

EUROPEAN SOUTHERN OBSERVATORY

# Southern sky surveyed

## Garching, near Munich

CREATED out of the ruins of European astronomy after the Second World War with the help of the Ford Foundation, the European Southern Observatory (ESO) has become one of the most successful undertakings in European science. After years of solid contributions to optical astronomy, ESO now stands poised to seize the initiative internationally with its planned Very Large Telescope (VLT).

Following the model of the European nuclear research centre CERN, ESO goes beyond the financial abilities of individual member states to build powerful instrumentation in its field. Since the creation of ESO in 1962, its main tasks have been to build telescopes for scanning the Southern Hemisphere and to develop new instrumentation for optical astronomy.

Among telescope designers, ESO is now known as the pioneer of what are called active optics, embodied in its New Technology Telescope (NTT), which began a series of trial observations on a mountaintop in Chile in March. Active optics are the computer engineers' alternative to the cumbersome slabs of glass from which telescope mirrors have traditionally been made. Many hold that the diameter of conventional glass mirrors has now reached its technical limit, and that active optics are the only way forward.

The idea is that a microcomputer controls transducers which in turn control the precise figure of a thin glass mirror, distorted though that may be by gravity and other influences. The aim is superior resolution, but also telescopes that are more manageable and less costly. Active optics will play a pivotal role in the VLT, which is actually a set of four 8-m mirrors yielding the equivalent of a single 16-m dish. The telescope will be the largest in the world when it is completed in 1998.

The five original member states — Sweden, West Germany, Belgium, the Netherlands and France — were joined by Denmark in 1967 and Italy and Switzerland in 1982. Austria is now making a strong bid for membership. But despite an early interest, Britain has stayed out of ESO, concentrating at first on collaborations at observatories in South Africa and Australia and, more recently, on telescopes of which it is the chief owner in the Canary Islands and Hawaii.

ESO has its European headquarters in a smart modern building in the Bavarian flatlands at Garching, near the Max Planck Institute (MPI) for Physics and Astrophysics, the MPI for Plasma Physics and the campus of the Technical University of Munich. It operates or shares the 15 telescopes (counting the NTT) at La Silla in northern Chile, 600 km north of Santiago. The staff of 280 is divided

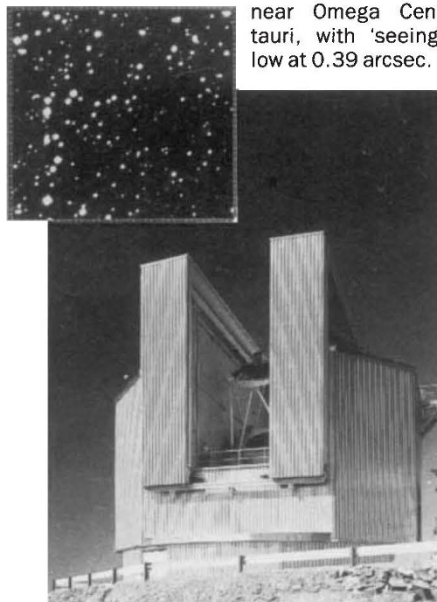
between Garching and La Silla, where most of the technical staff is Chilean. In Garching, there are about 50 astronomers (10 permanent) and 80 other staff members. The remote site at La Silla — Spanish for "the saddle" — in the Atacama Desert is "one of the most unpolluted sites on Earth in every sense", says Richard West, an ESO astronomer. The first telescope went into operation in 1968.

The organization of ESO is virtually identical to that of CERN (see page 722). An administrative council meets twice a year to decide budget and policy issues. A director-general (now Harry van der Laan of the Netherlands) is responsible for day-to-day operations. The scale is the most important difference: ESO is about ten times smaller than CERN. The annual budget of about DM50 million (it will rise to DM100 million in the 1990s because of the VLT) is shared by member states, with the larger states paying more.

ESO has generated excitement among European and outside astronomers with its ambitious plans for the VLT. Expatriate Europeans such as Jacques Beckers of the Netherlands, recently of the US National Optical Astronomy Observatory, have been lured back from the United States to work on the VLT, whose construction was approved unanimously by ESO member states in 1987. The VLT construction budget is DM382.2 million.

VLT is the logical offspring of NTT. The active optics of NTT are expected to allow the 3.58-m telescope a threefold improvement in resolution over that of previous instruments. Active optics will be a necessity for the VLT, whose 8-m mirrors would collapse under their own weight if ground at conventional thick-

The New Technology Telescope and results of 'first light' on 23 March. Inset shows an area near Omega Centauri, with 'seeing' low at 0.39 arcsec.



ness. ESO researchers expect to choose a site in Chile for the VLT by 1990. The first telescope may be working as early as 1995.

One of ESO's obvious difficulties is its popularity. As at other well-equipped observatories, only about a half of the 700–750 applications for observing time can be granted each year, and many successful applicants receive less time than they ask for. A committee made up of astronomers from each member state rates the proposals numerically, but the director-general has the final say. Van der Laan's task is "tricky and difficult", says West, especially because not all heavenly objects can be observed all the time.

Although ESO is a European organization, astronomers from member states enjoy no advantage in the refereeing process. Chilean, US and British groups have all been granted time in recent years. West says that the competition for time has raised the quality of European proposals — and, in the end, Europeans do receive most of the observing time.

What advantages accrue to ESO's member states? The most obvious is the organization's reason for existence — that astronomers have access to telescopes of a quality that national organizations would be unable or unwilling to finance. There are other tangible benefits, not least access to technical knowhow. Thus ESO was early in the field with the use of image-processing systems for extracting information from images of the heavens. Astronomers who used to travel to Garching to use its image-processing systems have often been able to find the funds with which to build their own, but ESO continues to provide software support to member states and others free of charge.

Italy and Denmark have decided to build versions of ESO instruments for their national astronomy programmes. Indeed, Italy joined ESO in part to gain the technology to build its own 4-m telescope. The project has a name — Galileo — but not yet a site.

ESO's small staff of professional astronomers, deliberately kept small, is regarded as a collective benefit. To keep ideas flowing in, there are only a few permanent positions. In striking a balance between a self-standing research organization and a service organization for its members, ESO (prodded by its council) has leant in the second direction.

ESO wins praise from astronomers not only for providing a unique opportunity for them to observe the southern sky. La Silla and Garching are also well known as meeting places where collaborations are incubated. VLT may be such a powerful magnet for observers everywhere in Europe that its influence could extend far beyond mere time-sharing. After all, as Beckers says, VLT "is where [optical] astronomy is going." **Steven Dickman**