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BEYOND EARTH

ASTRONAUTS AT WORK ON THE HUBBLE SPACE TELESCOPE

In December 1999, the Earth-orbiting Hubble Space Telescope was fitted with new gyroscopes, a new computer, and many other parts and instruments during a Space Shuttle Servicing Mission. Our home planet serves as a stunning backdrop for this wide-angle photo, which shows astronauts Steven Smith and John Grunsfeld at the tip of the Shuttle's robotic arm.

There's no better place for a telescope than space itself. Above the Earth's atmosphere observations are no longer hampered by air turbulence, so telescopic images of distant stars and galaxies are razor-sharp. Unlike a ground-based telescope, an instrument in Earth orbit can operate twenty-four hours a day and reach every part of the sky. Observing from space also makes it possible to study types of radiation that are otherwise absorbed by the atmosphere. Little wonder that the Hubble Space Telescope has made so many contributions to astronomy. And Hubble is not alone — more than 100 space observatories have been launched since the 1960s.

“Hubble has revolutionised every single field in astronomy”

YOUNG STARS SCULPT GAS WITH POWERFUL OUTFLOWS

From high above the Earth's atmosphere, the Hubble Space Telescope has provided astronomers with razor-sharp images of the Universe. Here, energetic radiation from a young cluster of stars eats into its dusty surroundings, creating dramatic structures of arched, ragged filaments. This star-forming region is located 210 000 light-years away in the Small Magellanic Cloud, a satellite galaxy of our Milky Way.

The NASA/ESA Hubble Space Telescope is by far the most famous telescope in history. For good reason. It has revolutionised every field in astronomy. Hubble's mirror is small by current standards: only 2.4 metres across. But its location is — literally — out of this world. High above the blurring effects of the atmosphere, Hubble has the best possible view of the Universe. What's more: Hubble sees near-infrared and ultraviolet radiation that doesn't reach the ground. Cameras and spectrographs, some as large as a telephone booth, dissect and register the light from distant cosmic havens.

Like a telescope on the ground, Hubble can be upgraded. It was launched in April 1990 into a relatively low Earth orbit where it could easily be visited by NASA's Space Shuttle. Since then spacewalking astronauts have carried out Servicing Missions every few years. Broken parts have been fixed or replaced and older instruments have made way for new, state-of-the-art detectors. Hubble has become the workhorse of observational astronomy and has transformed our understanding of the cosmos.

Hubble has observed seasonal changes on Mars and a Saturn ring plane crossing, but the most spectacular event witnessed by the telescope was the impact of a comet on Jupiter in July 1994. The twenty fragments of comet Shoemaker-Levy 9 plunged into the atmosphere of the giant planet, producing huge fireballs and leaving giant dark markings that could easily be seen with an amateur telescope.

Looking beyond the Solar System, Hubble has followed the life cycle of stars from their birth and infancy in dust-laden clouds of gas to their final farewells as delicate planetary nebulae, slowly blown into space by dying stars or titanic supernova explosions that almost outshine their home galaxy. The famous “Pillars of Creation” in the Eagle Nebula have been shown to be the sites of future star formation. Deep in the Orion Nebula, Hubble has seen a breeding ground for new solar systems: dusty discs around newborn stars that may soon condense into planets.

