a greater insight into the mysteries of our universe.

However, as space companies continue to inject tens of thousands of new satellites into low orbits around Earth, the new additions could fundamentally transform astronomical observations of the night sky and the universe. In the future, as astronomers make observations of the night sky, they might see more and more satellites pass overhead that ruin their work — and this problem is likely to get a lot worse.

Numerous companies such as SpaceX, Amazon, OneWeb, and more have proposed launching thousands of satellites into medium to low orbits above Earth in order to provide broadband internet access to the ground below. But if upward of 100,000 satellites are added to Earth orbit, as many companies have proposed, there's no way to completely erase their effects.

Whenever bright satellites pass over an observatory, they can leave white streaks across an image, ruining planned observations of the cosmos. Plus, the satellites that SpaceX have been putting up already have been particularly bright because of their altitudes in the sky and how they're designed. For instance, their antennae are particularly shiny and effective at reflecting light from the sky, even at night.

Astronomers are good at coping with satellites – as they are with all manner of things. It's a noisy cosmos and we're a noisy planet. However, astronomers believe something has changed recently, when large numbers of satellites began launching and began being visible in our nighttime sky. Studies have tried to quantify just how afraid astronomers must be, and the new report written by a group of astronomers who convened this summer for the first Satellite Constellations 1 workshop, has been put together to figure that out.

It has been advised that both satellite operators and astronomers should work together to organize an observational campaign of all these satellites to really determine just how much they'll impact astronomy. As satellite operators tweak their vehicles, astronomers will need to measure these updates to see if they're actually working. Plus, the more observations of these satellites, the better astronomers can predict where they'll be and how they'll affect an

image. It is believed though, by many astronomers, that this is a long term precedent, and is only going to accelerate. There is an urgency to find a better alternative.

It cannot be determined as of now, whether satellites are a boom or a boon for future space enthusiasts. However, there is an upside. New astronomy has in common is the creation of enormous data sets, which are devoured not just by career stargazers but by an army of citizen scientists. Better access to the data, especially in parts of the world where the internet has yet to mature, will mean more discoveries by more people.

Astronomy is in a golden age; we've got spacecrafts in every corner of the Solar System and a couple outside, robots roaming Mars, and space observatories creating billion-star catalogues. We're snooping in every corner of the electromagnetic spectrum plus cosmic rays, neutrinos and gravitational waves. There is more enthusiasm – the one truly indispensable driver for space science.

One of the principle reasons we must continue is that we're explorers. That's why humans number in the billions — from our earliest upright steps, we've endeavored to learn more about the world around us, and this allowed us to build civilization. Exploring space is an opportunity not only to discover new worlds and build advanced technologies, but to work together toward a larger goal irrespective of nationality, race, or gender. If we stop exploring, we stop being human.

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