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# OPTICON: Optical Infrared Coordination Network for Astronomy

**Large telescopes are the essential infrastructure of optical and infra-red astronomy. Larger telescopes produce better science and, thanks to modern computer control systems, there seems almost no limit to their future size. Preparing the ground for a future Extremely Large Telescope (ELT), with a hundred times the power of today's instruments, is a key aim of the EU-funded OPTICON project. OPTICON is developing the new networks and technologies that will be needed to support the ELT as well as improving access to the current generation of telescopes.**

## ● A GALAXY OF ASTRONOMERS

The further you look, the more there is to see: if this is, in a sense, true of science in general, it applies literally to astronomy. Almost everything we know about the realm beyond our Earth has been inferred by looking – first with the naked eye, and more recently with telescopes and radio telescopes.

And when it comes to telescopes, better almost always means bigger. Doubling the diameter of a telescope gives four times the light-gathering power, and four times the ability to detect faint objects deep in space. Even more significantly, the time needed to make a given observation – using what is effectively a digital camera – falls by a factor of 16.

The biggest telescopes in the world today have mirrors between six and 11 metres in diameter, but the constant push to see fainter and farther objects means that astronomers want much larger instruments. The planned Extremely Large Telescope (ELT) project, for instance, will have an aperture of around 100 metres. Since even a 10-metre mirror would be too difficult to make from solid glass, the ELT will have many small mirrors, a design concept pioneered in the two 10-metre Keck telescopes on Mauna Kea,

Hawaii. Like all large modern telescopes, the ELT will use 'active optics', in which flexible, lightweight mirrors are supported and adjusted by an array of computer-controlled actuators.

Preparing the way for the ELT is a key objective of the OPTICON project, which brings together nearly 50 European observatories and other astronomical institutions. The OPTICON partners fund, operate and develop Europe's major optical and infra-red astronomical infrastructures, as well as several world-class facilities for solar astronomy in the Canary Islands.

More specifically, OPTICON includes networking, Transnational Access and Joint Research Activities (JRAs) to improve access to existing large telescopes and develop new technology in adaptive optics and other areas, as well as foster the cooperation needed for the ELT.

The Transnational Access programme gives European researchers access to 17 observatories housing 18 optical and infra-red telescopes with apertures between 1.5 and 4 metres, plus 4 solar telescopes.

## ● BETTER TELESCOPES AND BETTER NETWORKS

One of OPTICON's six networking activities aims to structure the European astronomical community around several large projects, the ELT among them. Others are developing synergies between space-based and ground astronomy, bringing the techniques of optical and infra-red interferometry into mainstream astronomy, and monitoring the success of the Transnational Access programme.

Of the six OPTICON JRAs, one is developing the next generation of adaptive optics which will be fitted to the existing generation of

large telescopes. Not to be confused with active optics, adaptive optics is a form of computer control that compensates for rapidly changing atmospheric turbulence. Another activity is to create a new high-sensitivity, low-noise detector for adaptive optics, while a third investigates the technological challenges involved in developing other new high-speed detectors.

The fourth JRA is developing the tools needed to help astronomers without specialised technical knowledge take advantage of interferometry, in which two or more telescopes



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work together to increase their effective aperture. The fifth is working on techniques known as integral field and multi-object spectroscopy and imaging, while the sixth is developing volume

phase holographic gratings, potentially a major advance for future astronomical spectrographs.

## ● OPTICAL INFRARED COORDINATION NETWORK FOR ASTRONOMY IN SUMMARY

**Project acronym:** OPTICON

**Funding scheme (FP6):** Integrated Infrastructures Initiative (I3)

**EU financial contribution:** €19.2 million

**EU project officer:** Elena Rigbi-Steele

**Duration:** 60 months

**Start date:** 1 January 2004

**Completion date:** 31 December 2008

**Project webpage:** [www.astro-opticon.org](http://www.astro-opticon.org)

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