

The European Southern Observatory — Reaching New Heights in Astronomy



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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. Several other countries have expressed an interest in membership.

Created in 1962, 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 also plays a leading role in promoting and organising cooperation in astronomical research.

ESO operates facilities at three world-class observing sites in the Atacama Desert region of Chile: La Silla, Paranal and Chajnantor. ESO's first site is at La Silla, a mountain 2400 metres high and 600 kilometres north of Santiago de Chile. It is equipped with optical telescopes with mirror diameters of up to 3.6 metres.

The 3.5-metre New Technology Telescope broke new ground for telescope engineering and design and was the first in the world to have a computer-controlled main mirror, a technology developed at ESO and now applied to most of the world's current large telescopes. La Silla remains at the forefront of astronomy and is still the second-most scientifically productive observatory in ground-based astronomy.

The Paranal Observatory, located at 2600 metres above sea level, is the flagship facility of European visible-light astronomy. It is the site of the Very Large Telescope array (VLT) as well as the VISTA and VST survey telescopes. Paranal is situated about 130 kilometres south of Antofagasta in Chile, 12 kilometres inland from the Pacific coast in one of the driest

areas in the world. Scientific operations for the VLT began in 1999 and have resulted in many extremely successful research programmes.

The VLT is not just one, but an array of four telescopes, each with a main mirror of 8.2 metres in diameter. With one such telescope, images of celestial objects four billion times fainter than those seen with the naked eye have been obtained.

One unique feature of the VLT is the option to use it as a giant optical interferometer (VLT Interferometer or VLTI). This is done by combining the light from multiple telescopes: up to four of the 8.2-metre telescopes, or up to four 1.8-metre movable Auxiliary Telescopes. In this interferometric mode, the telescope has vision as sharp as that of a telescope the size of the separation between the most distant mirrors. For the VLTI, this can be up to 200 metres.

Each year, about 1800 proposals are made for the use of ESO telescopes, requesting between three and six times more nights than are available. ESO is the most productive ground-based observatory in the world and each year more than 800 peer-reviewed publications based on data from ESO telescopes are published.

The Atacama Large Millimeter/submillimeter Array (ALMA), the largest astronomy project in existence, is a revolutionary facility for world astronomy. ALMA comprises an array of 66 giant 12-metre and 7-metre diameter antennas observing at millimetre and submillimetre wavelengths. ALMA was inaugurated in 2013, although early scientific observations started in 2011. ALMA is located on the high-altitude Llano de Chajnantor, at 5000 metres above sea level — one of the highest astronomical observatories in the world. The ALMA project is a partnership between Europe, East Asia and North America, in cooperation with the Republic of Chile.

ESO is a partner in ALMA, representing its Member States.

The Chajnantor site is also home to the 12-metre APEX millimetre and submillimetre telescope, operated by ESO on behalf of the Max Planck Institute for Radio Astronomy, the Onsala Space Observatory, and ESO itself.

The next step beyond the VLT is to build the European Extremely Large Telescope (E-ELT), with a primary mirror 39 metres in diameter. The E-ELT will be "the world's biggest eye on the sky" — the largest optical/near-infrared telescope in the world. ESO has drawn up detailed construction plans together with the community. The E-ELT will address many of the most pressing unsolved questions in astronomy. It may, eventually, revolutionise our perception of the Universe, much as Galileo's telescope did, 400 years ago.

Green light for construction of the E-ELT was given in late 2014 and first light is planned for 2024.



A bird's-eye view of ESO Headquarters.

About ESO

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