

# 2 The year in review

## Review of the AAO

The Department of Education, Science and Training carried out a comprehensive review of the AAO in early 2006. The review addressed the issues arising from the expected withdrawal of the UK from the existing bi-national agreement by mid-2010 in the context of the recent Australian Astronomy Decadal Plan. The Decadal Plan places high priority on maintaining the Anglo-Australian Telescope (AAT) as one of Australia's main optical/infrared facilities up to at least 2015. It also envisages the gradual evolution of the AAO into Australia's national optical observatory, supporting all the major optical/infrared facilities in which Australia has a stake.

The review panel visited the AAO's Epping and Siding Spring facilities and conducted extensive discussions and interviews with users, staff and other stakeholders, drawing on extensive written submissions from a range of interested parties. The panel's report was submitted at the end of June 2006, and made ten important recommendations for the future of the AAO. In abridged form, these were as follows:

1. The AAO should continue in its role as the major national facility manager for optical astronomy in Australia until at least 2015.
2. The Australian Government should increase the planned recurrent funding for the AAO by \$10.5 million over the five-year period 2006-07 to 2010-11.
3. Noting that the outstanding success of the AAO is based on the conjunction of research, instrumentation and facility management, maintaining this capability combination should be a priority when considering future funding for the AAO, in order to optimise delivery to the user community.
4. A new instrument should be developed which will extend the life of the AAT for use by Australian researchers and students for at least the period to 2015. The instrumentation capability of the AAO is central to its ability to deliver forefront astronomical capability to users, and in so doing ensures that the AAO retains a strongly competitive position worldwide as a builder of innovative instruments.
5. The AAO should be refurbished as necessary, with funding to address the two most critical categories of repairs of \$4.1 million in the budget period 2006-07 to 2010-11.



*Professor Matthew Colless, FAA  
Director of the AAO, with the AAT in the  
background*



6. The AAO should be given the broader role of a national optical observatory, managing both national and international projects, and encompassing Gemini, Extremely Large Telescopes, Antarctic astronomy facilities and other national investments to the benefit of the Australian astronomical community.
7. An Optical Astronomy Australia (OAA) Board should be established as a statutory corporation after 2010 to own and manage national facilities where appropriate, provide leadership and coordination of optical astronomy research in Australia, undertake strategic planning, provide a point of contact with the Australian Government and international organisations, seek and distribute major facility funds, and appoint the Director and manage the AAO.
8. An Interim OAA Board should be established in 2007 with broad responsibilities to lead and manage the optical astronomy program in Australia from 2007-2010, with suitable transition arrangements as the UK's involvement in the current AAO reduces and ends in 2010.
9. Consideration should be given in the future to widening the scope of the OAA Board to that of a broader peak body for all Australian astronomy beyond 2010.
10. A further review should be held in the period 2010-11 with the purpose of developing guidance for the AAO for the period out to 2015.

## NCRIS and Astronomy Australia Ltd

The first steps towards realising this program were made on 27 November 2006, when initial outcomes of the National Collaborative Research Infrastructure Strategy (NCRIS) were announced. Optical and Radio Astronomy was one of nine capabilities that received substantial funding. Over the next 4½ years, \$45 million will be injected into a variety of programs in Australian astronomy, including existing facilities such as the AAT and Gemini, new facilities such as the Square Kilometre Array and its precursors, and design and development work for the Giant Magellan Telescope and PILOT, a proposed Antarctic 2m class telescope.

The AAO component of this broad investment plan is \$10 million, of which \$4.1 million will be used to refurbish and revitalise the AAT's 33-year-old systems and infrastructure, while the other \$5.9 million will be used to build a new front-line instrument for the AAT. Together, these investments will help ensure that the AAT remains a reliable, efficient and scientifically potent telescope for at least another decade.

Just as important, however, is the formation of Astronomy Australia Ltd (AAL), a public company, limited by guarantee, that has overall responsibility for managing NCRIS funding for astronomy. Membership in AAL is open to Australian institutions involved in astronomical research. If AAL is effective in its role as NCRIS program manager, then, in accord with recommendations 7 & 8 of the Review Panel, it may prove to be the

appropriate entity to take over the operation of the Observatory from the AAT Board after the UK's involvement with the AAO ends in mid-2010.

### The AAO in Transition

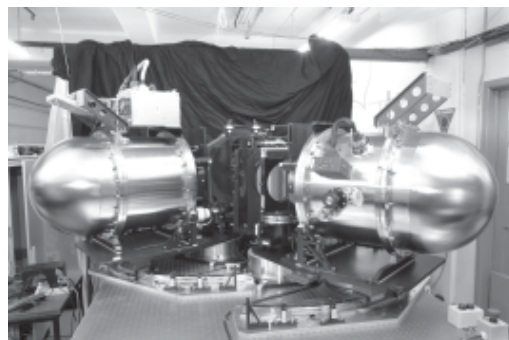
The Minister, the Hon. Julie Bishop MP, responded to the review of the AAO on 1 May 2007. She noted that recommendations 4 & 5 of the review panel's report were addressed by the NCRIS funding provided to the AAO for refurbishing the facility and constructing a new instrument. She also noted that the AAT Board supported the creation of AAL and recognised that it might prove a suitable replacement for the AAT Board after 30 June 2010. Given that AAL has only been in existence for a short time, the Minister considered it prudent to observe its operations before reaching a conclusion on its suitability for this role, and therefore charged DEST with establishing a working group to look at arrangements for a peak astronomy body and how such a body might incorporate the AAO. This working group is to be established in 2007 and will report to the Minister by early 2008.

The Minister appreciated the need for a degree of certainty regarding the AAO's longer-term funding and governance arrangements, and will therefore endeavour to give an indication of the Government's intentions by mid-2008 and finalise the arrangements for the longer term funding and governance of the AAO no later than May 2009. In the meantime the Minister allocated a supplement of \$1.8 million to AAO's funding in 2007-08; the possibility of further supplementary funding to offset the reduction in UK funding in 2008-09 and 2009-10 will remain under consideration as part of the Government's overall plan for the AAO's future.

All in all, the review panel's recommendations, the NCRIS outcomes and the Minister's response point the way towards realising the Astronomy Decadal Plan's vision of making AAO into Australia's national optical observatory, although important elements of this process – notably the AAO's long-term funding and post-2010 governance arrangements – are still to be worked out.


### Science at the AAO

The AAOmega spectrograph, with both 2dF multi-fibre and SPIRAL integral field front-ends, has now been in operation for over a year. It is the most highly sought-after facility on the AAT, commanding about half of all the time on the telescope. The largest program being undertaken with AAOmega is the WiggleZ survey, which seeks to understand the mysterious 'dark energy' that is driving the accelerating expansion of the universe. The WiggleZ survey aims to measure the redshifts for about a quarter of a million galaxies in a volume covering about 1000 square degrees of sky and looking back more



*Above: AAOmega spectrograph during construction, Photo David Smyth*

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than half the age of the universe. The survey will measure the apparent size of a feature that was imprinted on the matter distribution just after the Big Bang. In combination with measurements of the cosmic microwave background and distant supernovae, the survey will determine whether the dark energy is similar to Einstein's cosmological constant or due to some distinctly different, and previously unsuspected, physical phenomenon.

The science carried out with the AAT ranges over most of astronomy. Other highlights of this year include the imaging of the magnetic fields and 'starspots' on some young, nearby stars similar to the Sun, spectroscopic studies that show how the age at which galaxies form stars, and the amount of metals produced by those stars, depend on the galaxies' masses, and the continuing discovery of planets around other stars by the Anglo-Australian Planet Search program. Meanwhile data obtained with the AAO's other facility, the UK Schmidt Telescope (UKST), has been used in programs as diverse as identifying previously-unknown remnants from several exploding stars in our own Galaxy, and charting the clusters, filaments and voids in the nearby universe using measurements of more than 120,000 galaxy redshifts that cover most of the southern sky.

## Staff and Students



*Above: The Hon. Julie Bishop MP, Minister for Education, Science and Training, with Professor Fred Watson, winner of the Eureka Prize for Promoting Understanding of Science, 2006, Photo Australian Museum*

During 2006-07, staff and students at the AAO have received a disproportionate number of high awards and honours given the size of the Observatory. In August 2006, Professor Fred Watson, Astronomer in Charge at the AAT, was awarded the Australian Government Eureka Prize for Promoting Understanding of Science. This Prize is given for outstanding achievements in science outreach, and recognises Prof. Watson's long-standing contributions in this field, including his weekly astronomy segments on ABC radio and his well-received book *Stargazer: the life and times of the telescope*.

Professor Chris Tinney was awarded an ARC Australian Professorial Fellowship for the period 2007-11. The Fellowship and its associated research grant has a total value in excess of \$1.2 million and will support a new group at UNSW led by Prof. Tinney that will undertake research into the detection and understanding of extra-solar planets. Specific projects include the continuation of the AAT's long-running Anglo-Australian Planet Search, the detection of unbound extra-solar planets in nearby star clusters, and the search for habitable terrestrial planets orbiting nearby dwarf stars with the Precision Radial Velocity Spectrograph that is to be built for the Gemini Observatory.

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After Prof. Tinney's departure to take up his new position, we were delighted to welcome Dr Andy Bunker as our new Head of Astronomy. Dr Bunker comes to the AAO via Oxford, Berkeley, Cambridge and Exeter, and is well known internationally for his work detecting high-redshift galaxies and studying the star formation history of the universe. On the AAT he has used the CIRPASS and IRIS2 instruments to study star-formation in distant galaxies, and he plans to follow up new near-infrared imaging surveys with AAOmega. His other interests include the James Webb Space Telescope project, where he is closely involved in the development of the NIRSpec near-infrared spectrograph as a tool for studying the period spanning the end of the 'Dark Ages', when the first stars, galaxies and quasars formed and re-ionised the universe.

In May 2007, Professor Joss Hawthorn was awarded a prestigious Federation Fellowship by the Australian Research Council (ARC), to work on a revolutionary new approach to infrared astronomy. The Australian Government initiated the Federation Fellowships to support and encourage researchers of international renown to conduct research of significant national benefit. Professor Hawthorn's breakthrough has been to find a way to use optical fibres to filter out unwanted radiation from the atmosphere while letting starlight pass through. He will now work on developing his techniques to the stage where they can be incorporated into instruments for major international telescopes. This new technology is expected to bring large instrument contracts to Australia from the world's leading observatories.

Professor Brian Schmidt has worked closely with the AAO over many years, both on the Australian Time Assignment Committee and, since January 2005, on the AAT Board. Along with Saul Perlmutter and Adam Riess from the USA, Prof. Schmidt was awarded the Shaw Prize in Astronomy for 2006 in recognition of his leadership of one of the two teams that made the remarkable discovery of the acceleration in the rate of the expansion of the universe in 1998. Schmidt, Perlmutter and their teams were also awarded the 2007 Gruber Prize in Cosmology for the same work.

In July 2006, AAO/Macquarie University Honours student Brent Miszalski won the Bok Prize. This prize is sponsored

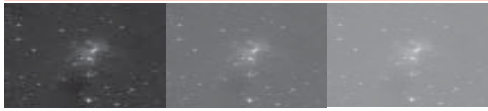


*Top: Professor Chris Tinney, during commissioning of IRIS2.*

*Photo David Smyth*

*Centre: Professor Joss Bland-Hawthorn, awarded a prestigious Federation Fellowship*

*Bottom: Professor Brian Schmidt, Winner of the Shaw Prize in Astronomy 2006*



*Recently retired staff, above, John Stevenson and below, Denis Whittard; highly skilled and dedicated employees*



*Below: Steve Lee (right), has worked 30 years at the AAO, shown here at the AAT's 2006 Open Day demonstrating optical spectroscopy*



by the Astronomical Society of Australia and the Australian Academy of Science, and is awarded to the Australian undergraduate student submitting the best research report on an astronomical topic. Brent was studying on a joint AAO/Macquarie University Scholarship when he completed his Honours research into more efficient observing methods for multi-object spectrographs. His new technique is now in constant use at the AAT and is likely to be adopted by other observatories around the world.

A number of long-serving staff members have retired from the AAO over the past year. John Stevenson retired after over 22 years at the AAT, during which time he worked on a number of crucial projects for the Observatory. Denis Whittard also retired from the AAO in Epping, where he worked for nearly 23 years on a number of instrumentation projects, most notably 2dF, IRIS2 and AAOmega. Finally, Steve Lee, the head night assistant at the AAT, joined a select group of staff members who have worked at the AAO for more than 30 years.

## Outlook

The next three years will see an organic evolution of the AAO, as it transforms itself from a joint Anglo-Australian facility into Australia's national optical observatory. This process is already underway, as the AAO takes on responsibility for Australia's involvement in off-shore large telescopes. The AAO is already responsible for managing Australian access to the two 6.5-metre Magellan telescopes in Chile under the Major National Research Facilities program. The AAO's expanded role is clearly mapped out in the astronomy program supported by the National Collaborative Research Infrastructure Strategy (NCRIS). Under NCRIS, the AAO will not only continue to operate and instrument the AAT for the foreseeable future, it will also (from January 2008) take over responsibility for the Australian Gemini Office and support Australian access to the twin Gemini 8-metre telescopes. Looking to future facilities, the AAO is managing the design study for PILOT, a proposed 2.4-metre telescope in Antarctica, and will work closely with the ANU-based Australian Project Office for the 25-metre Giant Magellan Telescope. Thus the scope of the AAO's activities is expanding as the organisation evolves towards becoming Australia's national optical observatory.



*The AAT Board has six members, three appointed by each country, and the role of Chair and Deputy Chair alternates between the two countries. Further details of the Board are included on page 13 and in Appendix D. Pictured here are the members of the AAT Board along with some members of the AAO Executive at the Royal Observatory of Edinburgh (from left) Dr Ian Chessell, Mr Neville Legg (Executive Officer), Professor Brian Schmidt, Professor Matthew Colless (Director AAO), Professor Warrick Couch (Chair AAT Board), Dr Stephen Warren, Professor Pat Roche and Dr Colin Vincent*



*Professor Warrick Couch,  
Chair, AAT Board*

### Review by the Chairman of the Board

In the Australian Astronomy Decadal Plan that was released in 2005, two key missions were identified for the AAO through until 2015: to continue to operate the 3.9m Anglo-Australian Telescope and maintain it as a world-class facility, and to evolve into Australia's national optical observatory, with responsibility for the support of all major optical/infrared facilities that Australian astronomers have access to. This was in the face of the planned withdrawal of the UK from the AAO by the middle of 2010, which in itself requires the AAO to adapt and change in terms of both its governance and funding arrangements. This last year has seen a number of important developments critical to setting the AAO along this new and changing course, although many challenges remain in seeing it transition to a fully Australian institution.

The recommendations coming from DEST's review of the AAO were much welcomed in providing clear guidance as to the way ahead. Of particular importance was the review panel's endorsement of the roles envisaged for the AAO in the Decadal Plan, the attention it paid to what expenditure would be required to address the diminution in UK funding and to maintain the AAT as a front-ranked facility, and its recommendations on the future governance arrangements for the AAO. The response from the Minister, the Hon. Julie Bishop MP, in May 2007 saw the first steps being taken to implement recommendations from the review. These included the allocation of \$1.8M of supplementary funding for the 2007-08 financial year, and the foreshadowed creation of a working group to establish the



optimum longer-term funding and governance arrangements for the AAO, with the newly formed Astronomy Australia Limited being noted as a possible replacement for the AAT Board after 30 June 2010.

The announcement of the initial outcomes of the Australian Government's new National Collaborative Infrastructure Strategy (NCRIS) in November 2006 – in particular the allocation of \$45M to the Optical and Radio Astronomy capability over the next 4½ years – has resulted in two of the AAO's essential funding needs identified in the DEST review being addressed. The AAO will receive \$10M of this NCRIS funding, \$4.1M of which will be used to refurbish the AAT's aging systems and infrastructure to ensure its continued reliable operation, and \$5.9M will provide for a major new instrument that will keep the telescope at the scientific forefront in the years to come.

The AAO will also receive NCRIS funding to take over the operation of the Australian Gemini Office and hence be responsible for supporting Australian use of the Gemini and Magellan telescopes. In addition, the AAO will be contracted by the University of New South Wales to undertake a \$1M concept design study for PILOT, a 2m-class Antarctic telescope, as part of the NCRIS investment in future optical/infrared facilities.

Despite the changes mooted for the AAO and the associated uncertainties that these create, the Observatory's two telescopes – the AAT and UKST – remain highly productive research facilities. As highlighted in this report, a broad range and wealth of internationally competitive science continues to be undertaken by the AAO's user communities. Large survey programs which exploit the wide field and multiplexing power of the AAT's AAOmega and UKST's 6dF spectrograph facilities have made excellent progress this year, the "WiggleZ" dark energy survey and the RAVE stellar velocity surveys both being flagship projects in this regard. The AAT also remains at the forefront of extra-solar planet research, with the Anglo-Australian Planet Search now making in-roads into finding systems like our own solar system and detecting terrestrial-mass planets.

This year, Mr Greg Harper's term as an Australian Board member came to an end and he was replaced by Dr Ian Chessell. It was pleasing, however, that Mr Harper's valuable association with the AAO continued through his role as Chair of its Audit and Risk Management Committee. The scientific excellence of two of the AAO's staff was recognised through the award of an ARC Professorial Fellowship to Prof Chris Tinney and an ARC Federation Fellowship to Prof Joss Bland-Hawthorn. Congratulations to them both. Their departure from the AAO represents a great loss after their numerous years of outstanding service and scientific leadership within the organisation. The AAO also farewelled two long-serving staff members who retired – John Stevenson and Denis Whittard. Both epitomise what has been a key ingredient in the success of the AAO – highly skilled and dedicated employees who give their all to the Observatory over many years.

### Appointed by the Australian Government

Anglo-Australian Telescope Board at 30 June 2007



*Chair  
Professor Warrick  
Couch, Australian ELT  
Project Scientist,  
Swinburne University;  
appointed 5 November  
2004 till 30 June 2010*



*Professor Brian  
Schmidt, ARC  
Federation Fellow,  
Research School of  
Astronomy and  
Astrophysics,  
Australian National  
University; appointed  
1 January 2005 till  
31 December 2008*



*Dr Ian Chessell,  
Director, Chessell  
Research Pty Ltd,  
South Australia;  
appointed 22 March  
2007 till 30 June 2010*

### Appointed by the UK Government



*Deputy Chair  
Dr Stephen Warren,  
Reader, Department of  
Physics, Imperial College  
London; appointed 1  
March 2006 till 28  
February 2009*



*Professor Pat Roche,  
Department of  
Astrophysics, Oxford  
University; appointed  
1 January 2003 till 31  
December 2007*



*Dr Colin Vincent,  
Head, Astronomy  
Division, STFC,  
indefinite appointment  
from 5 April 2006*

