

Anglo-Australian Observatory

# THE ANGLO-AUSTRALIAN OBSERVATORY

The Anglo-Australian Observatory is an organisation established in 1971 to provide world-class optical and infrared observing facilities for Australian and UK astronomers. It operates the largest optical/infrared telescope in Australia, the 3.9-m Anglo-Australian Telescope, and the UK Schmidt Telescope: both are located at Siding Spring Observatory. The AAO's headquarters are in the Sydney suburb of Marsfield.

The AAO has 68 staff and an annual operating budget of \$10.8 M.

## Governance

Ownership of the Observatory's facilities is vested in the Anglo-Australian Telescope Board, an independent, bi-national authority funded by the Australian and UK governments. The Board operates under the *Anglo-Australian Telescope Agreement*. The agencies responsible for implementing the agreement are the Department of Education Science and Training (in Australia) and the Particle Physics and Astronomy Research Council (in the UK). Each country appoints three members to the AAT Board.

## Location

The AAT is located at Siding Spring Observatory near Coonabarabran, NSW. This site was originally chosen in 1965 as an outstation for the Australian National University, and is still managed by the ANU. It is now the centre of optical astronomy in Australia, hosting telescopes from several institutions.



## A national facility

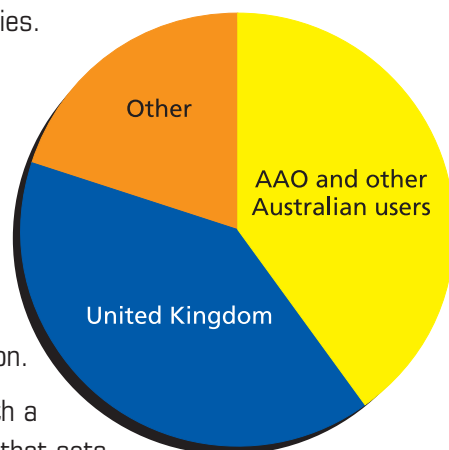
The AAO is a national facility for both Australia and the UK: that is, all Australian and UK astronomers may apply to use its telescopes. National facilities are an effective way for a community of researchers to share resources.

## Telescope users

About 40% of the users of the AAO's telescopes are based in Australia; 40% are from the UK; and 20% are from other countries.

The Anglo-Australian Observatory Users' Committee promotes the interests of AAO users, advising the AAO Director on aspects of the Observatory's operation.

The AAO operates with a client service charter that sets out the organisation's commitments to the users of its facilities.



## Allocating observing time

Observing time on the Anglo-Australian Telescope is awarded to researchers on the basis of the merits of their proposed research programs. There is a strong demand for the AAO's facilities — more than twice as much time is requested on the AAT as is available.



Two views of the Anglo-Australian Telescope.  
Photographs: Shaun Amy.

# AAO SCIENCE — RECENT HIGHLIGHTS

## Major surveys

AAO telescopes have carried out several major surveys, collecting data on tens of thousands of stars and hundreds of thousands of galaxies. All these projects are international collaborations.

***The Two-Degree Field Galaxy Redshift Survey (2dFGRS)*** — “undoubtedly Australia’s largest contribution to astronomical research ever” (cosmologist Carlos Frenk, University of Durham, July 2003). At its completion in 2003, this was the biggest galaxy survey ever made, producing a map showing the locations of more than 221,000 galaxies in space. The information in the map was used to make the most precise estimates to date of the Universe’s mass and density and its relative amounts of baryonic (‘normal’) matter, ‘dark matter’, and the recently discovered ‘dark energy’.

***The 2dF-Sloan LRG and Quasar survey (2SLAQ)*** — a follow-up survey to the 2dFGRS to look at how galaxies are distributed earlier in the Universe’s history.

***The 2dF Quasar Survey (2QZ)*** — a survey of more than 20,000 quasars (bright cores of distant galaxies). It provides a key to understanding how the young Universe developed.

***The Six-Degree Field Galaxy Survey (6dFGS)*** — among other things, this will show how the distribution of galaxies is related to the distribution of the unseen ‘dark matter’, giving another clue to the nature of dark matter.

***The RAdial Velocity Experiment (RAVE)*** — data on 80,000 stars that will help us reconstruct the history of our Galaxy.

## Other discoveries

***Planets around other stars*** — a long-term, high-precision planet search with the AAT has found more than 20 planets around stars other than the Sun.

***A new class of galaxies*** — very small ones, known as “ultra-compact dwarfs”. A complete inventory of all galaxy types helps us understand the ways in which galaxies form.

***Evidence for the nature of gamma-ray bursts*** — huge explosions that give off flashes of gamma rays. Australian telescopes, including the AAT, helped show that these violent events — the biggest explosions since the Big Bang — are massive stars exploding and their cores collapsing to form black holes.

## New techniques

AAO astronomers have developed new techniques for:

***Probing the inner regions of forming stars*** — with ten times the resolution of the Hubble Space Telescope. The conditions in these inner regions tell us a lot about how stars and planets form.

***Finding faint ‘planetary nebulae’*** — shells of glowing gas formed by low-mass stars such as our Sun at the end of their lives. This will help us better understand how stars die. The new technique is revealing many times more ‘planetary nebulae’ than have been found before.

***Examining the surroundings of quasars*** — the very bright cores of galaxies in the distant universe. For the first time we see that quasars may be destroying small galaxies around them. This may change our picture of how galaxies evolve.



An AAO staff member, Paul Cass, with the 6dF instrument being used to carry out the 6dF Galaxy Survey.  
Photograph: Shaun Amy.

The Helix nebula, NGC 7293. A new technique developed at the AAO is finding large numbers of these objects.

© Anglo-Australian Observatory.  
Photograph by David Malin



Artist's impression of the giant planet around star HD23079, detected with the AAT.

Image: David A Hardy ©PPARC



The galaxy distribution revealed by the 2dF Galaxy Redshift Survey.

Image: Paul Bourke, Centre for Astrophysics and Supercomputing, Swinburne University.

# INNOVATIONS FOR ACHIEVING SCIENCE

The Anglo-Australian Observatory designs and builds instruments for its own telescopes and for international customers. It leads the world in the construction of robotic positioners for fibre-based astronomy.



**IRIS2** — a widefield infrared camera and spectrograph. In 2002 it won Engineers Australia's JJC Bradfield Award for outstanding engineering achievement. Photograph: David Smyth



**Oz-Poz** — a multi-fibre positioner for the European Southern Observatory's Very Large Telescope in Chile.

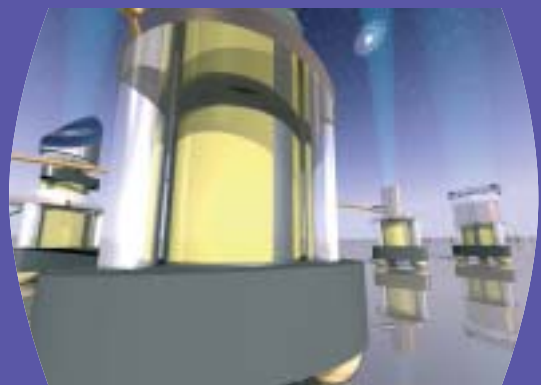


**FMOS-Echidna** — a radical new fibre-positioner being built for Japan's Subaru Telescope. Its 400 fibres will be individually positioned by piezoelectric drivers. Photograph: David James

The AAO develops technologies to push the performance of today's telescopes, and to prepare for the 'Extremely Large Telescopes' of tomorrow.



A wide-field spectrograph with more than 4000 fibres — now being investigated for Gemini (Australia's 8-m telescope)



**Starbugs** — a new type of positioner for moving payloads on a telescope's focal plane



Customised optical fibres — being developed with commercial partners. Image: OFTC, University of Sydney.



Large-aperture tuneable filters designed for the next generation of optical telescopes.



**Anglo-Australian Observatory**  
PO Box 296  
Epping NSW 1710 Australia  
167 Vimiera Road  
Eastwood NSW 2122 Australia

**Phone:** +61 2 9372 4800  
**Facsimile:** +61 2 9372 4880  
**E-mail:** [director@aaoepp.aao.gov.au](mailto:director@aaoepp.aao.gov.au)  
**Internet:** <http://www.aao.gov.au>