

The European Extremely Large Telescope — The World's Biggest Eye on the Sky



European Southern Observatory

Artist's impression of the European Extremely Large Telescope (E-ELT).

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Extremely Large Telescopes are considered worldwide as one of the highest priorities in ground-based astronomy. They will vastly advance astrophysical knowledge, opening the way for detailed studies of the hottest topics in astronomy.

Since the end of 2005, ESO and its user community of European astronomers and astrophysicists have been collaborating to define the giant new telescope needed by the middle of the next decade. A large number of astronomers from all European countries have been involved since 2006, helping the ESO Project Offices to produce a novel concept, in which performance, cost, schedule and risk were carefully evaluated.

Dubbed E-ELT for European Extremely Large Telescope, this revolutionary new ground-based telescope will have a 39-metre main mirror and will be the largest optical/near-infrared telescope anywhere: “the world’s biggest eye on the sky”.

With the start of operations planned for early next decade, the E-ELT will tackle some of the biggest scientific challenges of our time, and aim for a number of notable firsts, including studying Earth-like

planets around other stars in the “habitable zones” where life could exist — one of the holy grails of modern observational astronomy. It will also perform “stellar archaeology” in nearby galaxies, as well as make fundamental contributions to cosmology by measuring the properties of the first stars and galaxies and probing the nature of dark matter and dark energy. Astronomers are also planning for the unexpected — the new and unforeseeable questions that will surely arise from the discoveries made with the E-ELT. The E-ELT may, eventually, revolutionise our perception of the Universe as much as Galileo’s telescope did, 400 years ago.

The telescope’s “eye” will be almost half the length of a soccer pitch in diameter and will gather 13 times more light than the largest optical telescopes operating today. The telescope has an innovative five-mirror design that includes advanced adaptive optics to correct for the turbulent atmosphere, providing images 16 times sharper than those from the Hubble Space Telescope. The main mirror will be made from 798 hexagonal segments.

The telescope will have several science instruments and it will be possible to switch from one instrument to another

within minutes. The telescope and dome will also be able to change positions on the sky and start a new observation in a very short time.

Finding a home for this telescope was a priority for ESO. One of several possible sites worldwide, Cerro Armazones, 20 kilometres from Paranal, was selected as the future home of the E-ELT. This site was found to have the best overall sky quality and can be operated together with Paranal. Cerro Armazones and Paranal have over 320 clear nights per year.

The E-ELT is widely supported in the European scientific community. This venture was the only optical astronomy project selected in the roadmap of the European Strategy Forum on Research Infrastructures. It also features very prominently in the ASTRONET European Infrastructure Roadmap for Astronomy.

The European leadership of this major flagship project will indisputably raise the European scientific, technological and industrial profile and provide numerous possibilities for technology spin-off and transfer.

www.eso.org/e-elt



Artist's illustration comparing the size of the E-ELT with the Very Large Telescope and the Arc de Triomphe.

About ESO

ESO, the European Southern Observatory, is the foremost intergovernmental astronomy organisation in Europe. It is supported by 15 countries: Austria, Belgium, Brazil*, the Czech Republic, Denmark, France, Finland, Germany, Italy, the Netherlands, Portugal, Spain, Sweden, Switzerland and the United Kingdom.



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.

* Brazil is in the process of ratifying its membership in the Brazilian parliament.

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