

# Spain unveils its eye on the sky

World's largest optical telescope inaugurated.



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## LA PALMA, SPAIN

As the world's largest single optical telescope officially opens for business, some astronomers are still wondering precisely what that business should be.

The Gran Telescopio Canarias (GTC), which boasts a 10.4-metre mirror composed of 36 hexagonal segments, is the latest addition to the Roque de los Muchachos Observatory perched about 2,400 metres above sea level on La Palma, one of the Spanish Canary Islands.

The telescope's 24 July inauguration by King Juan Carlos of Spain attracted astronomers from around the globe, who stayed on for a two-day scientific symposium. Most agree that the telescope is a valuable addition to the 8- to 10-metre class of telescopes, such as the twin 10-metre Keck telescopes in Hawaii. Some argue that the GTC also makes an ideal testbed for the technology and instruments needed by its successors — monster telescopes with mirrors measuring 25, 30 or even 42 metres, which are scheduled to come online in the coming decade (see *Nature* **452**, 142–145; 2008).

But others have their doubts about how much the GTC can achieve before then. “Keck picked much of the low-hanging fruit,” concedes William Smith, president of the Association of Universities for Research in Astronomy. Keck pioneered the search for remote galaxies, for example, before the GTC was conceived.

Bruno Leibundgut, director for science at the European Southern Observatory (ESO), which operates the Very Large Telescope in Chile, thinks the Spanish newcomer “needs to find a niche where it can provide something that other telescopes haven't done yet”. He suggests that the GTC could undertake time-consuming survey projects or specialized follow-up observations of, say,  $\gamma$ -ray

bursts spotted by orbiting telescopes.

But Rafael Rebolo, a research professor at the Canarias Institute of Astrophysics (IAC) in Tenerife, thinks that the GTC will be opening up new astronomical domains, studying the very first galaxies in the Universe or carrying out mid-infrared observations of cool extrasolar planets.

The GTC's observing programme will depend in part on what instruments are installed. An imaging spectrograph called OSIRIS is currently the GTC's only operational instrument; an infrared camera called CanariCam is still in boxes awaiting installation later this year. GTC director Pedro Álvarez says that they plan to install a diverse set of astronomical instruments over the next 3–4 years, including a near-infrared spectrograph that can study many objects simultaneously, a high-resolution spectrograph for visible-wavelength observations and a near-infrared camera that will use a planned adaptive optics system to mitigate atmospheric turbulence.

The GTC was originally supposed to become operational in 2003. Francisco Sánchez, director of the IAC, initiated the GTC project in 1998 and admits that their schedule was too optimistic.

The effort initially met with strong scepticism — Spain had little experience in building optical telescopes, its previous largest being just 80 centimetres wide (see *Nature* **435**, 140–142; 2005). “When a bicycle repair man announces he's going to build a Porsche, you're naturally unconvinced,” says René Rutten, GTC head of astronomy operations. “However, I now believe it will surpass the quality of the Keck telescopes, thanks to better stability and better optics.”

“My main worry is to quickly provide the best possible instrumentation,” adds Sánchez. “Given the imminent emergence of extremely

large telescopes, our window of opportunity is small.” Indeed, the Thirty Meter Telescope — joining the Keck telescopes atop Mauna Kea in Hawaii — should be operational by 2018 (see *Nature* **460**, 563; 2009).

## Timeshare

Because 90% of the €105-million (US\$150-million) GTC budget was provided by Spain, most of the telescope's observing time will go to Spanish astronomers. But Rebolo says the GTC is still open to new partners, and other European astronomers will get access to the GTC thanks to Spain's membership of the ESO consortium. When Spain joined the ESO in 2006, it offset about a quarter of its €65-million entrance fee with the promise of a total of 122 observing nights on the GTC for astronomers from consortium member states. The deal also included 55 ‘technology days’, allowing ESO engineers to get hands-on experience with the GTC's segmented mirror — potentially useful in designing and constructing the proposed 42-metre European Extremely Large Telescope (E-ELT).

According to Sánchez, this synergy could become even stronger if the E-ELT were built at the Roque de los Muchachos Observatory, which is one of a handful of candidate sites under consideration. “Building the E-ELT at La Palma would favour the further development of telescopes here, and would enormously promote European astronomy,” agrees Rebolo.

E-ELT construction could also be speeded up by choosing La Palma as its location. Spain is more than willing to invest in the project, and the European Union could sponsor it with extra funds provided through its Ultra Peripheral Regions development programme. Moreover, of the six possible sites currently under review, La Palma is the only one with an existing infrastructure of roads and support buildings. “It's only natural to host the E-ELT here,” says Sánchez. ■

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