

The Very Large Telescope —
The World's Most Advanced Visible-light Astronomical Observatory



European Southern Observatory

The Very Large Telescope — The World's Most Advanced Visible-light Astronomical Observatory

The Very Large Telescope array (VLT) is the flagship facility for European visible-light astronomy. It is the world's most advanced optical instrument, consisting of four Unit Telescopes with main mirrors 8.2 metres in diameter and four movable 1.8-metre Auxiliary Telescopes. The VLT is sited on Cerro Paranal in northern Chile at an altitude of 2635 metres.

The telescopes can work together to form the giant VLT Interferometer (VLTI), allowing astronomers to see details up to 25 times finer than with the individual telescopes. The light beams are combined in the VLTI using a complex system of mirrors in underground tunnels where the light paths must be kept equal to distances of less than one thousandth of a millimetre over a hundred metres. With this kind of precision the VLTI can reconstruct images with an angular resolution of milliarcseconds, equivalent to distinguishing the two headlights of a car at the distance of the Moon.

The 8.2-metre Unit Telescopes can also be used individually to obtain images of celestial objects in one-hour exposures that are four billion times fainter than those visible to the naked eye.

The VLT instrumentation programme is the most ambitious ever conceived for a single observatory. It includes wide-field imagers, adaptive-optics-corrected cameras and spectrographs, as well as high resolution and multi-object spectrographs and covers a broad spectral region, from ultraviolet (300 nm) to mid-infrared (20 μm) wavelengths. The 8.2-metre telescopes are housed in compact, thermally controlled buildings, which rotate synchronously with the telescopes. This design minimises any adverse effects on the observing conditions, for instance, from air turbulence in the telescope tube, which might otherwise occur due to variations in temperature and wind flow. The first of the Unit Telescopes, Antu, began routine scientific operations on 1 April 1999. Today, all four Unit Telescopes and all four Auxiliary Telescopes are operational.

The VLT has made a major impact on observational astronomy. It is the most productive individual ground-based facility, and results from the VLT have led to the publication of an average of more than one peer-reviewed scientific paper per day. The VLT contributes greatly to making ESO the most productive ground-based observatory in the world. The VLT has stimulated a new age of discoveries, with several notable scientific firsts,

including the first image of an exoplanet, tracking individual stars moving around the supermassive black hole at the centre of the Milky Way, and observing the afterglow of the furthest known gamma-ray burst.

Although the four 8.2-metre Unit Telescopes can be combined in the VLTI, they are mostly used for individual observations and are only available for interferometric observations for a limited number of nights every year. But the four smaller, dedicated Auxiliary Telescopes (ATs) are available to allow the VLTI to operate every night. The ATs are mounted on tracks and can be moved between precisely defined observing positions from where the beams of collected light are combined in the VLTI.

The ATs are very unusual telescopes, as they are self-contained in their ultra-compact protective domes, and travel with their own electronics, ventilation, hydraulics and cooling systems. Each AT has a transporter that lifts the telescope and moves it from one position to the other.

The VLT hotel, the Residencia, is an award-winning building, and served as a backdrop for part of the James Bond movie *Quantum of Solace*.



Credit: ESO/B. Tafreshi (twanight.org)

This panoramic photograph captures the ESO Very Large Telescope (VLT) against a beautiful twilight on Cerro Paranal. The enclosures of the VLT stand out in the picture as the telescopes in them are readied for a night of studying the Universe. The VLT is the world's most powerful advanced optical telescope, consisting of four Unit Telescopes with primary mirrors 8.2 metres in diameter and four movable 1.8-metre Auxiliary Telescopes, which can be seen in the left corner of the image.

About ESO

ESO, the European Southern Observatory, is the foremost intergovernmental astronomy organisation in Europe. It is supported by 16 countries: Austria, Belgium, Brazil, the Czech Republic, Denmark, France, Finland, Germany, Italy, the Netherlands, Poland, Portugal, Spain, Sweden, Switzerland and the United Kingdom, along with the host country of Chile.

ESO carries out an ambitious programme focused on the design, construction and operation of powerful ground-based observing facilities enabling astronomers to make important scientific discoveries. ESO plays also a leading role in promoting and organising cooperation in astronomical research. ESO operates facilities at three unique world-class observing sites in the Atacama Desert region of Chile: La Silla, Paranal and Chajnantor.

ESO
education and Public Outreach Department
Karl-Schwarzschild-Straße 2
85748 Garching bei München
Germany

Tel. +49 89 320 060
Fax +49 89 320 2362
E-mail information@eso.org
www.eso.org

