

Europe's window on the Universe

The E-ELT has already gained wide support in the European scientific community. This venture is the only optical astronomy project selected in the roadmap of ESFRI, the European Strategy Forum on Research Infrastructures. It also features very 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. ESO's Very Large Telescope is the world's most advanced ground-based optical telescope and has enabled many scientific breakthroughs.

This expertise forms the backbone of the efforts to develop an Extremely Large Telescope for Europe's astronomers. The basic reference design was completed by the end of 2006. The final design of this facility, a study costing 67 million euros, was completed in 2011, with the aim of having the E-ELT observatory starting operation early in the next decade. In addition to these design activities, more than 30 European scientific institutes and high-tech companies are studying the technological aspects of large telescopes within the Framework Programme 6 ELT Design Study, partially funded by the European Commission. 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 European industry.

European leadership of this major flagship project will indisputably raise the European scientific, technological and industrial profile.

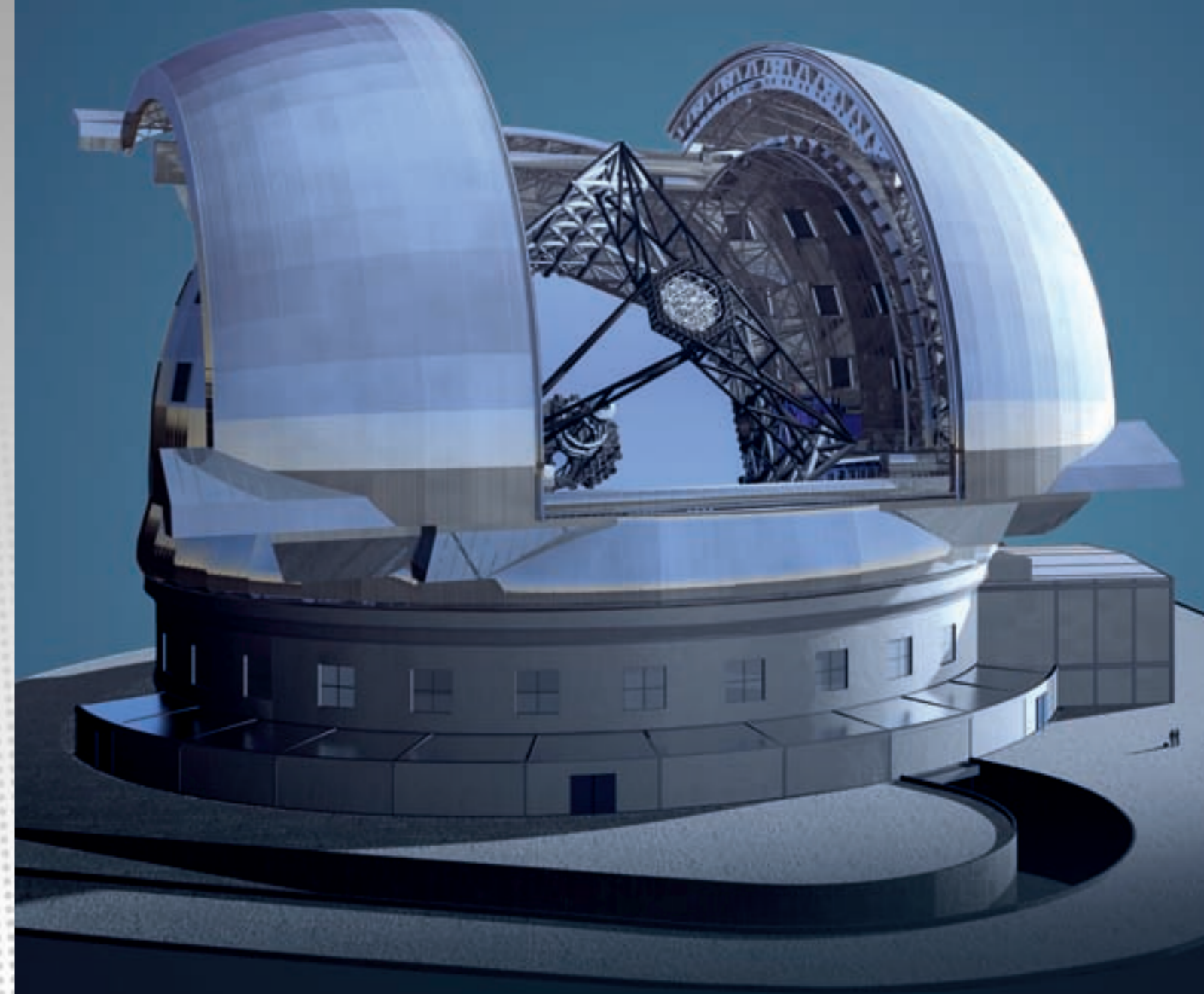
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E-ELT The European Extremely Large Telescope

The World's Biggest Eye on the Sky



Preparing a Revolution

With the start of operations planned for early in the next decade, 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.

Astronomy is experiencing a golden era. The past decade alone has 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 15¹ Member States.

The challenge is to consolidate and strengthen this position for the future. This will be achieved with a revolutionary new ground-based telescope concept, the European Extremely Large Telescope (E-ELT). A majestic 40-metre-class 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. The main mirror will consist of almost 800 hexagonal segments, each 1.4 metres across. The gain is substantial: the E-ELT will gather 15 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 have been carefully analysed, with the final decision settling on Cerro Armazones in the Atacama Desert, Chile.

The European Extremely Large Telescope recently completed its very detailed design phase. The start of E-ELT construction is planned for 2012, with the start of operations planned for early in the next decade.

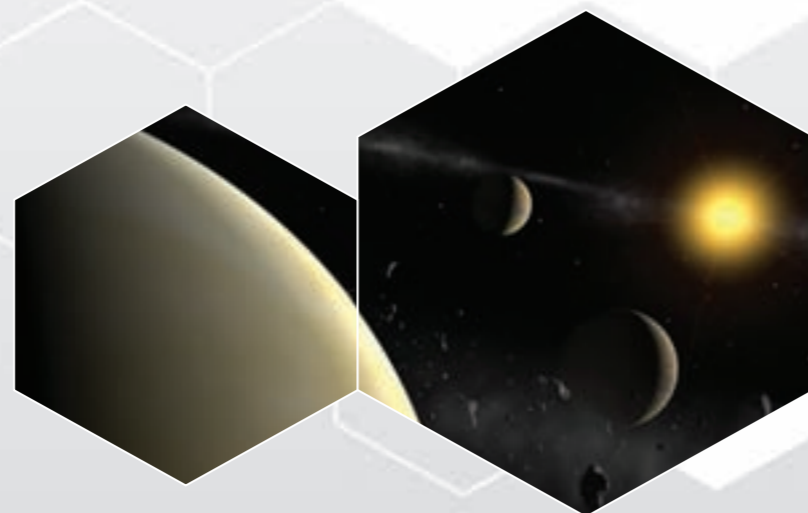
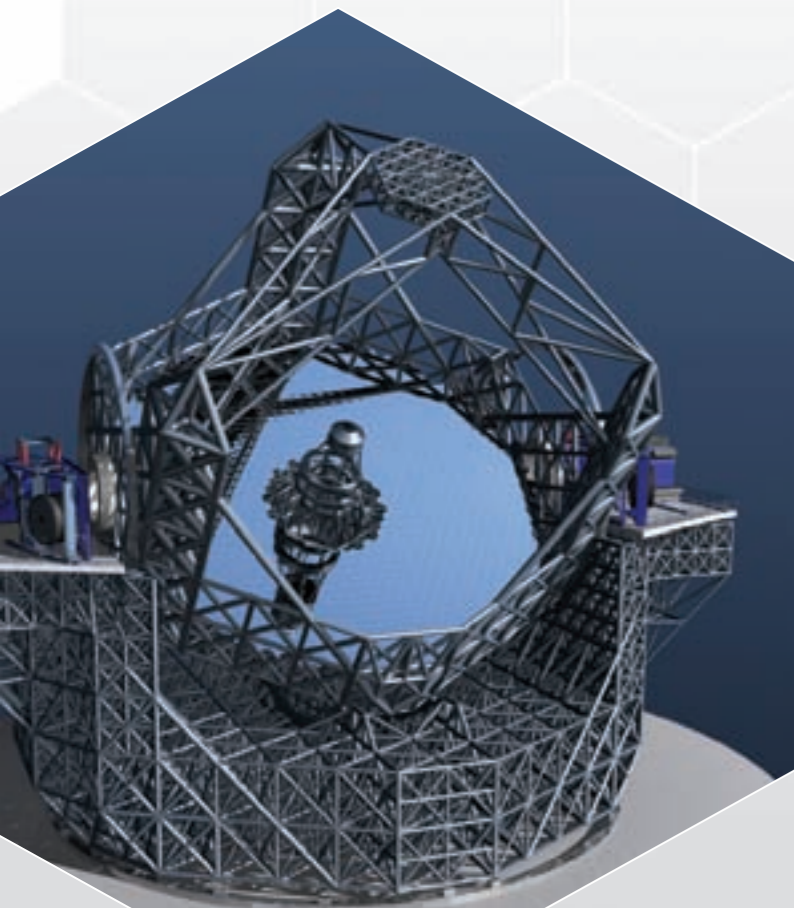
Making Sense of the Cosmos

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

The E-ELT has embraced the quest for exoplanets, that is, 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.

Furthermore, 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. Thus, 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 relationship between the first stars, galaxies and black holes. The E-ELT will also search for possible variations in the fundamental physical constants with time. An unambiguous detection of such variations would have far-reaching consequences for our comprehension of the general laws of physics.



¹ The Federative Republic of Brazil signed the formal accession agreement on 30 December 2010, paving the way for it to become a Member State of the European Southern Observatory (ESO). Following government ratification Brazil will become the 15th Member State and the first from outside Europe.

