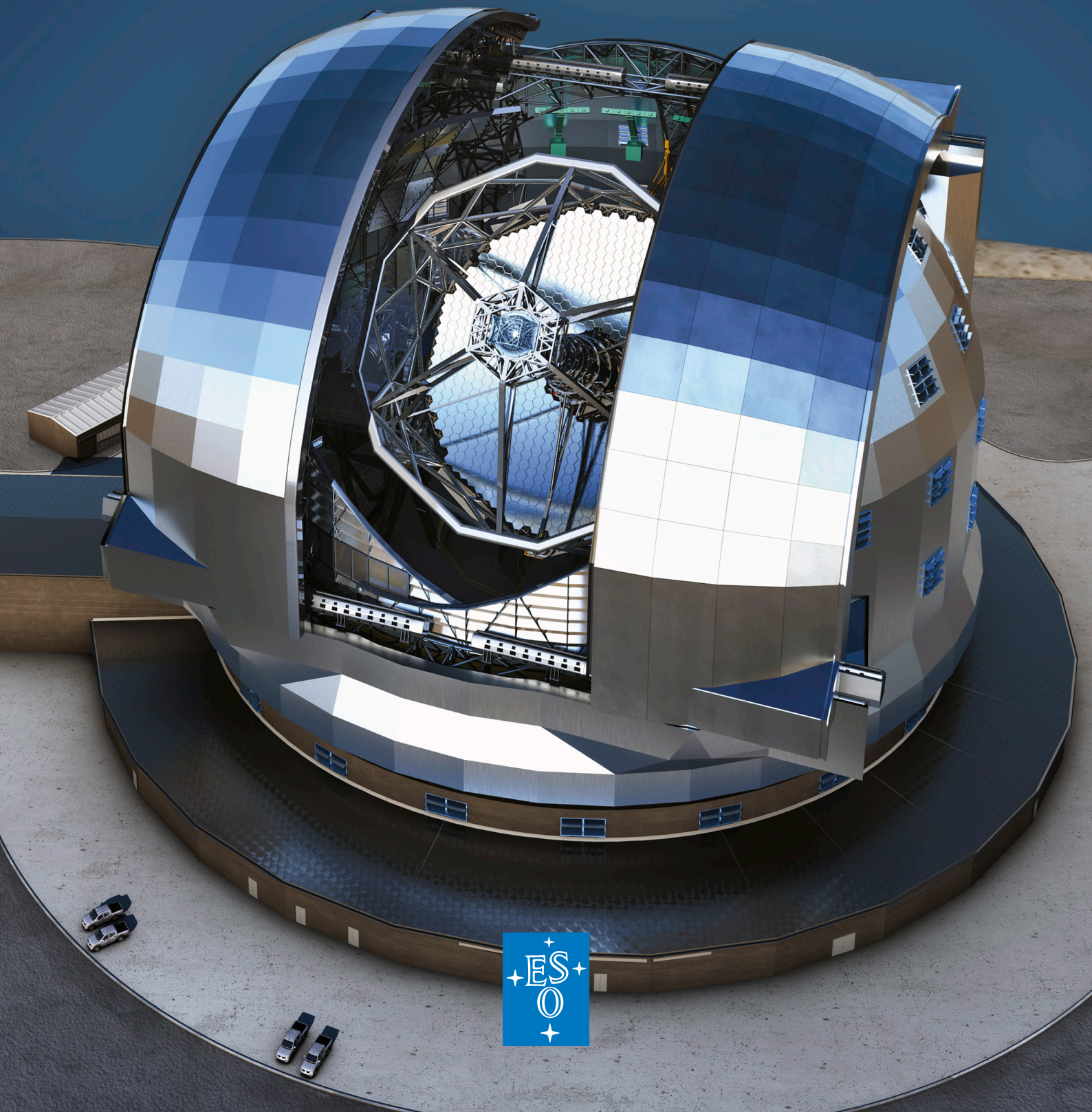
E-ELT The European Extremely Large Telescope

The World's Biggest Eye on the Sky



Preparing a Revolution

With the start of operations targeted for 2024, the European Extremely Large Telescope 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.

Astronomy is experiencing a golden era. The past few decades have brought amazing discoveries that have excited people from all walks of life, from the first planets orbiting other stars to the accelerating Universe, dominated by the still-enigmatic dark matter and dark energy.

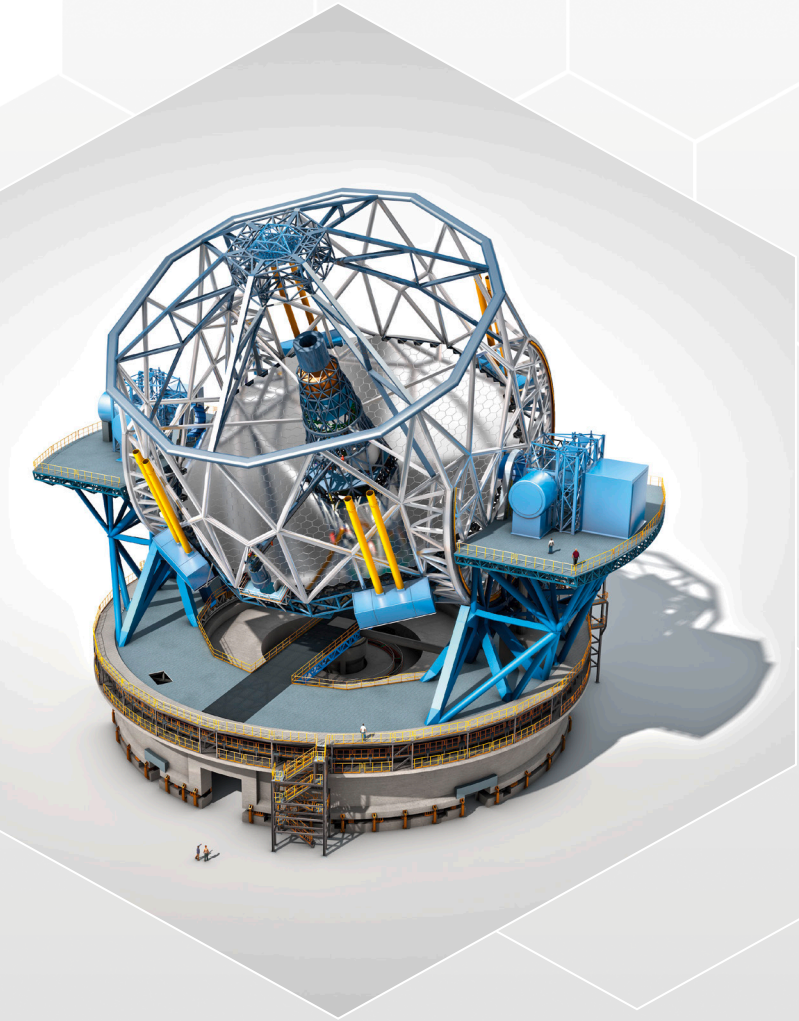
Europe is at the forefront of all areas of contemporary astronomy, thanks in particular to the flagship ground-based facilities operated by ESO, the pre-eminent intergovernmental science and technology organisation in astronomy, which is supported by 16 countries.

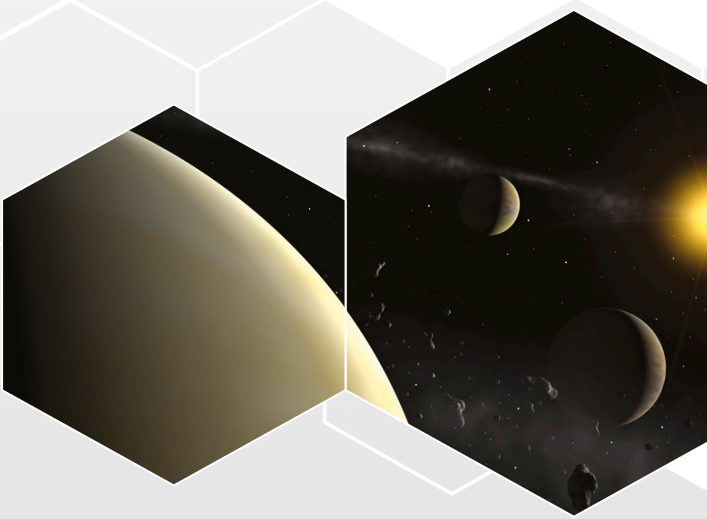
To consolidate and strengthen this position for the future, ESO is building a revolutionary new ground-based telescope, the European Extremely Large Telescope (E-ELT). As a 39-metre telescope, it will be the world's biggest eye on the sky.

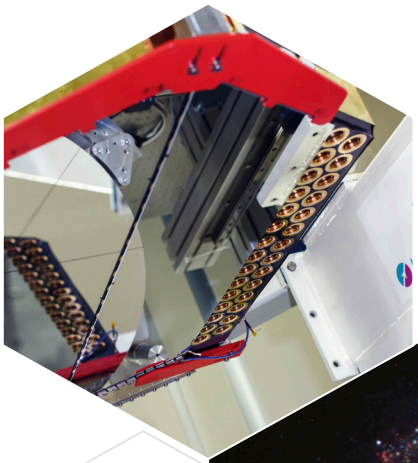
The telescope has an innovative five-mirror design that includes advanced adaptive optics to correct for the turbulent atmosphere, giving exceptional image quality — significantly better than will be possible with the James Webb Space Telescope. The main mirror will consist of 798 hexagonal segments, each 1.4 metres across. The gain is substantial: the E-ELT will gather 13 times more light than the largest optical telescopes operating today.

To take advantage of this unique science machine, sites in the northern and southern hemispheres were carefully assessed, with the final choice settling on Cerro Armazones in the Atacama Desert, just 20 kilometres from the site of ESO's Very Large Telescope at Paranal.

The green light for the construction of the E-ELT was given in December 2014.







Making Sense of the Cosmos

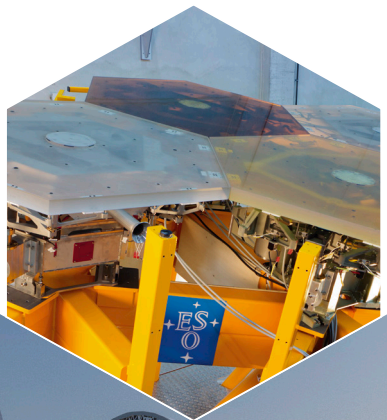
Are we alone? What is the Universe made of? What were the first objects in the Universe?

The E-ELT is an outstanding facility designed to tackle all these key questions and more. In particular, the E-ELT has embraced the quest for planets orbiting other stars. This will include not only the discovery of planets down to Earth-like masses using indirect measurements of the wobbling motion of stars perturbed by the planets that orbit them, but also the direct imaging of larger planets and possibly even the characterisation of their atmospheres.

The E-ELT's suite of instruments will allow astronomers to probe the earliest stages of the formation of planetary systems and to detect water and organic molecules in protoplanetary discs around stars in the making. The E-ELT will answer fundamental questions regarding planet formation and evolution and bring us one step closer to answering the question: are we alone? Apart from the obvious scientific interest, this would represent a major breakthrough for humanity.

By probing the most distant objects the E-ELT will provide clues to understanding the formation of, and the relationship between, the first stars, galaxies and black holes. The imaging and spectroscopic capabilities of the E-ELT instrumentation across optical and infrared wavelengths will allow astronomers to unravel the physical mechanisms that shape the evolution of stars and galaxies.

Exploiting its unrivalled sensitivity and resolution, the E-ELT will allow a much more detailed study of the region around the supermassive black hole at the centre of our galaxy, the Milky Way, as a ultimate proof of Einstein's theory of general relativity. The E-ELT will also allow astronomers to search for possible variations in the fundamental physical constants. An unambiguous detection of such effects would have far-reaching consequences for our comprehension of the laws of physics.



Building a Giant

The E-ELT has already gained wide support within ESO's 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 prominently in the ASTRONET European Infrastructure Roadmap for Astronomy.

ESO has built up considerable expertise in planning, constructing and operating large astronomical telescopes at remote sites. This world-leading know-how forms the backbone of the development of the E-ELT for ESO's astronomers.

The basic reference design was completed by the end of 2006 and the final design of the facility was finished in 2011. The E-ELT programme was approved by ESO Council in 2012 and the green light for the start of construction given in December 2014.

The E-ELT is a high technology, highly prestigious science-driven project that incorporates many innovative developments, offering numerous possibilities for technology spin-off and transfer, together with lucrative technology contract opportunities, and it provides a dramatic showcase for industry.

In Chile the preparations of the site for the telescope are well advanced and industrial contracts for the design and construction of the telescope's very demanding mechanical and optical elements are being placed.

European Southern Observatory

Karl-Schwarzschild-Straße 2, 85748 Garching bei München, Germany
Phone: +49 89 320 060 | Fax: +49 89 320 2362 | E-mail: information@eso.org
www.eso.org