

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 14 countries: Austria, Belgium, the Czech Republic, Denmark, France, Finland, Germany, Italy, the Netherlands, Portugal, Spain, Sweden, Switzerland and the United Kingdom. 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 three unique 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 2400 m high mountain 600 km north of Santiago de Chile. It is equipped with several 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. While La Silla remains at the forefront of astronomy, and is still the second most scientifically productive in ground-based astronomy, the 2600 m high Paranal site, with the Very Large Telescope array (VLT) and VISTA, the world's largest survey telescope, is the flagship facility of European astronomy. Paranal is situated about 130 km south of Antofagasta in Chile, 12 km inland from the Pacific coast in one of the driest areas in the world. Scientific operations began in

1999 and have resulted in many extremely successful research programmes.

The VLT is a most unusual telescope, based on the latest technology. It 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 as faint as magnitude 30 have been obtained in a one-hour exposure. This corresponds to seeing objects that are four billion times fainter than those seen with the naked eye.

One of the most exciting features 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 several of the telescopes, including one or more of four 1.8-metre moveable Auxiliary Telescopes. In this interferometric mode, the telescope has a vision as sharp as that of a telescope the size of the separation between the most distant mirrors. For the VLTI, this is 200 metres.

Each year, about 2000 proposals are made for the use of ESO telescopes, requesting between four and six times more nights than are available. ESO is the most productive ground-based observatory in the world, which annually results in many peer-reviewed publications: in 2009 alone, almost 700 refereed papers based on ESO data were published.

The Atacama Large Millimeter/submillimeter Array (ALMA), the largest ground-based astronomy project in existence, is a revolutionary facility for world astronomy. ALMA will comprise an array of 66 giant 12-metre and 7-metre diameter antennas observing at millimetre and submillimetre wavelengths. Construction of ALMA started in 2003 and it will start scientific observations in 2011. ALMA is located

on the high altitude Llano de Chajnantor, at 5000 m elevation – 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 the European partner in ALMA.

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 optical/infrared Telescope (E-ELT) with a primary mirror 42 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 and ESO is drawing 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. The final go-ahead for construction is expected in 2010, with the start of operations planned for 2018.



ESO Headquarters in Garching

About ESO

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