A GLIMPSE OF THE UNIVERSE

TELESCOPES

By Daniela González

The telescope is an instrument used more than 400 years ago to observe objects in the Universe.

Conventional telescopes are built with lenses and mirrors, making it possible to magnify images of distant objects. But, like our eyes, they can only capture a small fraction of the light that reaches us from the Universe.

The scientific community developed telescopes that capture different wavelengths of light or electromagnetic radiation, allowing humans to reveal great discoveries about the Cosmos.

Radio  Microwaves  Infrared  Visible  Ultra Violet  X Rays  Gamma Rays

Long wavelengths (lower energy)  Short wavelengths (higher energy)

Human beings can only see a small part of the light that exists.

If we didn’t study all the frequencies or wavelengths of light - known as the electromagnetic spectrum - it would be impossible today to know what a black hole, a supernova, and other objects are.

These different telescopes allow us to study the mass, temperature and chemical composition, among others, of distant objects. And, more importantly, whether nearby planets are habitable or could harbor life.

LONG WAVELENGTHS

Telescopes that capture long wavelengths, the least energetic part of the electromagnetic spectrum, are mostly ground-based and have dish or parabola-shaped antennas. They can capture the coolest and faintest processes and objects in the Universe, such as the gas and dust of star-forming nebulae, the remnants of supernovae, and much more.

Examples: Atacama Large Millimeter/submillimeter Array (ALMA), Atacama Cosmology Telescope (ACT), South African Large Telescope (SALT).

SHORT WAVELENGTHS

These waves are dangerous for life on Earth, but luckily, our atmosphere protects us from them. To be able to detect high-energy emissions from objects and processes such as galactic nuclei, black holes, and distant nebulae, it is necessary to observe them from space.

Examples: Chandra X-ray Observatory, Compton Gamma-Ray Observatory (CGRO).

SUPER EYE

Telescopes like ALMA enable capturing astronomical data through extremely faint signals in the Universe and generating images. The higher their sensitivity and resolution, the better data they obtain from their observations.

COMPLEMENTARY

Both ground-based and space-based telescopes - with low and high energy radiation - need to complement and share information with each other. This allows astronomers to analyze the complete electromagnetic spectrum of studied astronomical objects.