

# ESO Top 10 Astronomical Discoveries

**1. Stars orbiting the Milky Way's central black hole**

Several of ESO's flagship telescopes were used in a long-term 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.

**2. Accelerating Universe**

Two independent research teams, working with observations of exploding stars, including observations from ESO's telescopes at La Silla and Paranal, have shown that the expansion of the Universe is accelerating. The 2011 Nobel Prize in Physics was awarded for this result.

**3. Revolutionary ALMA image reveals planetary genesis**

In 2014, ALMA 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.

**4. First image of an exoplanet**

The VLT has obtained the first-ever image of a planet outside the Solar System. The five-Jupiter-mass planet orbits a failed star — a brown dwarf — at a distance of 55 times the mean Earth–Sun distance.

**5. Oldest star known in the Milky Way**

Using ESO's VLT, astronomers have 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. Uranium has also been detected in a Milky Way star and used as an independent estimate of the age of the galaxy.

**6. Direct measurements of the spectra of exoplanets and their atmospheres**

The atmosphere around a super-Earth exoplanet, GJ 1214b, has been analysed for the first time using the VLT. As the planet passed in front of the parent star some of the starlight was filtered through the planet's atmosphere, leaving a telltale imprint on the light that reached Earth. The exoplanet's atmosphere is either mostly water in the form of steam or is dominated by thick clouds or haze.

**7. Cosmic temperature independently measured**

The VLT has detected carbon monoxide molecules in a galaxy located almost 11 billion light-years away, allowing astronomers to obtain the most precise measurement of the cosmic temperature at such a remote epoch.

**8. Richest planetary system**

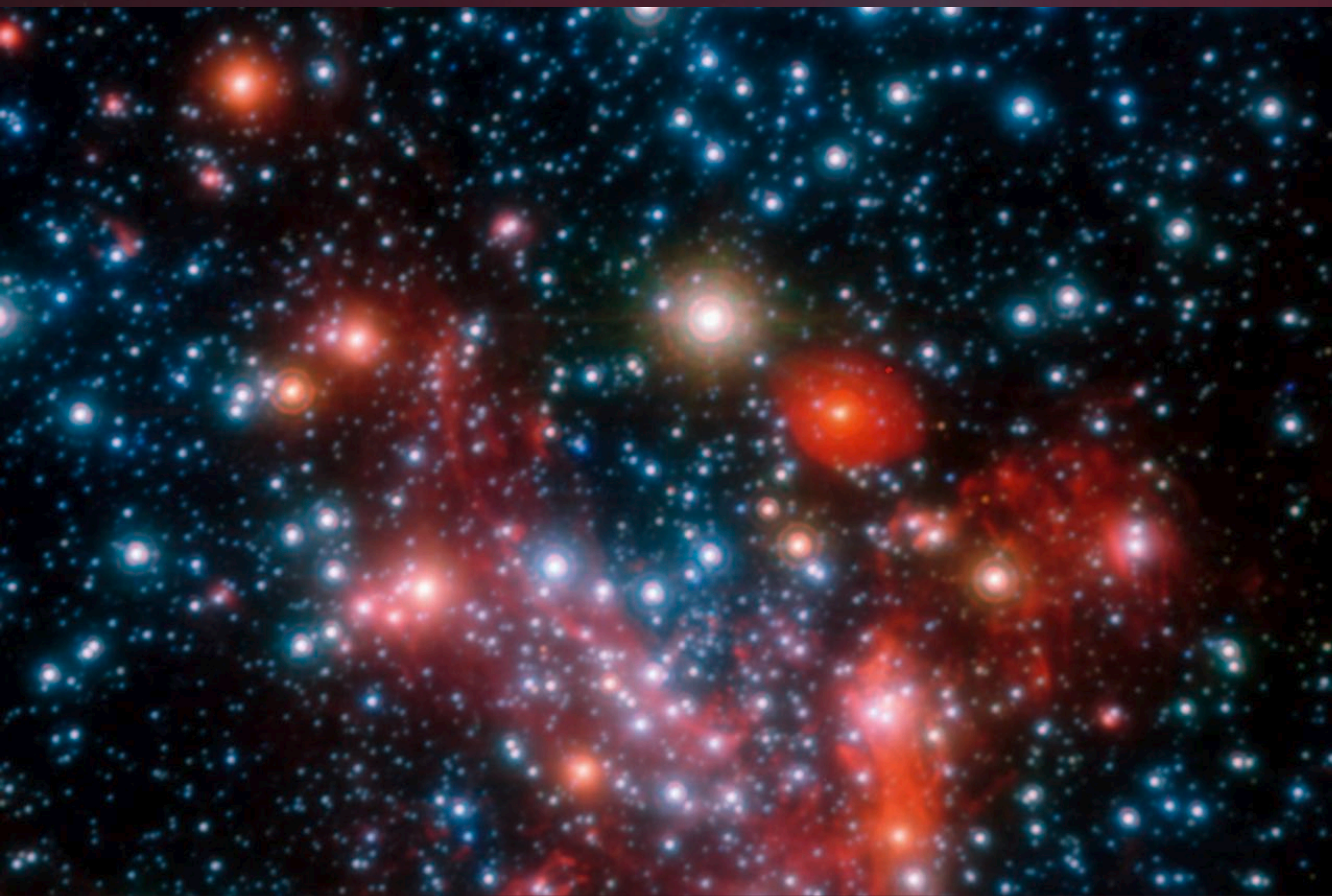
Astronomers using ESO's HARPS planet hunter have discovered a planetary system containing at least five planets, orbiting the Sun-like star HD 10180. Also, there is evidence that two other planets may be present, one of which would have the lowest mass ever found.

**9. Linking gamma-ray bursts with supernovae and merging neutron stars**

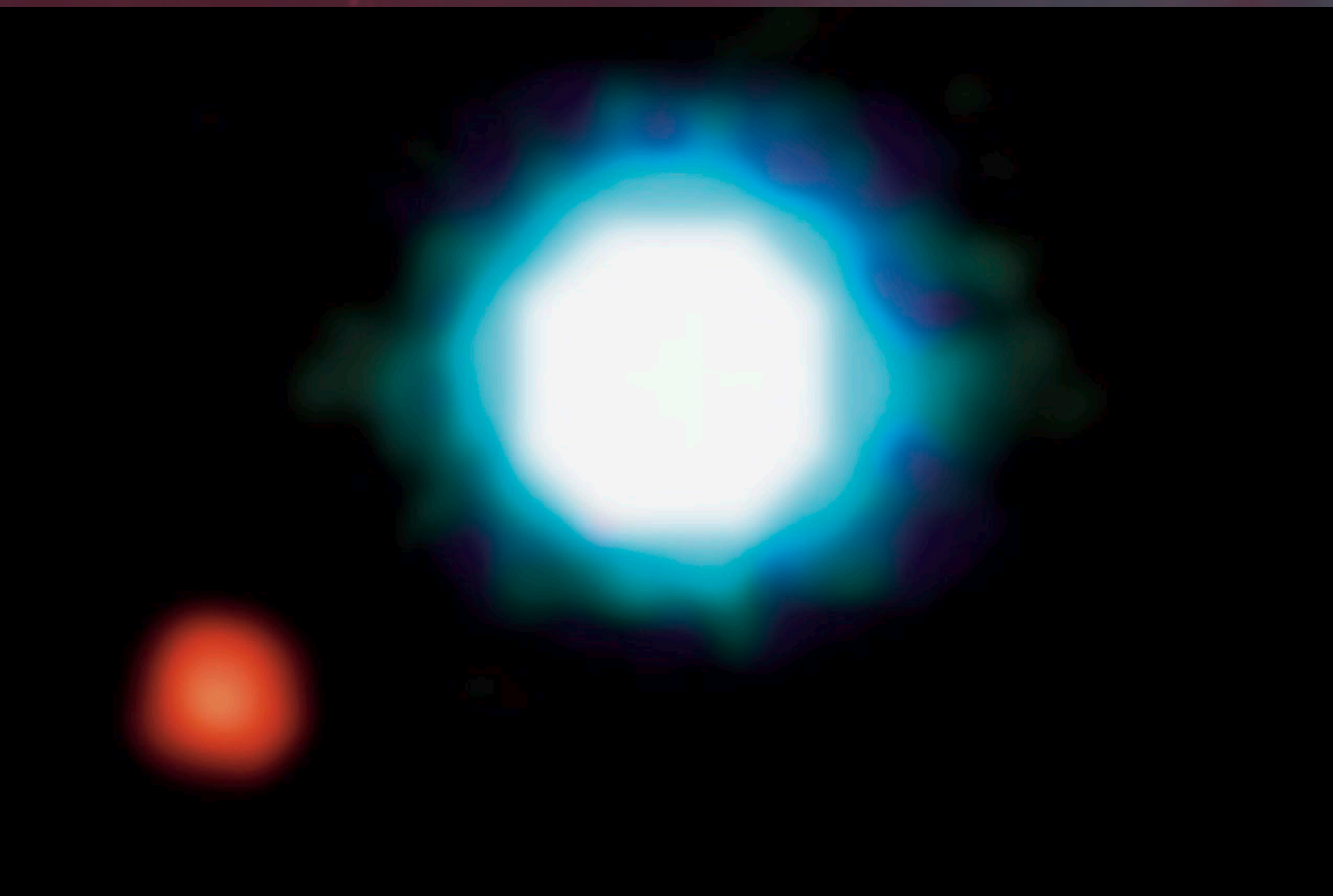
ESO telescopes have provided definitive proof that long gamma-ray bursts are linked with the ultimate explosion of massive stars, solving a long-time puzzle. Also, for the first time, observations from a telescope at La Silla have shown that short gamma-ray bursts most likely originate from the violent collisions of two merging neutron stars.

**10. Best observational evidence of first generation stars in the Universe**

Astronomers using ESO's VLT have discovered by far the brightest galaxy yet found in the early Universe and strong evidence that examples of the first generation of stars lurk within it — stars that were previously only a theoretical prediction. These massive, brilliant objects were the creators of the first heavy elements, which are necessary to forge the stars and the planets we see today, and ultimately life as we know it.



The central parts of our galaxy, the Milky Way, as observed in the near-infrared with the NACO instrument on ESO's Very Large Telescope. Credit: ESO/S. Gillessen et al.



First image of an exoplanet.



[www.eso.org](http://www.eso.org)