Usage of the AAOmega spectrograph was dramatically up on 2005–06 following its successful commissioning in November 2005, and fully half the nights in the second half of 2006 used AAOmega. Interest in the integral field spectroscopy mode of AAOmega using the SPIRAL fibre-feed continues to grow. The high-resolution optical spectrograph UCLES is experiencing constant and reliable usage, including one unprecedented block of 48 consecutive nights in early 2007 to search for "super Earth"–size planets around nearby stars. A PPARC/STFC grant (Tinney, Jones and Eakins) has made funds available to enable hardware and software upgrades to UCLES to streamline the observing process for the Anglo-Australian Planet Search (AAPS). These upgrades are now largely complete and the first commissioning runs have been undertaken. Although IRIS2 is no longer the widest-field infrared camera available to the UK community, it has found a new niche in confirmation and spectroscopic followup of rare sources discovered by satellites, or by the UKIRT Infrared Deep Sky Survey (UKIDSS).

Pathway towards the future

The AAO is pleased to report that it hopes to be entering a period of relative stability in its funding and is much better positioned to focus on projects with strategic value to the Australian astronomical community. Presented here are the current set of projects that the Instrumentation group is pursuing, and a discussion of the options that we are creating for a new instrument for the AAT.

Figure 4.15 Two diverse locations where the AAO's unique engineering skills are being applied: above, the mountains in Hawaii where the Subaru Telescope is located. Photo Rolf Muller.
Figure 4.16 below, India's Himalaya mountain range, location of the Himalayan Chandra Telescope. Photo Vladimir Churilov. Both locations offer opportunities for the AAO's unique engineering skills.

Recent History and Current Path

Over the past couple of years, the instrumentation group has seen the successful commissioning of the AAOmega spectrograph, the delivery of the FMOS/Echidna fibre positioner, and involvement in the Gemini WFMOS effort. Further details of progress on these instruments can be found in AAO Newsletters 105, 107, 109, 110 and 111. (See the AAO website at http://www.aao.gov.au/library/news.html).

WFMOS

This AAO–led collaboration of seven institutions to develop a concept design for a very wide field, highly multiplexed multi-object spectrograph for the Gemini Observatory has, unfortunately, been on hold since the Gemini Board halted the initial concept studies in May 2006 due to funding uncertainties. However, the AAO was recently approached by Gemini to resubmit a proposal for a new design effort for a Conceptual Design Review in advance of the November 2008 Gemini Board meeting. The AAO is collaborating with the same team as before (University of Durham, Johns Hopkins University, Rutherford Appleton Laboratories, NOAO, University of Oxford, and the University of Portsmouth) and looks forward to restarting this effort.

Although still firmly committed to the pursuit of making WFMOS a reality within the Gemini observatory, the AAO is no longer solely dependent on that project for its financial future and is now looking at a variety of options to ensure that new science capabilities are enabled on a reasonable and timely timescale for our community. The funds received from the NCRIS scheme for the development of a new instrument for the AAT are currently being used to look at a variety of instrument options. One concept being explored is a non-thermal infrared channel for AAOmega, called AAOmicron. Other funds were secured to explore WFMOS alternatives and we are looking at scaled-back WFMOS-like capabilities for the AAT as other possible options.

New Instrument for the AAT

AAOmicron Study

We are continuing to explore the scientific and technical viability of a non-thermal Infrared channel that can be fed with the AAOmega fibres. This concept could be developed

as a single-channel spectrograph based on the successfully commissioned AAT instrument, AAOmega. The conceptual layout is shown in Figure 4.17 below and the detailed technical capability was summarised in AAO Newsletter 110. If chosen, this instrument will open up a new wavelength regime for relatively high target multiplex over the full 2 degree field of view of the AAT.

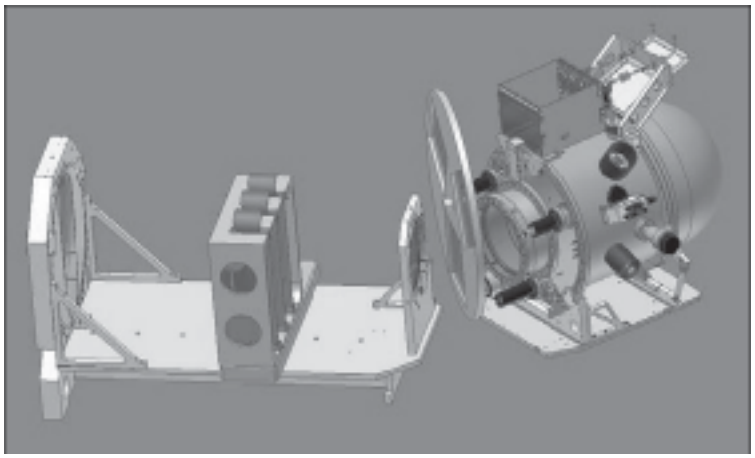


Figure 4.17
3D schematic of the AAOmicron concept.

HRMES Study

Another possible option for a new AAT instrument is an echelle grating-based spectrograph design (HRMES – High Resolution Multi-object Echelle Spectrograph) which also makes use of existing AAOmega component designs where possible. This option would create a facility for multi-object spectroscopy and, if chosen, will open up a new resolution regime in the optical for relatively high target multiplex over the full 2 degree field of view.

Starbugs Development

For both AAOmicron and HRMES, we must be wary of the remaining expected lifetime for the existing 2dF positioner, which has already seen a decade of heavy usage. We could invest further effort to refurbish that positioner, however it might be preferable to explore the implementation of a new technology that we call Starbugs (see discussion of roving robot technology in the special IAU AAO Newsletter July 2003) in which each fibre is mounted on its own inexpensive self-autonomous positioner.

Figure 4.18 shows such a concept for a Starbug actuator. The conceptual replacement for the current 2dF positioner involves a set of 540 fibre probes capable of quasi-simultaneous reconfiguration to get the reconfiguration time to less than 10 minutes per target field. This would simplify the fibre feed and spectrograph entrance slit mechanisms and also allow a larger number of target fields to be observed in any given night.

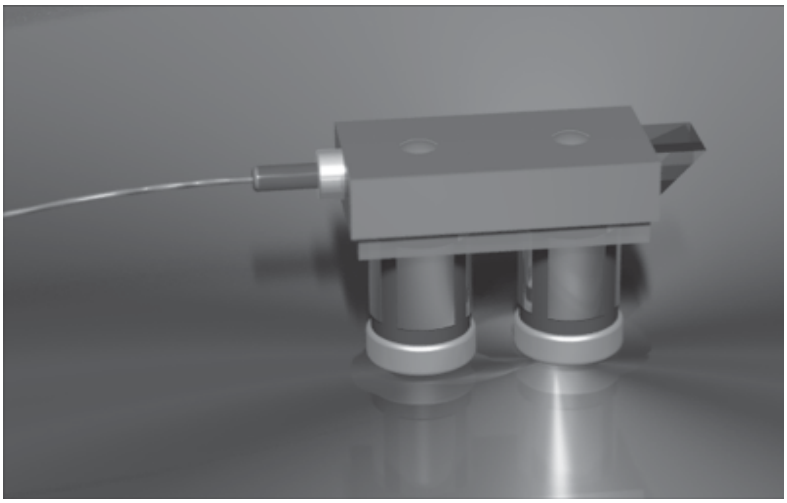


Figure 4.18 Conceptualisation of a Starbug actuator

The Starbugs technology is good for the relatively low density of apertures that can be viewed by the existing AAOmega spectrograph and proposed AAOmicron and HRMES concepts but is not suited to high-density such as WFMOS-A (see below). For that we turn to the Echidna technology developed for the FMOS instrument on Subaru and proposed as the positioner technology for WFMOS on Gemini.

WFMOS-A

Following the Gemini Board's decision not to pursue the WFMOS concept studies in May 2006, the ARC stepped in to provide $1.2 million to continue work on designing WFMOS and to examine alternative implementations. WFMOS-A is an instrument concept whereby a wide-field multi-object spectrograph might be built for a 4-metre class telescope such as the AAT instead of an 8 metre-class telescope such as Gemini. A significant subset of the science objectives for WFMOS can be achieved on a 4-metre class telescope; for instance such an instrument could deliver a suitably optimised survey to learn more about the properties of Dark Energy. WFMOS-A serves as one possible

fallback position in case the Gemini implementation of the WFMOS study fails to mature and could be collecting data 2 to 3 years in advance of the likely timescale for WFMOS on Gemini.

The baseline concept for the instrument maximises the fibre density and enables a more optimised Dark Energy survey to take place. It includes a 1600 fibre feed with an Echidna positioner replacing the existing 2dF robot.

Other Efforts of the Instrumentation Group

IIA-HESP

The Instrumentation group has developed a design and costing for a High Resolution Echelle Spectro-Polarimeter (HESP) for the Indian Institute of Astrophysics in Bangalore, India. The instrument will go on the 2-metre Himalayan Chandra Telescope and will provide resolving powers of R=30,000 and 60,000 with complete spectral coverage for two channels (2 simultaneous polarimetry modes or object-sky mode) from 370-900 nm.

The AAO is partnered with KiwiStar Optics and PrimeOptics in this effort.

APT CCD

The AAO has designed and built a CCD camera for the University of NSW for implementation on its Automated Patrol Telescope located at Siding Spring. The instrument is working to specification and the AAO will deliver the instrument to the University in the new financial year.

Figure 4.19 Top: Himalayan Chandra Telescope team in preparation for the annual videoconference with Head of the Indian Parliamentary Committee on Science & Technology.
Middle: Himalayan Chandra Telescope, Hanle Observatory, with Mohinderpal Singh at left and Vlad Churilov at right on the observation floor.
Bottom: Dr Sam Barden, Head of Instrumentation at the AAO, presenting the HESP concept to the review team of the Indian Institute of Astrophysics in Bangalore. Photos Vlad Churilov & HCT team.

6dF Field Plate

A project to build a third 6dF field plate began on 1 March 2007. It is funded from an ARC LIEF Grant and direct contributions from collaborating organisations (Macquarie University, the ANU, the University of Sydney, Astrophysikalisches Institut Potsdam in Germany, University of Central Lancashire, AAO). Macquarie University will act as the overall Project Administrator, the AAO will manage the project and construct the third field plate and AIP will manufacture, assemble and test the fibre buttons.

Telescope Control System

The Telescope Control System project is implementing a replacement for the original Interdata computer system which, although reliable, is obsolete and and which replacement parts are hard to find. Partial commissioning took place in April 2006 and final commissioning will take place in December 2007. Once complete, the Telescope Control System will enable the AAO to retire a significant quantity of legacy IT equipment.

AAOmega Improvements

AAOmega was successfully commissioned on the AAT at the end of 2005. A new project, AAOmega Improvements project, consists of various specific tasks designed to enhance AAOmega performance for scientific and operational gain.

FMOS Echidna

FMOS Echidna, an automated fibre positioner, focal plane imager and prime focus corrector for the Japanese Subaru Telescope in Hawaii, was safely delivered to the Subaru Telescope in February 2006 and awaits commissioning there. FMOS Echidna will be used for multi-object spectroscopy in the near infrared.

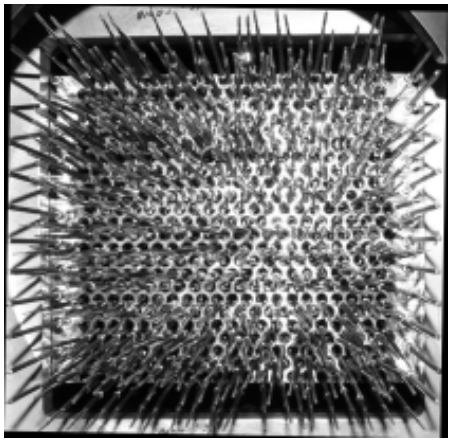


Figure 4 20 Close up of Echidna's spines. The principle of operation for Echidna is different from 2dF, 6dF and OzPoz in that all 400 fibres can be moved simultaneously to their required positions. Photo Jurek Brzeski

CYCLOPS, MOS-UCLES, SPIRAL Upgrade

In addition to the various options for a new instrument on the AAT, the AAO Instrumentation Group is exploring a variety of smaller projects to enhance current AAT capabilities. Three studies are currently underway to determine design approach and costing:

- CYCLOPS: a multi-fibre image slicer feed for the UCLES and UHRF facility that has been endorsed by the AAOUC.
- MOS-UCLES: a multi-fibre feed from 2dF for multi-object observations with UCLES.
- SPIRAL Upgrade: a proposal to double the spatial coverage of the SPIRAL IFU for AAOmega.

The current effort will scope out each of these ideas so that they can be evaluated and prioritised for future funding.

PILOT (Pathfinder for an International Large Telescope)

PILOT is a proposed telescope and support facility located at Dome C, in the Australian Antarctic Territory.

Management and technical support are being provided by the AAO for the ongoing PILOT feasibility and design study that is funded by NCRIS funds and led by the University of New South Wales. The objectives of this study are to determine the technical issues and costing associated with implementation of a 2-metre class telescope at Dome C as a pathfinder for larger optical and infrared telescopes. It is a unique project in that it will need to focus on innovative applications of the latest material and engineering advances to provide solutions to the technical and environmental challenges. The project is financed by NCRIS, through AAL to the UNSW. The UNSW has then contracted the AAO to execute the study.

Figure 4.21 Joss Bland-Hawthorn holding the first prototype integrated photonic spectrograph for astronomy. In the background is a 'draw tower', used for creating optical fibres, of the Optical Fibre Technology Centre of the University of Sydney. Photo Chris Walsh.

Instrument Science

This has been a successful year for the Instrument Science group. In 2006, the AAO won a $1.6M research grant from PPARC to develop photonic OH suppression technology over the next three years, with a review of the program at the end of the first year. In June 2007, the AAO successfully passed the review and has been authorised to proceed to an on-sky demonstration with the new technology. The Instrument Science group were also critical to the success of the new NCRIS funding awarded to the AAO.

In staff movements, Simon Ellis joined the group in August 2006 specifically with a view to assist in the development of the First Light Explorer (FLEX) concept based on photonic OH suppression. Also, Dionne Haynes joined the group on a shared basis with Macquarie University. The Head of the group, Joss Bland-Hawthorn has been awarded a prestigious Federation Fellowship and will be leaving the AAO to take a Chair at the University of Sydney at the end of the year.

In addition to the photonic OH suppression, the group has developed several new concepts, including the AAOmicron infrared wide-field spectrograph, Bragg gratings in few mode fibres, an integrated photonic spectrograph, and starbug fibre positioners that can be closely packed. The group demonstrated the first integrated photonic spectrograph which appeared on the front cover of the AAO Newsletter 112. The group has also proposed the development of smart telescope structures in addition to smart focal planes as part of the push to develop an extremely large telescope (ELT).

The Instrument Science group continues to be heavily involved in internal and external projects. The AAOmega project continues to be a spectacular success in large part because of Will Saunders' technical oversight and unique abilities in commissioning instruments. He has

now established that the blue response is almost as good as the red response. Will Saunders and Andrew McGrath play a key role in the NCRIS-funded PILOT project that explores the possibility of siting a 2m telescope at Dome C in Antarctica. Now that FMOS has been delivered to the Subaru telescope, Andrew McGrath is focussed on WFMOS-related projects. This has become a complex issue: in addition to the Gemini/Subaru WFMOS concept, there is a real prospect of a WFMOS-style instrument on the AAT, and/or a 2dF-fed multiobject high resolution spectrograph (HRMES).

In collaboration with the University of Durham, Roger Haynes has now completed his two-year exploration of new photonic components, a project funded by an Innovative Technologies grant from PPARC. In collaboration with Ellis, he championed the concept of the AAOmicron infrared wide-field spectrograph, an upgrade to the existing AAOmega instrument. Horton and Saunders played a key role in the optical design of the new camera for the UNSW Australian Patrol Telescope (APT) for the University of New South Wales.

Several of the group members have made important presentations to workshops related to the Giant Magellan Telescope (GMT) and Thirty Metre Telescope (TMT), with presentations to the European ELT to take place in Munich later in the year. The group has organised a workshop to be held on Dunk Island in April 2008. This meeting will focus on AO-fed instruments for large telescopes.

Finally, the Instrument Science group was invited to join the CUDOS consortium based at the University of Sydney. The AAO, under CUDOS, will investigate the potential of photonic gratings and mechanisms for use at mid infrared wavelengths. The invitation by CUDOS is an endorsement by the photonics community of AAO's leading role in developing the field of astrophotonics. Furthermore, the group has been invited to join Astrophotonica Europa, a large consortium that will investigate photonic applications in future astronomical instruments.

Resources

Human Resources

The AAO strives to provide challenging work combined with good employment conditions and work-life balance. The AAO is an equal employment opportunity employer and has a strong commitment to occupational health and safety.

Staff numbers

The AAO employs research scientists, technical staff, software engineers, electronics engineers, optical and mechanical engineers, computing, administrative and library staff. Staff members are located at the Epping Laboratory and at the Siding Spring Observatory. Table 4.4 shows staff numbers by tenure.

Table 4.4 Staff Numbers by Tenure at 30 June 2007

Fixed Term Positions	**Number of Full Time**	**Number of Part-Time**	**FTE Part-Time**	**TOTAL FTE#**
Director*	1			1.0
Instrument Scientist	2			2.0
Instrumentation	3	1	0.5	3.5
Research Astronomer	6	4	2.0	8.0
Operations	2		0.0	2.0
Corporate/Information Technology	1	2	1.3	2.3
Sub total	**15**	**7**	**3.8**	**18.8**

Indefinite Term Positions	**Number of Full Time**	**Number of Part-Time**	**FTE Part-Time**	**TOTAL FTE#**
Executive Officer	1	0		1.0
Instrument Scientist	3	1	0.5	3.5
Instrumentation	15	2	1.5	16.5
Research Astronomer	1		0.0	1.0
Operations	14	0	0/0	14.0
Corporate/Information Technology	8	2	1.2	9.2
Sub total	42	5	3.2	45.2

Total Staff	**57**	**12**	**7.0**	**64.0**

*direct Board appointment # full time equivalent

Staff by function

The functional areas of the AAO are:

- Astronomy which includes staff astronomers, visiting astronomers, research fellows, and visiting students.
- Operations which is responsible for the running of the AAT and UKST at Siding Spring.
- Instrumentation which builds instruments for the AAO telescopes and external clients.
- Instrument Science which develops new technology.
- Corporate which includes accounting, library and other support services.
- Information technology which manages systems at both sites.

Employment arrangements

The AAO's terms and conditions of employment are set via a collective agreement, the Anglo-Australian Telescope Board Enterprise Agreement 2005-2007. The next agreement is currently under negotiation.

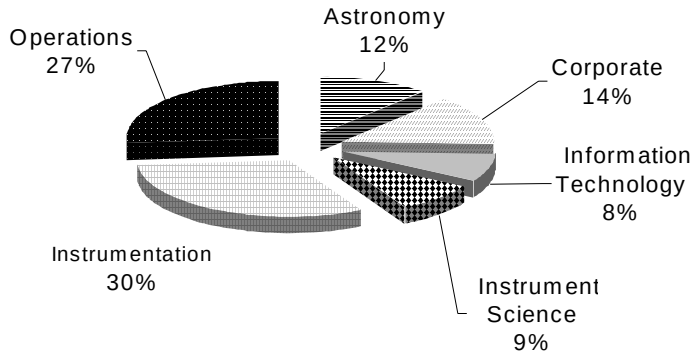


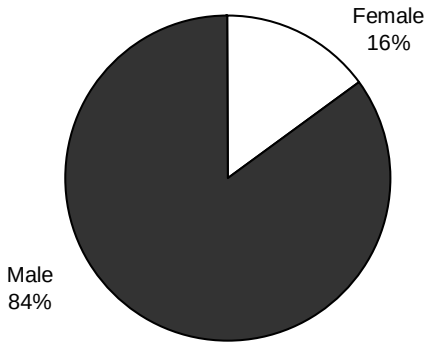
Figure 4.22 Staff by function at 30 June 2007.

Equal Employment Opportunity (EEO)

The AATB is an equal employment opportunity employer and strongly supports workplace diversity. Figure 4.23 below shows the ratio of males to females at the AAO and reflects the difficulty of attracting and retaining females in science.

During the year the AAO also had 12 visiting students. Of this number 25% were female.

Figure 4.23 shows the relative numbers of male and female staff at the AAO



Occupational health and safety

The aim of the AAT Board's safety policy is to ensure that employees at every level and working visitors are provided with a safe and healthy working environment. The AAO has two Health and Safety committees – one at each site (Siding Spring and Epping) – which meet quarterly. They comprise staff and management representatives. The Executive Officer is a member of both committees. The names and contact details of committee members and the locations of first aid stations are posted on notice boards, as are emergency evacuation details.

The OH&S plan for the year continued to raise awareness throughout the organisation with the specific foci for the year on emergency and evacuation policy and procedures, safe handling of chemicals, and the use of laser equipment.

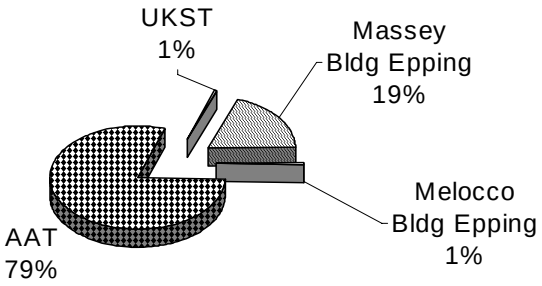
The AATB's Workers Compensation insurer is Comcare – an Australian Government statutory authority responsible for workplace safety, rehabilitation and compensation. The AAO has worked hard to maintain a safe working environment. There have been no notifications of dangerous occurrences for the last five years.

Table 4.5 OH&S Statistics

	2002-03	*2003-04*	*2004-05*	*2005-06*	*2006-07*
No of claims	5	2	2	3	4
Payments made	$12,400	$2,735	$3,241	$15,121	$41,627
Dangerous occurrences	0	0	0	0	0
Workers Compensation premiums	$15,612	$32,500	$37,309	$33,891	$52075

In 2005, the AATB commissioned an external review of its OH&S infrastructure needs. The report identified various remedial works that need to be undertaken at both Epping and Siding Spring, with the bulk of the work to be undertaken at the AAT.

Figure 4.24 shows infrastructure upgrades by cost and location

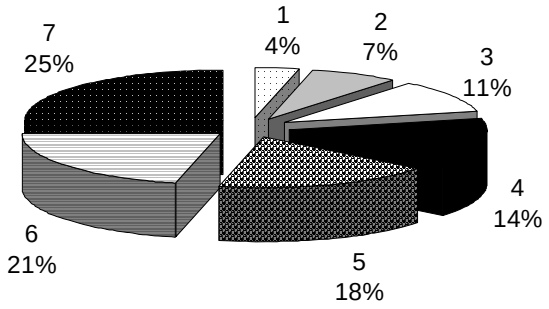


Following an approach by the AATB, the Australian and United Kingdom Governments provided $2.7 million to fund a remedial works program. This program has commenced and is expected to be completed over a 2– 3 year timeframe. The AAO Safety Committees are actively involved in the project.

The tasks identified for remedial work have been grouped into 7 sections reflecting the variety of works and the likely trades involved.

1. Asbestos identification and rectification
2. Buildings
3. Domes
4. Electrical
5. Fire
6. Heights & Handling
7. General

Figure 4.25 shows task sections and the estimated costs.



Financial Resources

The financial statements in Appendix A outline the AAO's financial position. The Australian National Audit Office (ANAO) has audited the financial statements of the AATB and has again provided a clear audit certificate. The auditor's report is also contained in Appendix A.

Funding sources for the AAO are:

- Government grants provided by Australia and the United Kingdom.

- Contracts for the building of instruments for external clients.
- All other revenue which includes research grants and fellowships funded via the ARC and STFC, and the RAVE international consortium for survey work on the UKST. This year, the MNRF has funded two research fellows for three years – two of which will be at the Magellan telescope at Campanas in Chile, and the third year at an Australian institution. The MNRF also contributed to the cost of the AAO's business project management software.

The AATB is funded mostly for recurrent expenditure and has to strike a balance between that expenditure, capital needs and telescope refurbishment. Funding from the Australian Government is made via the Department of Education Science and Training (DEST Output 3.1). This funding is indexed whilst that of the UK is not. As part of its phased wind-down to the UK-Australian treaty conclusion (30 June 2010), UK funding for the year under review reduced to 50% of that of 2005/06. For the following years to the treaty conclusion, this will reduce to 25% of the 2005/06 amount.

The results for 2006– 07 show that the AATB has net assets of $44.2 million and as expected, a decrease in revenue for the year. A net loss for the year almost equal to the depreciation charge is also shown. The AATB focus for the year has been both on its short term budget position and identification of its longer term needs especially in the context of the UK's gradual withdrawal.

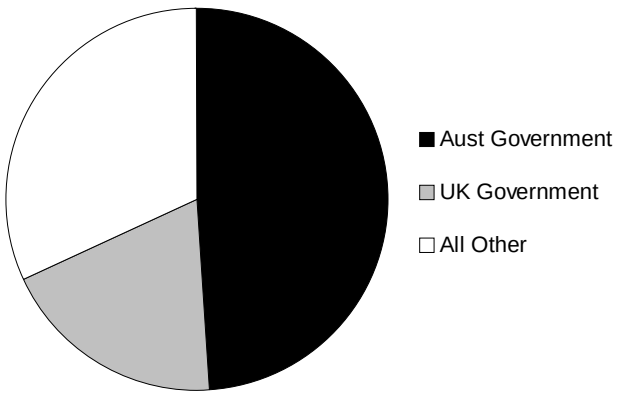


Figure 4.26 Source of funds for 2006– 07.

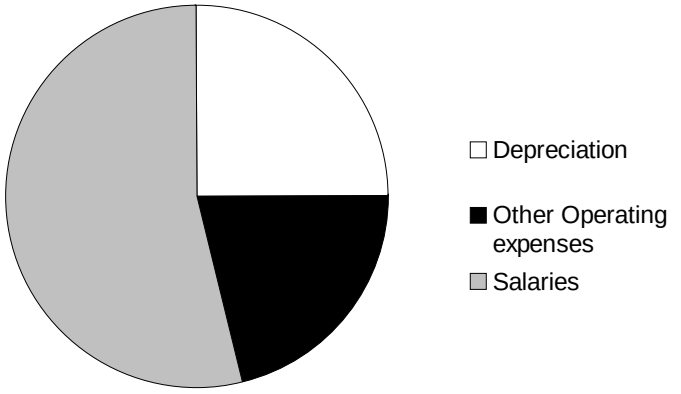


Figure 4.27 Application of expenses for 2006-07.

The Australian astronomy community included the AAO, as a priority, in its Decadal Plan 2006– 2015 funding bid to the Australian Government's National Collaborative Research Infrastructure Strategy (NCRIS). NCRIS grants to the AAO have been made for a new instrument for the AAT, and for refurbishment of the AAT and related infrastructure. This was also part of the Australian Government's response to the recommendations of the independent review of the AAO (see chapter 2).

The Board is also attempting to increase its external revenue through its instrumentation program both domestically and overseas. The AATB expects to be able to fund an expenditure program of $11.2m for 2006/07.

Business systems

Major instrumentation projects such as WFMOS and the new AAT instrument demand that systems are adequate to facilitate a high level of project performance, management and control. The AAO has outgrown the capability of its business systems to meet such expectations for major projects. The AAO has purchased new business software which:

- provides a fully integrated solution which will allow time recording, project management, project scheduling, project and general accounting, and general ledger functions; and
- is a smaller business type solution with low total cost of ownership.

The implementation of this new software has been one of the AAO's major tasks of 2006– 07 and the aim is to have the new system running early in the new financial year. This implementation will more than satisfy the requirements of managing large projects.

Information Technology

The current IT Strategic plan has come to an end, and a new plan is under development. The last few years have seen a successful change in direction for the IT infrastructure, with Linux based systems now dominant. The new plan will consolidate on the gains that have been made, and will continue to improve the IT environment offered by the AAO.

The high speed internet connection to Siding Spring continues to perform well. It has provided a significant improvement to the operations of IT at the telescopes. We have been able to make extensive use of video conferencing, thus reducing the need for staff to travel and thereby increasing the efficiency of collaboration amongst teams within the AAO. The software team is able to offer an improved level of support for instrumentation systems, in particular, they are able to mimic displays from the telescope – a very valuable aid to fault finding. The efficiency of IT support activities such as downloading security patches has been significantly enhanced, and we have been able to allow observing data to be sent via electronic means without any noticeable impact on other network users. We are presently exploring ways to enable remote observing support to be offered.

All AAT Archive data from 1990 onwards has now been made available to the community from the CASU Astronomical Data Centre. (http://casu.ast.cam.ac.uk/casuadc). AAT archive data that is no longer subject to the proprietary period is available for immediate download.

The last 12 months have been dominated by the implementation effort for the Microsoft Dynamics SL (Solomon) Financial and Project Management system. We are looking forward to the benefits that this new system will bring.

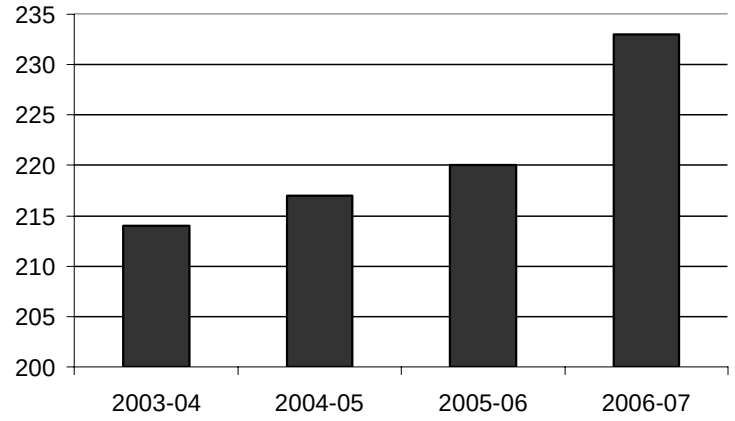
Environmental Performance

In June 2007, the Director asked six AAO staff members to form a working group for a “Green AAO” initiative. The aim of the working group is to identify a package of relatively simple, practical and cost-neutral ways in which the AAO could become a greener organisation. The Director looks forward to a short set of recommendations for practical actions that would improve the AAO’s environmental performance and that are financially viable.

External Communications

The AAO is aware that good two-way communication is central to all its activities. While it must listen to its stakeholders, it must also communicate with the wider community. The stakeholders are the AAO staff, the astronomy community, responsible Ministers, funding agencies, the Board and its advisory committees and the time assignment committee. The community includes the general public, hence the broad term 'Public Relations.'

Figure 4.28 Media Interviews



World Wide Web and digital images

The AAO's website at http://www.aao.gov.au has recently been upgraded and continues to attract a large audience. Most of the Internet visitors are attracted by the images pages, which now support a total of about 220 photographs.

A newsletter is published twice a year on the web, and distributed as a hardcopy to over 1,000 subscribers and institutions. It caters to a wide range of readers, including professional astronomers, instrument scientists, users of the observatory and local AAO staff.

The science web page has the aim of attracting students towards collaborative work at the AAO either through vacation positions or thesis study.

A wealth of more technical information is also available and is constantly being updated and developed.

Publicity and Outreach

The AAO issued three media releases this year. AAO staff gave 233 media interviews (radio, television and print) and wrote 15 popular science articles; they gave 54 talks to audiences of lay-people and 47 professional-level talks. In October the AAO organised the annual Bok lecture (and one of the ever-popular sessions of "Science in the Pub") as part of Coonabarabran's annual "Festival of the Stars", this year repeating it in the nearby town of Dubbo. The 2006 Bok lecturer was Professor Malcolm Walter, Director of the Australian Centre for Astrobiology. The annual Allison-Levick Memorial Lecture, organised by the AAO and presented alternately in Australia and the UK, was given in September 2006 by the AAO's Joss Bland-Hawthorn, at an Open Night organised by the Foundation for Astronomy at Macquarie University in Sydney.

Figure 4.29 The 2006 Bok lecturer Professor Malcolm Walter. Photo Helen Sim.

A new outreach activity for AAO staff this year was webcasts to schools. These were organised through the Dubbo School of Distance Education, an institution of the NSW Department of Education and Training that provides distance education to children in isolated circumstances. Most of the webcasting was done from the AAT during the week in March 2007 when the telescope's mirror was being re-aluminised: a later webcast involved an interview with Chris Tinney (UNSW) at the telescope.

In August 2006, the AAO's Fred Watson was one of those who bravely participated in "Speed Meet a Scientist" (and other events) at the inaugural Ultimo Science Festival in Sydney. The five-day festival was the brainchild of four cultural institutions in the inner-city suburb of Ultimo, and focused on scientific research, engineering, technology and design. In "Speed Meet a Scientist", members of the public queued up to quiz four scientists within 15 minutes – an exhausting process for their interviewees.

Figure 4.30 Attendees at the Bok lecture. Photo Chris McCowage