Australian Government

Department of Industry
Innovation, Science, Research
and Tertiary Education

AUSTRALIAN ASTRONOMICAL OBSERVATORY

BUSINESS PLAN

2012 - 2013

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1. Divisional Overview

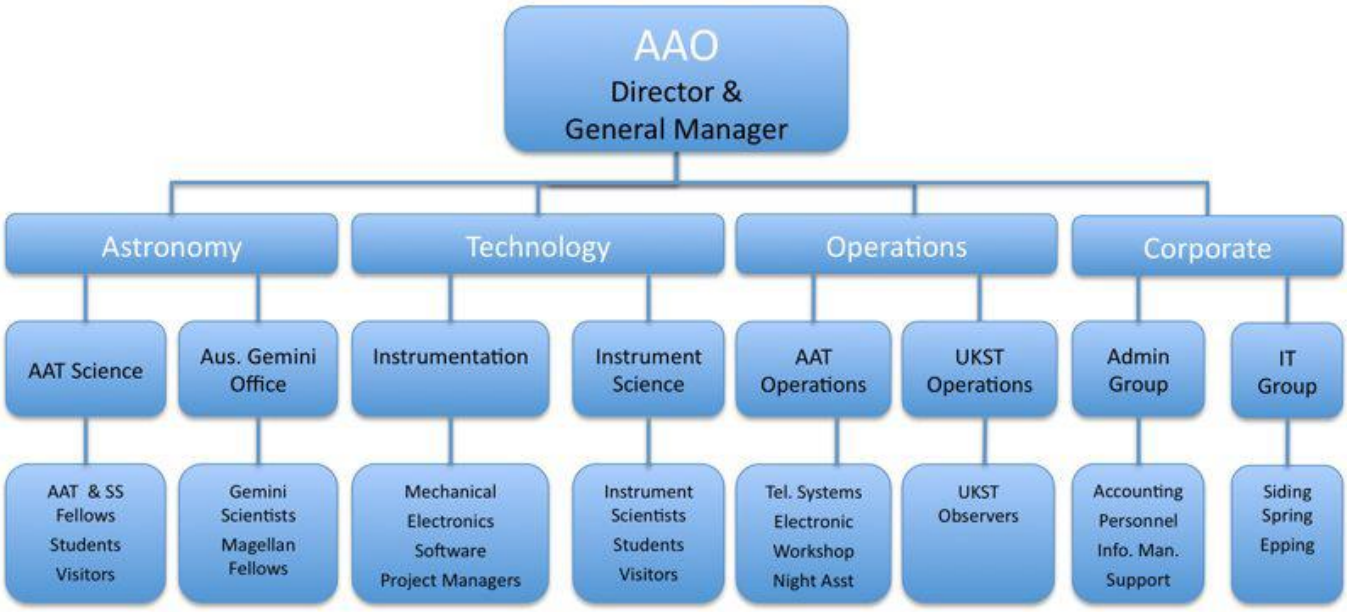
The Australian Astronomical Observatory (AAO) is Australia's national optical and infrared observatory. It operates the Anglo-Australian Telescope (AAT) and the UK Schmidt Telescope (UKST) and manages access to large international telescopes on behalf of the astronomical community. Its mission is to provide world-class optical and infrared observing facilities enabling Australian astronomers to do excellent science. The AAO is a world leader in astronomical research and in the development of innovative telescope instrumentation. It also takes a leading role in the formulation of long-term plans for astronomy in Australia. To carry out these functions the Observatory is part of and is funded by the Australian Government.

The AAO became a Division of the Department on 1 July 2010 under the provisions of the Australian Astronomical Observatory Act 2010 (the Act). It was formerly known as the Anglo-Australian Observatory (established 1971). The Act also established the Statutory Office of Director of the AAO and the AAO Advisory Committee and lists the functions of the new AAO. The Australian Astronomical Observatory Transitional Provisions Act 2010 dealt with the transfer to the Commonwealth of the staff of the former AAO as well as its assets and liabilities.

The AAO has two main physical locations: the 4-metre Anglo-Australian Telescope and the 1.2-metre UK Schmidt Telescope are located at Siding Spring Mountain near Coonabarabran in northern NSW; the AAO's head office and laboratories are located in the Sydney suburb of Eastwood on the grounds of the CSIRO Radiophysics Laboratory. In August 2012 the AAO head office and laboratories will move to new premises at North Ryde.

1.1 Organisation Chart of Division

The Head of Division is Professor Matthew Colless FAA.
The AAO General Manager is Neville Legg.



As outlined above, the AAO is organised into four key activity areas with eight functional Sections:

Astronomy
- covering science on the AAO's 4-metre AAT: AAT Science Group, and
- international access for Australian Astronomers to 8-metre class telescopes: Australian Gemini Office AusGO.

Technology
- covering research and development in astronomical instrumentation: Instrument Science Group,
- the building of such instruments for the AAO's telescopes and for internationally based telescopes: Instrumentation Group.

Operations
- running the activities of the two AAO telescopes at Siding Spring: AAT Operations and UKST Operations

Corporate
- covering Administration (Accounting, Personnel, Information Management, Administration support) and Information Technology Groups

1.2 Operating Environment

The AAO was established on 1 July 2010 as a Division of the Department. The creation of the AAO was a part of substantial Australian Government support for astronomy, including additional funding for the Australian SKA Pathfinder and an SKA data centre, the naming of space science and astronomy as one of three 'Super Science' initiatives leading to 30 to 40 new early-career fellowships in astronomy, provision for a ten percent share in the Giant Magellan Telescope and enhancement to Australian involvement in telescope and instrument contracts.

The AAO's role has evolved from supporting telescopes for Australian and UK astronomers to being the national observatory supporting all of Australia's major optical and infrared astronomy facilities. It also takes a lead role in the formulation of long term plans for astronomy in Australia.

The AAO's legislated functions include supporting Australian access to the various international optical astronomy facilities in which Australia is a partner or participant. Currently these include the International Gemini Partnership (which operates the two 8-metre Gemini Telescopes, one in Hawaii and one in Chile), the Magellan telescopes (which are operated by a US consortium from which Australia buys access), and the Giant Magellan Telescope Organisation (in which Australia has invested a 10% share of the cost of construction of the Giant Magellan Telescope).

These international facilities and arrangements are evolving. Australia will lose access to large telescopes after 2015 unless it either renews its partnership in the Gemini Observatory or (as recommended by the Decadal Plan for Astronomy) becomes a member of the European Southern Observatory (ESO). The mode of funding for these facilities, which has grown organically over time, and which currently involves the Department, the Australian Research Council and Astronomy Australia Limited, also requires review.

The Act also established the AAO Advisory Committee (AAOAC) to advise the Secretary of the department on astronomy matters. Its membership is shown below:-

Committee members	*Institution*	*Category*
Prof Warrick Couch FAA (Chair)	Swinburne University of Technology	Senior Australian astronomer
Prof Brian Schmidt FAA	Australian National University (ANU)	Senior Australian astronomer
Prof Phil Diamond	CSIRO Astronomy and Space Science	Senior Australian astronomer
Prof Roger Davies	Oxford University	Senior international astronomer
Prof Robyn Owens	University of Western Australia	Senior scientist in a related field
Dr Rosalind Dubs	Space Industry Innovation Council	Industry/private sector representative
Dr David Charles	Insight Economics	Person with senior government experience

1.3 People Management

The AAO employs a diverse range of people, including research scientists, software, electronics, optical and mechanical engineers, and computing, administrative and library staff. The scientific and technical staff are recruited from an international pool in order to ensure international competitiveness. Staff members are located at the AAO's headquarters and laboratories in Sydney and the Siding Spring Observatory near Coonabarabran.

Succession planning is a key challenge for the AAO, as it employs a highly specialised and potentially mobile workforce. The AAO will prepare a succession risk management plan in 2012-13, specifically aimed at identifying key positions and appropriate succession arrangements. A key immediate issue is the replacement of the current Director, who will be leaving the AAO at the end of 2012.

Performance management and appraisal have long been part of AAO employment practices. The AAO has revised its performance management and merit advancement arrangements to accord with the Department's Planning, Performance and Review (PPR) framework.

The AAO invests in targeted learning and development opportunities provided by the Department's Learning and Development strategy to support the professional and personal growth of all staff. In addition, the AAO will maintain its long-standing scientific and engineering professional development for staff, including attendance at courses, conferences and seminars and secondments to other institutions. AAO staff are also encouraged to publish scientific research as part of their professional career.

The AAO will maintain its long standing commitment to:

- WH&S, particularly in laboratory, workshop, and telescope operating environments.
- Maintaining work-life balance, flexible work practices, equal employment opportunity, and mutual respect and professional courtesy amongst all staff.
- Industrial democracy, with participation in Departmental Consultative Committees.
- Flexible human resources policies and alignment with Departmental policies where possible.

1.4 Outcomes

Table 1: 2012-13 Portfolio Budget Statement (PBS) outcome and program structure for the AAO

Outcome 2
Production, use and awareness of science and research knowledge, by supporting research activity; training and infrastructure; science communication; skill development; and collaboration, within the research sector and between researchers and industry, domestically and internationally.
Program 2.2 - Science and Research Capacity
The department aims to help Australia achieve a strong science and research capacity through:- promoting a strong culture of collaboration and networking across and between universities, research institutes, government and industry; providing major research infrastructure in a framework that is strategic, national and collaborative; increasing participation in science-based careers; and facilitating and supporting science and research cooperation and strategic alliances with international partners for the benefit of all Australians through increased participation in, and access to, leading scientific research globally.
Objectives
Program objective The objectives of Program 2.2 are to increase use and awareness of science and research knowledge through: *promoting a strong culture of collaboration and networking* *supporting research infrastructure* *increasing participation in science-based careers.*
Deliverables
Support for research infrastructure Support for research collaborations Support for collaborations between the Australian Public Service and the research community Support for international collaborative research projects and relationships Support for increased awareness of science and research in the community.

The AAO's work contributes directly to the achievement of Outcome 2 through:

- Ensuring appropriate access, high quality support and the development of powerful and innovative instrumentation for the existing 4-metre Anglo-Australian Telescope and 1.2-metre Schmidt telescope, both located at Siding Spring Mountain near Coonabarabran in north-western NSW.
- Designing and building instruments for major international telescopes around the world;
- Undertaking research and development for and in partnership with other research organisations;
- Providing support for Australian scientific access to the twin Magellan 6.5-metre telescopes located in northern Chile.

- Supporting Australia's involvement as a partner in the two Gemini 8.1-metre telescopes, located in Chile and Hawaii respectively, by hosting the Australian Gemini Office and developing instrumentation.
- Supporting Australia's involvement as a partner in the establishment of the Giant Magellan Telescope (GMT), and in the development of innovative instrumentation for the GMT.
- Facilitating and supporting science and research through its collaborative work with Australian Universities on research and instrument projects.
- Providing opportunities to undergraduate and postgraduate students to gain research experience and work along side AAO staff.

These activities contribute to the achievement of four of the six departmental strategic priorities of:

- Investment in scientific engagement and awareness;
- Focusing Australia's research efforts;
- Building capability ; and
- Fostering a culture of collaboration.

1.4.1 The AAO Forward Look to 2015

The AAO Forward Look is a strategic review that defines the AAO's goals for the period to 2015 and beyond. It is founded on the *Mid-Term Review of the Australian Astronomy Decadal Plan 2006-2015*.

In 2012-13 AAO will begin to implement some of the priorities identified in the Forward plan. The key priorities are:

- Maximising the research productivity and impact of both the AAO itself and the users of its facilities.
- Determining the effective scientific lifetimes of the AAT and UKST, and developing appropriate and cost-effective operations models.
- Managing the AAO's evolving role at Siding Spring Observatory in light of foreshadowed changes in ANU's role and support.
- Improving the AAO's support model for accessing offshore telescopes where Australia is a partner in an international consortium.
- Planning the AAO's next generation of instruments for all these telescopes, and leveraging the best scientific opportunities for users through the instrumentation program.
- Exploiting the improved facilities of the AAO's new Sydney headquarters to energise and advertise the organisation.
- Recruiting and nurturing world-class staff.
- Maintaining good relations with the astronomy community by being responsive to changing needs and effective in delivering services.

The Forward Look recommends 30 specific actions the AAO should carry out in order to improve the performance of its legislated functions and work towards the goals of the Decadal Plan for Astronomy (as updated in the Mid-Term Review).

1.5 AAO Achievements in 2011-12

1.5.1 Education and Research

The AAO continues to maintain a high level and quality of scientific output (i.e. high productivity, measured by the number of scientific papers, and high impact, measured by the citations to those papers).

- The Australia Research Council noted in a recent publication[1] that "Australia's citation performance in the astronomical sciences is very strong, with a citation rate well above the world average. All sectors and schemes with sufficient publication output to be analysed are publishing in journals with a similar relative impact, although in terms of relative citation impact, it is the Other Government sector that stands out. The bulk of these publications come from the Anglo-Australian Observatory."
  [1]*ARC supported research 2010: The Impact of Journal Publication Output 2001-2005.*

- In their international survey of the productivity of the world's telescopes based on research paper citations and their impact on science, Trimble and Ceja (2008) ranked the Anglo-Australian Telescope (AAT) as first in the world in the 4-metre class, and fifth in the world for all optical telescopes (which includes the Hubble Space Telescope and some 8-metre class telescopes) - a remarkable achievement and a powerful testament to the research productivity and international recognition of the AAT.

Major achievements in 2011-12 in this area include:-

- WiggleZ survey completed observations and has published the key survey papers.

- The AusGO/AAO observational techniques workshop held in September 2011 attracted over 50 students and researchers from around Australia.

- The fifth Southern Cross Conference, sponsored jointly by AAO and CSIRO, was held in June and was attended by about 100 astronomers, with about 30 international participants.

- The Magellan telescope oversubscription was in excess of 4.0 in both 2011B and 2012A.

- An increase of more than 50% in the number of Australian Gemini and Magellan publications.

- SIEF John Stocker Postdoctoral fellowship awarded to the AAO.

- Two AAO staff members were awarded prizes from the Australian Society of Astronomers; two members were recognised through the department's Innovation Scholarships and one staff member received a People Management award.

The AAO has a commitment to support science education and research. AAO staff co-supervise and mentor undergraduate and postgraduate students from Australian universities. This mutually beneficial arrangement will continue, as it allows AAO staff to pass their knowledge

and skills on to Australian students and makes the AAO more productive as a research organisation. In 2011-12 AAO staff jointly:-

- Jointly supervised 30 graduate research students;
- ran a twice-yearly student fellowship program, enabling six undergraduates to gain research experience; and
- provided five PhD top-up scholarships.

As well as providing a significant source of training for the next generation of Australian astronomers, these measures also support the AAO's succession planning for recruitment of professional staff.

1.5.2 Innovative Instruments

The AAO has developed and built many innovative instruments that have led to breakthroughs in astronomical observation and discovery.

Currently, with NCRIS and EIF funding, the AAO is building a next-generation spectrograph for the AAT – HERMES, the High Resolution Multi-object Echelle Spectrograph – that will unravel the formation of the Milky Way. Work is continuing on this project in 2012-13, which is expected to be completed in March 2013.

The Association of Universities for Research in Astronomy Inc (AURA) is seeking to build a new instrument, Gemini High Resolution Optical Spectrograph (GHOS), for the Gemini Observatory. The AAO was awarded the one of three contracts for first stage of the GHOS project, the concept design study. This was successfully completed in June 2012; a decision on whether the AAO will proceed to the next stage is expected in July 2013.

ARC LIEF and collaborating Partner funds are being used to construct KOALA - a new integral-field capability for the Anglo-Australian Telescope. This project commenced in 2011-12 and will be completed in 2012-13.

In 2011-12, the AAO completed the first stage of GNOSIS and was able to demonstrate its OH-suppression capability. The AAO participated in the successful LIEF bid for the GNOSIS-J project, led by the University of Sydney, which will fund the completion of this revolutionary OH suppression spectrograph for the AAT. The GNOSIS-J project brings together leading Australian astronomers to make use of recent technological advances in photonics (a key strength of Australian research and industry) to provide a dramatic improvement in observational sensitivity at near-infrared wavelengths. This will allow new observations of the deep universe.

The AAO also completed a design study for the Many-Instrument Fibre System (MANIFEST) fibre system for the Giant Magellan Telescope (GMT). MANIFEST has been selected by the GMT project as one of the first generation of instruments that will be built for this world-class new facility.

1.5.3 AAT and UKST Refurbishment

The AAO undertook some major refurbishment work in 2011-12 to ensure that the AAT and the UKST can continue to support the astronomy community for the next decade. This work included:

- A major upgrade to the AAT dome shutter emergency brakes;
- Painting of the AAT and UKST domes;
- AAT dome crane upgrade;
- Refurbishment of the spectrograph room in the AAT to house the HERMES instrument.

1.5.4 Accessing Offshore Telescopes

Departmental funding was provided via Astronomy Australia Ltd to purchase a further two semesters of access for Australian Astronomers to the Magellan telescopes in 2013 and 2014, to underpin Australian observer travel support to access 8-metre telescopes, and for the Australian Gemini Office and its Undergraduate Summer Studentships in Chile.

1.5.5 Key Performance Indicators 2011-12

The AAO has a set of key performance indicators used to measure outcomes against both its own past performance and its international competitors. The KPIs for 2011-12 are summarised in the table below.

KPI Table: AAO Key Performance Indicators for 2011-12

KPI	Description
1	Australian and overseas users of AAO facilities
2	Marginal over-subscription rate for AAO facilities
3	Publications from AAO facilities and AAO staff
4	Adjusted (5-year) citations for papers from AAO facilities and AAO staff
5	Level of satisfaction of astronomers with AAO facilities

KPI	Table Ref	Measure	AAT	UKST	Gemini	Magellan	AAO Staff	Other	Total (unique)
1	KPI-1	No. of Users	159	40	73	20	–	–	120
2	KPI-2	Oversubscription Rate	1.5	*	2.1	4.4	–	–	2.3
3	KPI-3	No. of Publications	53	31	12	1	146	128	222
4	KPI-4	No. of Citations (5yrs)	2964	9903	623	56	7679	6919	20365
5	KPI-5	Level of satisfaction	4.5						

The performance of the AAO over the past five years, as measured by these KPIs, is summarised in the following figures.

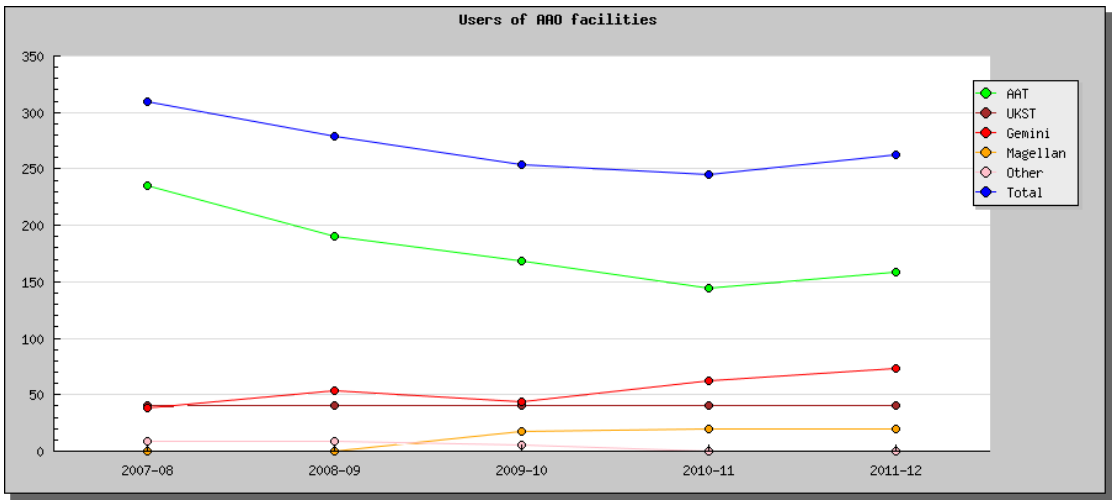


Figure KPI-1: Number of users of AAO facilities over the past five years. The decrease in the number of AAT users associated with the withdrawal of the UK from the Anglo-Australian Observatory has now bottomed out, and the last year has seen a modest increase. Usage of other telescopes is constant or slightly increasing.

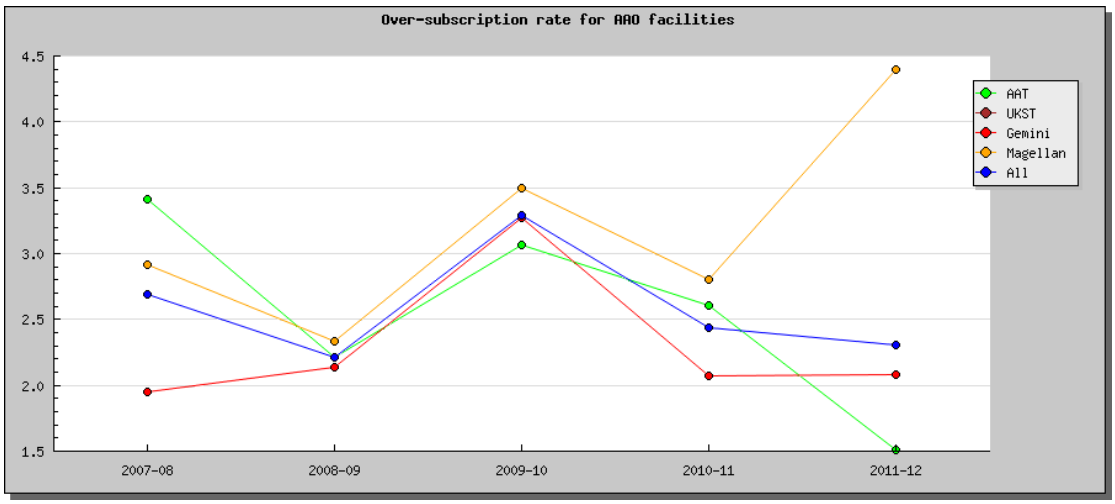


Figure KPI-2: Over-subscription rate for AAO facilities over the past five years. For all facilities demand has been strong during this period, with the over-subscription rate in the current year in the range 1.5-4.5 for all facilities. The decrease in demand for the AAT is expected to turn around strongly when the new HERMES instrument comes on-line in 2013, and when a call for new Large Programs is made.

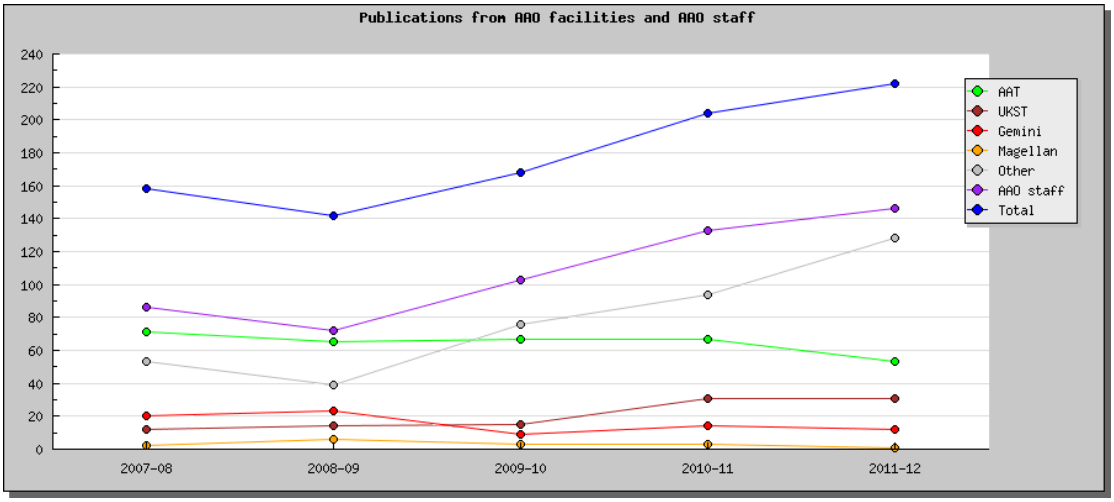


Figure KPI-3: Publications from AAO facilities and AAO staff over the past five years; currently publications are showing a strong increasing trend overall. The decrease from the AAT is the lagging consequence of the reduced number of users since the UK withdrawal, and should turn around following the more recent increase in usage (see Figure KPI-1).

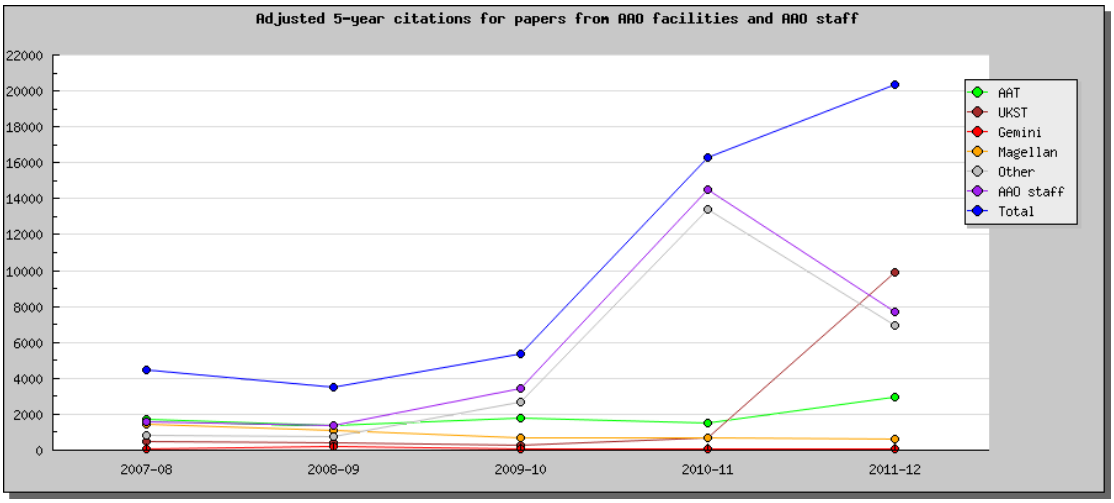


Figure KPI-4: Adjusted 5-year citations for papers from AAO facilities and AAO staff for the past five years. The average citations-per-paper is about 25, which is extremely high (the average 5-year citations for all astronomy papers is about 12). Citation rates are also showing an increasing trend. Note that the numbers for the most recent year are subject to larger fluctuations.

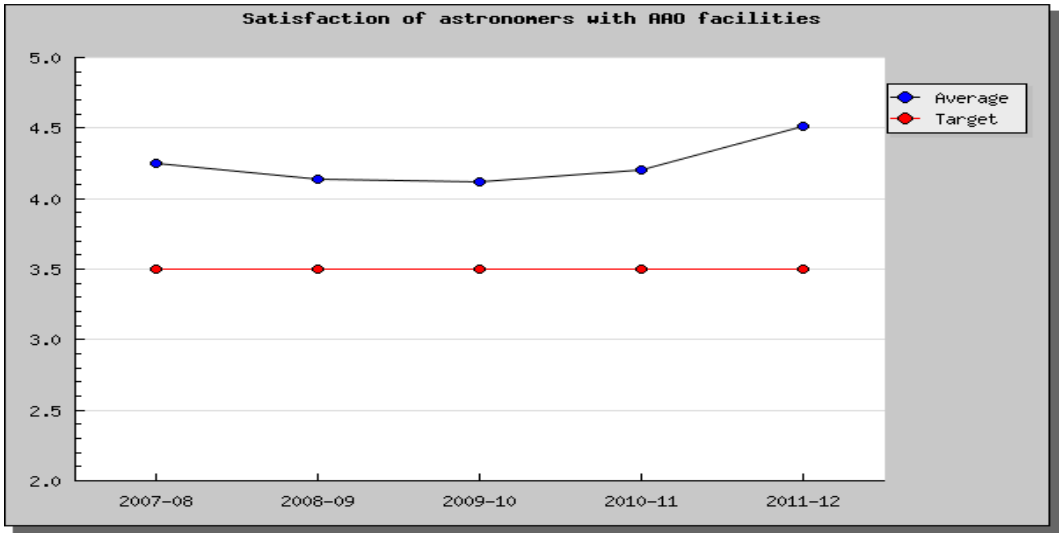


Figure KPI-5: The satisfaction level of AAT users, averaged over all categories, for the past five years. The target level is 3.75, which has been comfortably exceeded at all times. It is worth noting that the data for 2011-12 show that satisfaction levels were greater than 4.0 in all individual categories for the first time.

1.6 Priorities for 2012-13

The AAO's major priorities for 2012-13 are:

- Implementing the AAO Forward Look actions;
- Relocating the head office and laboratories to North Ryde;
- Recruiting a new Director;
- Resolving long-term national access to 8-metre class optical telescopes including ensuring that GMT proceeds to construction phase and making the case for Australia to join the European Southern Observatory by 2015;
- Commissioning of the HERMES instrument including marketing outcomes to the user community and participating in survey teams utilising HERMES;
- Completing the observational phase of the RAVE survey in January 2013;
- Co-ordinating the Southern Cross Astrophysics Conference Series VI in June 2013;
- Ensuring strong Australian representation at the Gemini Science and Users Meeting in San Francisco in July 2012;
- Implementing the AusGO strategic plan, including refilling the Deputy Gemini Scientist positions;
- Trialling remote observing with the AAT and remote eavesdropping with the Gemini and Magellan telescopes;
- Ensuring access to and support for Australian astronomers using the AAO's facilities at Siding Spring and the Gemini and Magellan facilities in Chile and Hawaii;
- Constructing new astronomical instrumentation and upgrades to improve the functionality of the AAT (including CURE, CYCLOPS2, KOALA and Praxis);
- Continuing work on MANIFEST for GMT to develop the design and build prototypes;
- Undertaking the preliminary design of the GHOST instrument for Gemini, if AAO is successful in winning the contract;
- Planning the next major instrument for the AAT, including design studies for Hector and Veloce;
- Performing astronomical research, in collaboration with national and international agencies and as a partner in CAASTRO (the ARC Centre of Excellence for All-Sky Astrophysics);

- Providing advice to the Minister, Department and the Australian community on major astronomical issues;
- Representing Australia at international conferences and scientific forums;
- Providing appropriate training and development opportunities for AAO staff;
- Maintaining support for undergraduate and postgraduate students, including supervision of 30 graduate research students by AAO staff, a twice-yearly undergraduate fellowship program, and providing three PhD top-up scholarships, including one for an instrumentation project; and
- Supporting the Distinguished Visitor program, which is designed to provide opportunities for AAO staff to benefit from longer term collaborative visits by eminent international colleagues.

The AAO provides support for the generation of scientific knowledge in survey astronomy by supporting ambitious large observing programs. These programs use AAO instruments to compellingly address major scientific questions with allocations of telescope time ranging from 50 nights to hundreds of nights over several semesters. At least 25% on the time on the AAT is given to large projects; and ambitious projects are encouraged through not setting an upper limit on the fraction of time awarded to such projects. Major observing projects planned for 2012-13 include:

- Anglo-Australian Planet Search – the hemisphere's most precise planet search program.
- RAVE – a survey using stellar kinematics and abundances to probe the history of our Galaxy.
- GAMA - a redshift survey of 250,000 galaxies to study galaxy structure and evolution.
- A survey using the new SAMI instrument of several thousand galaxies, providing the largest statistical sample to date to explore the internal astrophysics of galaxies.
- Pilot observations for the GALAH survey, using the new HERMES instrument on the AAT to measure up to 1,000,000 stars within our Milky Way Galaxy and study its formation history.