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<p>ESOCast Episode 75: ESO Top 10 Astronomical Discoveries</p>	
<p>00:00 ESOCast intro 1. This is the ESOCast! Cutting-edge science and life behind the scenes of ESO, the European Southern Observatory.</p>	<p>00:00 ESOCast introduction</p>
<p>00:30 [Visuals start] 2. ESO operates three world-class observatories in Chile.</p> <p>Astronomers use these telescopes to study objects both close to home, in the Solar System, and all the way out to the furthest reaches of the known Universe.</p> <p>Observations with ESO telescopes have led to many breakthroughs in astronomy, and, over the years, have been responsible for some truly remarkable findings.</p> <p>Here is our list of ESO's Top 10 astronomical discoveries so far.</p>	<p>00:00 [Visuals start] Timelapses taken at ESO's facilities in Chile</p>
<p>01:15 [Narrator] 3. Astronomers using ESO's Very Large Telescope have discovered by far the brightest galaxy yet found in the early Universe and found strong evidence that examples of the first generation of stars lurk within it — stars that were previously only theoretical.</p> <p>These massive, brilliant objects were the creators of the first heavy elements in history — elements that are necessary to forge the</p>	<p>Text overlay: 10 (large)</p> <p>Best observational evidence of first generation stars in the Universe</p>

<p>stars we see around us today, the planets that orbit them, and life as we know it.</p>	
<p>02:00 [Narrator] 4. ESO telescopes have provided definitive proof that long gamma-ray bursts are linked with the climactic explosions of massive stars, therefore solving an enduring mystery.</p> <p>A telescope at La Silla was also able to observe the visible light from a short gamma-ray burst for the first time, showing that this family of objects most likely originates from colliding neutron stars.</p>	<p>Text overlay: 9</p> <p>Gamma-ray bursts – the connections with supernovae and merging neutron stars</p>
<p>02:37 [Narrator] 5. Astronomers using ESO’s HARPS instrument in 2010 discovered a planetary system containing at least five planets, orbiting the Sun-like star HD 10180. They also found evidence that two other planets may be present, one of which, if confirmed, would be among the lowest-mass exoplanets ever found.</p> <p>Newer observations and re-analysis of the data suggest that there could be even more planets around this star.</p>	<p>Text overlay: 8</p> <p>Richest planetary system</p>
<p>03:18 [Narrator] 6. ESO’s Very Large Telescope was used to detect carbon monoxide molecules in a remote galaxy, seen as it was 11 billion years ago, a feat that had remained elusive for 25 years.</p> <p>This allowed astronomers to obtain the most precise measurement of the cosmic temperature at such a remote epoch, and it matched the temperature predicted by the Big Bang theory.</p>	<p>Text overlay: 7</p> <p>Cosmic temperature independently measured</p>

<p>03:55 [Narrator] 7. The atmosphere around a super-Earth exoplanet was analysed for the first time using the VLT. The planet, which is known as GJ 1214b, was studied as it passed in front of its parent star and some of the starlight filtered through the planet's atmosphere.</p> <p>The atmosphere was found to be either mostly water, in the form of steam, or dominated by thick clouds or haze.</p>	<p>Text overlay: 6</p> <p>Direct measurements of the spectra of exoplanets and their atmospheres</p>
<p>04:32 [Narrator] 8. Using ESO's VLT, astronomers measured the age of the oldest star known in the Milky Way. At 13.2 billion years old, the star was born in the earliest era of star formation in the Universe.</p> <p>Uranium was also detected in a Milky Way star and used as an independent estimate of the age of the galaxy.</p>	<p>Text overlay: 5</p> <p>Oldest star known in the Milky Way</p>
<p>05:06 [Narrator] 9. The VLT obtained the first ever image of a planet outside our Solar System. The planet, which has a mass about five times that of Jupiter, orbits a failed star — a brown dwarf — at a distance of 55 times the average distance between the Earth and the Sun.</p>	<p>Text overlay: 4</p> <p>First image of an exoplanet</p>
<p>05:35 [Narrator] 10. In 2014, ALMA, the Atacama Large Millimeter/submillimeter Array, revealed remarkable details of a solar system that is forming. The images of HL Tauri were the sharpest ever made at submillimetre wavelengths. They show how forming planets are vacuuming up dust and gas in a protoplanetary disc.</p>	<p>Text overlay: 3</p> <p>Revolutionary ALMA image reveals planetary genesis</p>

<p>06:13 [Narrator] 11. One of ESO's proudest moments came when two independent research teams, including ESO staff, arrived at a truly revolutionary finding: that the cosmos is not only expanding, but that it is doing so at an increasing rate.</p> <p>The findings of the separate teams were based on observations of exploding stars, or supernovae, including measurements made from ESO's telescopes at La Silla and Paranal. This discovery was rewarded with the 2011 Nobel Prize in Physics.</p>	<p>Text overlay: 2</p> <p>The Accelerating Universe</p>
<p>06:57 [Narrator] 12. And finally... Several of ESO's flagship telescopes were used in a 20-year study to obtain the most detailed view ever of the surroundings of the monster lurking at the heart of our galaxy — a supermassive black hole.</p>	<p>Text overlay: 1</p> <p>Stars orbiting the Milky Way black hole</p>
<p>07:19 [Narrator] 13. Astronomy is always moving forwards, and ESO's top ten scientific discoveries are not set in stone.</p> <p>As long as astronomers continue to study the Universe at ESO's observatories, unexpected and illuminating discoveries will follow. Who knows what exciting discoveries await and will find their way onto this list in the future!</p>	<p>Text overlay: Timelapses taken at ESO's facilities in Chile</p>
<p>07:47 [Outro]</p>	<p>ESOcass is produced by ESO, the European Southern Observatory.</p> <p><i>ESO builds and operates a suite of the world's most advanced ground-based astronomical telescopes.</i></p>