Astronomy Australia Ltd.

2011 / 12 Annual Report

Gemini Observatory/AURA

Gemini Observatory Legacy Image

Astronomy Australia Limited

Vision

Astronomers in Australia will have access to the best astronomical research infrastructure.

Mission

AAL will achieve its vision by:

1. Engaging with Australian astronomers to advance the national research infrastructure priorities of the Australian astronomy decadal plan.
2. Advising the Australian Government on future investments in national astronomical research infrastructure.
3. Managing investments in national astronomical research infrastructure as required.

Principles

1. Access to major astronomical research infrastructure should be available to any Australian-based astronomer purely on scientific merit.
2. The concept of national astronomical research infrastructure includes Australian participation in international facilities.
3. The AAO and CSIRO are empowered by the Australian Government to provide a component of the national astronomical research infrastructure and there is no need for AAL to directly manage investments to upgrade or operate the AAT and ATNF.

Front cover image

Gemini Legacy image of the complex planetary nebula Sh2-71 as imaged by the Gemini Multi-Object Spectrograph on Gemini North on Mauna Kea in Hawai'i. A research team, led by Australian astronomers David Frew and Quentin Parker (Macquarie University, Sydney) are studying the dimmer, bluer star to understand its nature. The long-assumed central star is the brightest star near the centre, but the much dimmer and bluer star (just to the right and down a little) might be the parent of this beautiful object. The image is composed of three narrow-band images, and each is assigned a colour as follows: H-alpha (orange), HeII (blue) and [OIII] (cyan).
Image credit: Gemini Observatory/AURA

Background image

Dipoles on one "tile" of the Murchison Widefield Array; one of the first telescopes with no moving parts.
Image credit: David Herne, ICRAR

AAL Membership as of 30th June 2012

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A message from the Chair

In last year's Annual Report, my message foreshadowed some significant changes and new directions for AAL, and it is pleasing to report here the successful implementation of many of them.

First and foremost was the Board's decision to simplify and revise AAL's vision and mission, and to set a number of clear objectives for the next few years. There were also changes and new challenges on the funding front, with AAL's original National Collaborative Research Infrastructure Strategy (NCRIS) grant having come to an end, but with a new $10M Education Investment Fund (EIF) grant to manage. This notwithstanding, there remained an important need for AAL to identify and secure new research infrastructure funding. In terms of the operation of AAL as a public company, it had become clear that some changes were needed to have it run more efficiently and effectively. Furthermore, it needed to do better in the way it selected and appointed people to its advisory committees, and to achieve a better gender balance.

The Board's decision to set seven major objectives, each defined by a series of sub-objectives, has been a good one in focussing AAL on its key priorities and measuring its performance more quantitatively. In 2011/12, excellent progress was made on most of these objectives; the only one that did not progress was the delivery of a new astronomy research infrastructure investment plan as a result of the government not moving to provide any successor program to NCRIS in the 2012 Budget. The two objectives where AAL did particularly well was in securing new funding and in the management of the astronomy EIF program. The award of a total of $2.8M in new research infrastructure grants is an outstanding result in a difficult financial environment. Moreover, the award of a $1.7M National eResearch Collaboration Tools and Resources (NeCTAR) grant which will allow AAL to significantly expand its activities in the e-Research domain through overseeing the All Sky Virtual Observatory project, is most gratifying. The excellent progress and significant successes with all the infrastructure projects funded by AAL's EIF grant can clearly be seen in the project reports contained in this document.

Of course there are objectives that have not yet been achieved and require more work. Top of this list is Australia gaining membership of European Southern Observatory (ESO). Here, AAL continued to present the potential benefits of ESO membership to government, primarily through the 2011 Strategic Roadmap for Australian Research Infrastructure consultation process. Having ESO mentioned and recognised as an effective model for investing in and managing large-scale research infrastructure within this document, is a significant step forward. In addition, Deputy Secretary Patricia Kelly from DIISRTE visited ESO's Headquarters in Garching in September 2011, coming away with a good understanding of the opportunities presented by ESO.

Throughout this last year, AAL continued to be very well served by its advisory/ancillary committees, which grew to a total of five with the creation of the Australian Supercomputer Time Allocation Committee (ASTAC). The Board is very grateful to all those within our community who give of their time and expertise in serving on these committees. Mindful of the need to have the right set of skills and expertise on these committees, and to work towards a better gender balance, the Board decided to formalize more the committee appointment process. The key changes are an annual call for applications for appointment, and the creation of an Appointments Committee (a sub-committee of the Board). An important role of the latter is to consult the committee chairs as to skill and expertise requirements, and to make appointments accordingly. This new approach appears to have worked well in its first year, although there is still some way to go in reaching the Board's target of at least 25% of committee members being female.

With AAL turning five in April 2012, it was felt timely to review its processes and systems as a company, to better place it for its operation into the future. The decision was made to bring AAL's finance management in-house, with Sue Russell being appointed as Finance Manager. Given the growth in the number of grants AAL manages, it was also decided to employ a Project Officer. Dr Mita Brierley was appointed to this position. In addition, Dr Yeshe Fenner was appointed as Executive Officer, after the departure of Amanda Kocz. With these additions, AAL's staffing levels have now grown from 2.5FTE to 3.8FTE. In addition to having more staff, most importantly AAL has an excellent team, which has already made a very positive impact on AAL's operations and its dealings with its members and stake-holders.

Finally, it has been a highly eventful year for the Board with the award of the 2011 Nobel Prize in Physics to one of its Directors, Prof Brian Schmidt. Not many boards can boast having a Nobel Laureate as one of its directors, and AAL is very fortunate that Brian continues to make himself available and give so generously of his time after such a 'life-changing' event. In November 2011, Prof Jeremy Mould finished his three year term on the Board, and I would like to warmly thank him for his many valuable contributions to AAL during this time. Prof Stuart Wyithe was the newly elected Director to the Board, and it has been a pleasure to have him join us and take responsibility for overseas optical telescope access, including becoming Australia's representative on the Gemini Board.

Prof Warrick Couch
Chair

A message from the CEO

AAL can celebrate another successful year, having made significant progress with a variety of projects and secured $2.8M in new grants for astronomy infrastructure. The largest new award was from the National eResearch Collaboration Tools and Resources (NeCTAR) programme to commence the All Sky Virtual Observatory (ASVO) project. The other major grants were from the Australian Government to support Murchison Widefield Array (MWA) operations, and to continue Australian access to the Magellan telescopes. Minor grants were secured to assist with planning for engagement with the Atacama Large Millimeter/submillimeter Array (ALMA) and Chinese telescopes in Antarctica.

In addition to securing new funds, project highlights during 2011/12 include: a workshop in September 2011 to agree the final MWA construction plan and excellent progress expanding the MWA to a 128-tile system; the deployment of PLATO robotic observatories to Dome A and Ridge A in Antarctica in January 2012; upgrading the C/X receiver systems on the Australia Telescope Compact Array; and the commencement of gSTAR supercomputer operations in February 2012.

One of AAL's major responsibilities involves Australian access to overseas telescopes. Following advice from AAL, the Australian Research Council signed the amendment to the International Gemini Partnership Agreement which extended Gemini's operations until December 2015. AAL had already secured the grants necessary to fund Australia's operational share of that extension, and transferred the total payment of USD 5 million to the US National Science Foundation in June 2012. While Australian astronomers continue to receive the majority of their access to large optical telescopes via the Gemini Observatory, AAL recognises the strong interest in the European Southern Observatory (ESO), and will continue to pursue the ESO option.

During 2011/12 AAL's eResearch activities increased substantially. In February 2012 AAL's Astronomy Supercomputer Time Allocation Committee (ASTAC) made its first call for proposals for astronomy-dedicated high-performance computing resources. By June 2012 ASTAC was allocating time on the National Computational Infrastructure (NCI) peak system, gSTAR, and the Pawsey Centre's Epic and Fornax systems. In May 2012, following extensive consultation and planning, AAL commenced the ASVO project, in partnership with NCI/Australian National University, Swinburne University of Technology, and Intersect Australia Ltd. ASVO will bring together optical survey data from the SkyMapper telescope with theory data held on gSTAR. AAL is taking

a more direct role in managing ASVO compared to the other projects it oversees as there is no agreed Australian centre to lead astronomy eResearch projects. To address this missing hub, in May 2012 AAL submitted the Federation of National Astronomy Datasets - Concept Design Study to the Australian Government. The report recommends the establishment of a facility to be titled the Australian Centre for Astronomy Data. This centre would house a permanent infrastructure development and research support team to build services and provide on-going support for astronomers around Australia. The investment required to realise such a centre is estimated at $5.9 million over five years.

On 18th April 2012 AAL reached its fifth birthday. AAL's internal systems and processes, and staff positions, had changed little during these first five years. It was therefore appropriate to review AAL's operational model in consideration of our evolving portfolio of projects, activities and responsibilities. The key drivers for change were AAL's significant new activities in the eResearch domain, summarised above, and the increased financial and reporting complexity associated with multiple grants instead of one large grant. As an example of this complexity, AAL's first annual report listed one grant liability, whereas this annual report covers nine grants and three grant-reserves. To address its eResearch responsibilities and to cease out-sourcing many of its accounting and company compliance tasks, AAL has increased its staffing levels by 1.5FTE and changed a number of internal systems. I'm delighted to report that these operational changes have been successfully implemented and AAL is now even better positioned to continue to add value to Australian astronomy.

Mr Mark McAuley
CEO

Project Reports

Placement of a tile for the Murchison Widefield Array at the Murchison Radio-astronomy Observatory site in Western Australia. Image credit: Peter Wheeler, ICRAR

Gemini

Providing its astronomers with sufficient access to the largest aperture optical telescopes remains one of the highest priorities of the Australian astronomical community. AAL has successfully worked with the Australian Government to secure Australia's 6.19% share in the Gemini Observatory until 31st December 2015, which enables continued access by Australian-based astronomers to Gemini's twin 8.1-metre telescopes on Mauna Kea in Hawaii and Cerro Pachon in Chile.

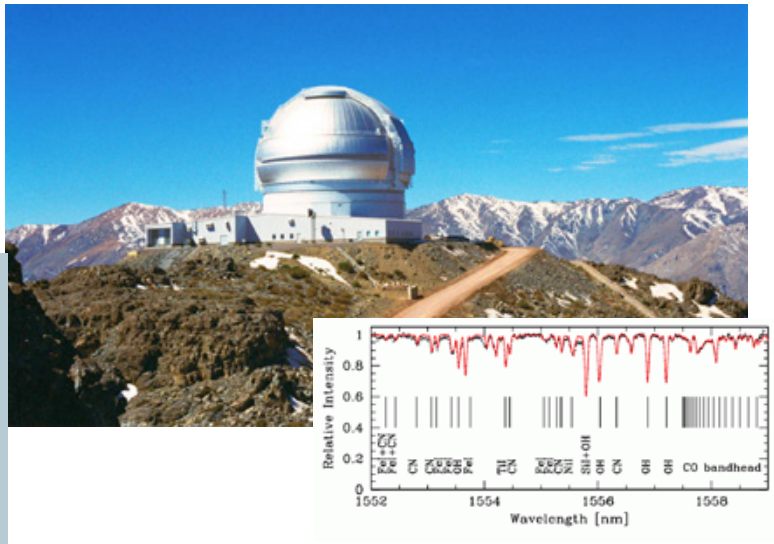
Following advice from AAL, the Australian Research Council (ARC) signed the amendment to the International Gemini Partnership Agreement which extended Gemini's operations from December 2012 until December 2015. AAL had already secured the grants necessary to fund Australia's share of that extension, and transferred USD 5 million to the US National Science Foundation (NSF) in June 2012.

AAL acknowledges the support and funding from the ARC, the Department of Industry, Innovation, Science, Research and Tertiary Education (DIISRTE) and the Australian Astronomical Observatory (AAO). All have played a critical role in cementing Australia's ongoing partnership in the Gemini Observatory. The other Gemini partners who have committed funding until 2015 are the USA, Canada, Argentina and Brazil.

A total of 79 astronomers (including 23 PhD students) from 12 Australian institutions were involved in submitting 66 proposals for queue time with Gemini in 2011/12. These figures are slightly higher than in the previous financial year, when 75 astronomers submitted 58 proposals. Collaborators from 82 foreign institutions were involved in the 2011/12 proposals, with half of all Australian proposals including investigators from one or more foreign institutions. The oversubscription factor (ratio of hours requested to total hours available, assuming no weather loss) for the year was 2.05. In total, 44 proposals involving 53 astronomers (13 of whom were PhD students) from 9 institutions were allocated Gemini time. Over the past year, 43 papers were published in refereed journals based on Gemini data and involving Australian authors, *a near-doubling of the 22 papers published in 2010/11*.

Gemini Science Highlight

ARC Super Science Fellow Alan Alves-Brito and his colleagues at the Research School for Astronomy and Astrophysics (RSAA) at the Australian National University (ANU) have found the first evidence for multiple generations of stars in the globular cluster M22, using the Phoenix high-resolution near-infrared spectrograph on Gemini South to observe 9 red giant stars in this cluster. This finding challenges the theory that all globular clusters formed their stars when the Universe was still quite young. The observations showed a significant spread in the abundances for iron, sodium, carbon, nitrogen, oxygen, and even fluorine between each of the stars, confirming that M22 has had quite a complex star formation history, with chemical enrichment from both high-mass and low mass stars.



Unique instrumentation on Gemini South (top) provides precise information on the chemical composition of stars from their IR spectra. Observed and best synthetic spectra of a red giant star in M22 in the H band (bottom) reveal several atomic and molecular lines, highlighting the need for high spectral resolution to separate these features.

Gemini Instrumentation

In delivering on its goal to provide astronomers in Australia with access to the best infrastructure, AAL also seeks to ensure that the telescopes to which Australia has access are equipped with the state-of-the-art in instrumentation. For Gemini, this includes instrumentation that best exploits the superb imaging capability of the telescope. The Gemini Multi-Conjugate Adaptive Optics System (GeMS), currently being commissioned, represents a major advance in delivering diffraction-limited imaging over a wide-field. GeMS consists of the Canopus optical bench (a 50 W laser to produce a "constellation" of 5 laser guide stars) and the Gemini South Adaptive Optics Imager (GSAOI). GSAOI was designed and built by RSAA.

Other relevant Gemini instrumentation developments include the submission of a bid for the Gemini High-resolution Optical Spectrograph (GHOS), by an AAO/Macquarie University/RSAA and Kiwistar (NZ) team. A decision on which concept(s) will proceed to the Preliminary Design phase is expected shortly. In addition the Gemini Observatory are implementing a fibre feed from the Gemini North telescope to an Echelle SpectroPolarimetric Device for the Observation of Stars (ESPaDOnS) instrument within the Canada-France-Hawaii Telescope building 80 metres away on Mauna Kea as an interim step towards a high-resolution optical spectroscopy capability.

New red-sensitive CCD detectors from Hamamatsu are due to be installed into the Gemini Multi-Object Spectrograph (GMOS)-North optical imager and spectrograph in early-2013. Similar detectors funded from an AAL Education Investment Fund (EIF) grant will be installed into GMOS-South soon afterwards.

Magellan

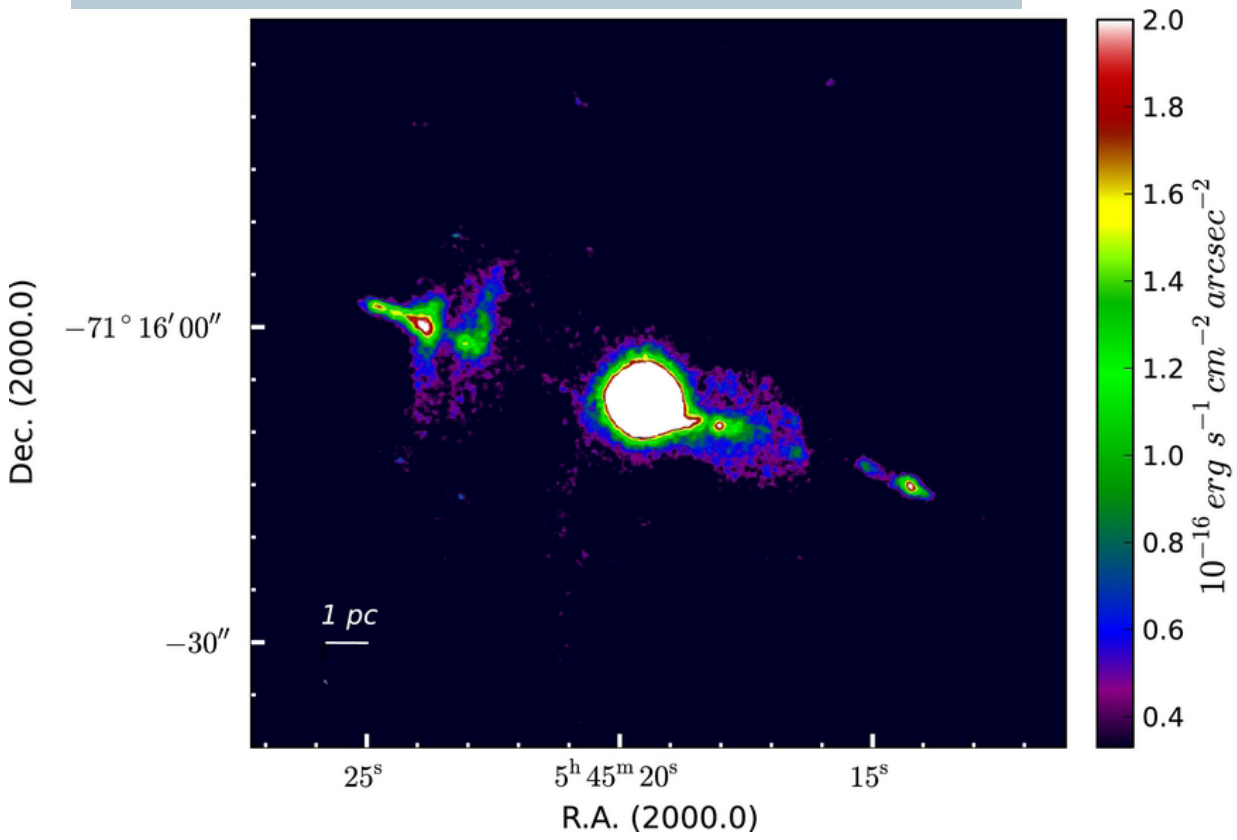
To extend Australia's access to 8m-class optical telescopes, AAL continues to purchase 15 nights per year on the 6.5m Magellan Telescopes at Las Campanas Observatory in Chile. This brings Australia's share of an 8m-class telescope equivalent to approximately 17%; approaching the Decadal Plan goal of 20%. It also extends the range of instrumentation offered to Australian astronomers on 8m-class telescopes, as Gemini and Magellan provide complementary instrumentation, exploiting the relative strengths of both telescopes; image quality (Gemini), wide field (Magellan).

A total of 44 astronomers (8 of whom were PhD students) from 12 Australian institutions were involved in submitting 25 proposals for observing time with Magellan in 2011/12. The number of astronomers and submitted proposals were 30-40% higher than in 2010/11. Collaborators from 31 foreign institutions were involved in the 2011/12 proposals, with 80% of proposals having investigators from one or more Australian institutions collaborating with investigators from one or more foreign institutions. The oversubscription factor (ratio of nights requested to total nights available) for the year was 4.4, *nearly double that for 2010/11*. In total, 7 proposals involving 39 astronomers (3 of whom were PhD students) from 7 institutions were allocated time on Magellan. All of Australia's Magellan time is classically-scheduled, and in 2011/12 almost 90% of Australia's nights on Magellan were usable, with only a small amount lost to poor weather. In the past year, 13 papers were published in refereed journals based on Magellan data and involving Australian authors, *twice as many as were published in 2010/11*.

Magellan Science Highlight

Australian Magellan Fellow Francesco Di Mille and colleagues in Chile discovered a giant, highly-collimated jet emanating from the variable emission line object known as “Sanduleak’s star” in the Large Magellanic Cloud, a satellite galaxy of the Milky Way. Imaging and spectroscopy with the Magellan telescopes show a jet nearly 50 light years across, making this the largest stellar jet ever seen. The jet appears to have a similar chemistry to matter ejected from Supernova 1987A, and to the Luminous Blue Variable star Eta Carinae, suggesting that Sanduleak’s star has already undergone eruptive outbursts, with more to come.

Image of Sanduleak’s star obtained with the MagIC instrument on the Magellan Clay telescope in a filter which highlights emission from ionized hydrogen and nitrogen. Note the long, linear jet feature extending in both directions.



The Australian Gemini Office

The Australian Gemini Office (AusGO) was established to ensure that Australian-based astronomers maximise their access to the Gemini and Magellan telescopes. Operated by the AAO on behalf of AAL, AusGO coordinates Australia's usage of Gemini and Magellan time by issuing calls for proposals; acting as first point of contact for prospective Australian applicants; technically assessing proposals on behalf of the Australian Time Assignment Committee; assisting successful Australian Principal Investigators with preparing their programs; providing guidance on how to reduce and analyse new and archival data; and helping promote Australian science from Gemini and Magellan to the media and general public. AusGO comprises five astronomers: the Australian Gemini Scientist Dr Stuart Ryder and Deputy Gemini Scientist Dr Simon O'Toole, both based at the AAO; Deputy Gemini Scientist Dr Christopher Onken based at RSAA; and 2 Magellan Fellows.

AusGO coordinates the Australian Gemini Undergraduate Summer Studentship (AGUSS) program sponsored by AAL. Under this scheme, two Australian undergraduate students spend 10 weeks working at the Gemini South headquarters in La Serena, Chile on a research project supervised by Gemini staff.

AusGO, with assistance from other AAO staff members and the Gemini Observatory, organised a workshop on optical and infrared observational techniques, focusing on the facilities offered on the Anglo-Australia Telescope (AAT), Gemini and Magellan telescopes. This workshop, held between the 30th of August and 2nd of September 2011, was attended by over 50 students and postdoctoral researchers and showcased some 20 speakers. It is planned to hold similar workshops every second year from now on.

Participants at the 2011 AusGO/AAO Observational Techniques Workshop. Image credit: Angel Lopez-Sanchez (AAO).

Giant Magellan Telescope

The Giant Magellan Telescope (GMT) is a next generation optical/infra-red telescope to be located at the Las Campanas Observatory site in Chile, at an elevation of over 2,500 metres. It will combine seven 8.4-metre mirror segments to give the resolving power of a 24.5-metre primary mirror. To advance the Decadal Plan strategy for Australian participation in Extremely Large Telescopes (ELTs), AAL invested in the GMT Organisation at a level designed to secure a 5% share in the project at the end of its Design and Development Phase. The ANU is also a 5% partner, ensuring that Australian participation in GMT at the 10% level is fully funded until the end of construction.

AAL is representing Australia's interests in GMT through the following roles:

- GMT Board: Matthew Colless, AAO and Mark McAuley, AAL
- GMT Finance Committee: Mark McAuley, AAL (Chair)
- GMT Science Advisory Committee: Chris Tinney, UNSW

Artist's conception of GMT on the peak of Cerro Las Campanas in Chile.

Image credit: GMTO Corporation

GMT Construction Highlights

- The GMT project is continuing its Design and Development Phase and preparing for a Preliminary Design Review (PDR) in early 2013. AAL will consult with the community and its Optical Telescopes Advisory Committee to ensure that Australian astronomers' needs are represented during evaluation of the PDR.
- The first of GMT's seven mirror segments has been polished to within specifications, retiring the greatest technical risk to the project. The second mirror was cast inside a rotating furnace in January 2012 and will hang vertically for several months while being cleaned, before polishing begins. The glass for the third mirror has been ordered and is scheduled for casting in late-2012/early-2013.
- Work began in March 2012 to blast more than 3 million cubic feet of rock from GMT's mountaintop position at the Las Campanas Observatory, as part of the site levelling and preparation works prior to the construction of GMT.

Antarctic Astronomy

Antarctic astronomy, and the unique observing advantages afforded by the high Antarctic plateau, were identified in the Decadal Plan as being important opportunities to pursue. AAL has maintained Australia's strategic position in Antarctic astronomy by investing in robotic observatories called PLATOs ("PLATeau Observatory"). PLATOs have been pioneered and constructed by the University of New South Wales (UNSW), and currently support Chinese, Japanese and US instruments. These international partnerships offer an excellent opportunity to leverage AAL's investments in Antarctic astronomy and maximise the scientific return to Australia. The Antarctic astronomy infrastructure projects funded by AAL in 2011/12 are described below.

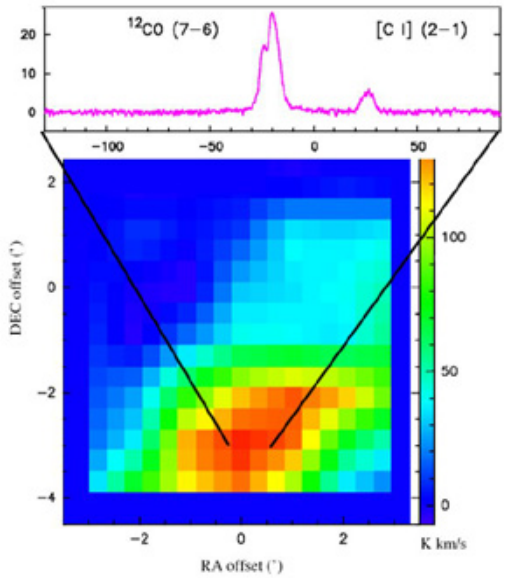
PLATO-R

PLATO-R is part of a project to establish a 0.6-metre aperture High Elevation Antarctic Terahertz telescope (HEAT) at Ridge A, a remote location in Antarctica. Satellite observations indicate that Ridge A is likely to be the best place on earth for conducting terahertz observations, which can otherwise only be performed from a high-altitude balloon or from space. The main science driver for PLATO-R is to map the Milky Way Galaxy at terahertz frequencies, which will provide unique insights into how stars form.

UNSW was able to bring forward the deployment of PLATO-R by one year. The installation of PLATO-R and the telescope was part of a 7-week trip to Antarctica undertaken by four members of the UNSW team and three collaborators from the University of Arizona. The observatory became operational at Ridge A, on 23 January 2012 following a 3-day expedition from the US Amundsen-Scott South Pole station. The telescope and observatory worked perfectly, and successfully obtained data from January until May 2012, when the initial allocation of 800 litres of fuel was exhausted. The data were analysed using the computers within PLATO-R, and the results returned to UNSW via Iridium satellite. PLATO-R is now hibernating, awaiting sunrise later in the year.

Science with PLATO-R

About 10% of the Galactic plane has been mapped using PLATO-R and HEAT, to provide the first ever wide-field, high resolution maps of neutral carbon emission. Neutral carbon emission probes areas within the star forming regions where the gas is mostly molecular, but carbon monoxide has not yet formed. Up to a third of the gas may reside in this region, yet it is invisible to optical or radio observations. Survey data includes superb measurements of trace carbon monoxide molecules and neutral carbon atoms in the massive star formation region NGC3576, yielding information about the velocity of the gas with a resolution of 1 km/s.



Observations of carbon monoxide and neutral carbon in the star forming region NGC 3576, taken using PLATO-R and the 0.6-metre terahertz telescope, HEAT. The plot at the top shows the velocity of the molecules, in kilometres per second.

Antarctic Schmidt Telescopes

The Antarctic Schmidt Telescopes (AST3) project is a new facility being established by the Chinese Centre for Antarctic Astronomy at Kunlun Station, Dome A, Antarctica. AST3 will use three 0.5-metre wide-field optical telescopes to survey the sky at high-precision, yielding data for a variety of scientific programs. These include searching for planets around other stars, rapidly detecting supernova explosions, astroseismology, and studying variable stars.

AAL funding provides important infrastructure support for the Kunlun station through the PLATO-A observatory and the provision of the astronomical instrumentation. PLATO-A is an upgraded model of the original (and still-operational) PLATO, also located at Dome A. PLATO-A was deployed in January 2012 and is the primary support platform for the AST3 project.

The first of three AST3 telescopes began operating on 15 March 2012, running for 54 days. During that commissioning period it observed for 746 hours, collecting 28,500 images and 3.3TB of data.

AAL is funding UNSW to design and build two astronomical instruments for use by AST3: one to measure the sky background radiation through the near and mid-infrared, and the other an all-sky mid-infrared camera to monitor observing conditions. Work on these two instruments began towards the end of the reporting year.

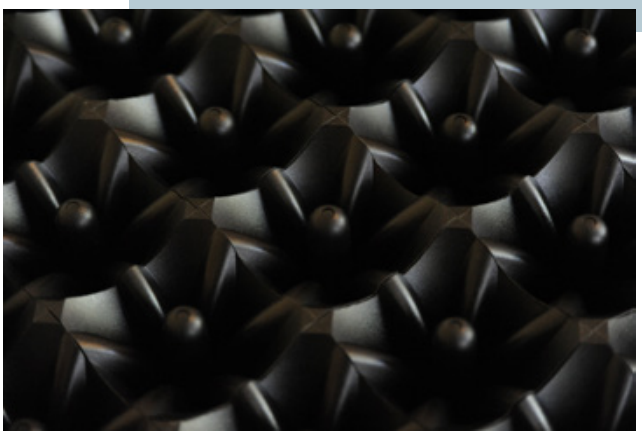
Science with AST3

Over 28,000 images were taken by AST3-1 during the commissioning period, the majority of which will be used to address the main science goals of the telescope. For exoplanet and stellar variability studies over 5,000 images of the Large Magellanic Cloud and 3,400 exposures in the disk of the Galaxy were taken at 30 sec to 1 min cadence. A further 5,000 images were taken of a 1,000 square degree field for the construction of a supernova survey template. As the data volume is too large to transmit via satellite, a full analysis will be undertaken when the data disks are returned from Antarctica in March 2013.

Industry outcomes

AAL's initial investment in Antarctic astronomy infrastructure has largely been targeted at the development of equipment by the UNSW to conduct site characterisation. One of the crucial parameters that characterises an astronomical observatory site is the turbulence in the atmosphere above the site. The special conditions in Antarctica required development of a new instrument, called Snodar, to measure the turbulence with an acoustic radar technique. The instrument was designed and built at UNSW by PhD student Colin Bonner and his supervisor Michael Ashley, and was based on intellectual property gained by UNSW, in part, through AAL's investment. The Snodar technology was then used to start the Fulcrum 3D company. Fulcrum3D has grown into a technology development company based in Sydney employing a team of seven people focussed on instrumentation for the renewable energy sector. Fulcrum3D's flag-ship product is the Fulcrum3D Sodar which is the first Australian designed and built wind profiling SODAR for the wind energy industry.

Acoustic transducers used by Fulcrum3D in their SODAR instrument.



Pierre Auger Observatory

The Pierre Auger Observatory in Argentina is an international project to study ultra-high energy cosmic rays by a scientific collaboration involving 18 countries and almost 500 scientists worldwide. The advantages and opportunities afforded by participation in such programs were recognised by the Decadal Plan, particularly where Australia has unique and valued contributions to make.

AAL is using EIF funds to maintain Australia's role in the Pierre Auger Observatory, by supporting the University of Adelaide to upgrade the Observatory's important cloud detectors. The Observatory relies on Australian expertise in high energy astrophysics and atmospheric fluorescence techniques.

The Observatory operates with 1660 water Cherenkov detectors fitted with photomultiplier tubes that detect Cherenkov light to allow the number of particles in each cosmic ray shower to be estimated. Four sites, each comprising six 4-metre Schmidt telescopes, view atmospheric nitrogen fluorescence light from incoming cosmic ray showers over the 3000 km^2 area of the Observatory.

Atmospheric monitoring is important since the fluorescence detectors often view cosmic ray air showers at distances of over 30 km and corrections must be made for cloud obscuration and the absorption and scattering of the light by molecules and aerosols. Thus the presence of night-time cloud must be monitored over the full Observatory area. The existing infra-red cameras used for cloud monitoring are nearing ten years old, are not radiometric and produce image artefacts that can confuse cloud analysis algorithms. The University of Adelaide, using AAL's EIF grant, is replacing the existing cloud detectors with four radiometric cameras that will enable cloud image analysis to be achieved with greater confidence. Each of the four new cloud cameras will scan across the field of view of each fluorescence detector telescope, plus surrounding areas of sky, to produce images that will provide both data on cloud cover for each fluorescence telescope pixel and real-time all-sky cloud images for observers. The four camera systems are now complete and being calibrated. One is in the field in Argentina. Software is being written to enable automatic data collection. The four camera systems are expected to be operational after a site visit in November 2012.

A Pierre Auger Observatory surface detector station with the Andes in the background.
Image credit: http://www.auger.org.

Pierre Auger cloud camera on a "pan and tilt" platform.
Image Credit: Roger Clay, University of Adelaide.

Murchison Widefield Array

The Murchison Widefield Array (MWA) is a vital part of Australia's radio astronomy infrastructure. It has enormous strategic importance as the low-frequency Square Kilometre Array (SKA) Precursor telescope at the Murchison Radioastronomy Observatory (MRO) – the site chosen by the international community for the SKA low-frequency telescope in May 2012. The MWA also has enormous scientific potential, providing a unique window on the Universe in the 80-300MHz band at the world's best site in this frequency range.

The majority of the Australian funding for the MWA project has been via the National Collaborative Research Infrastructure Strategy (NCRIS) and EIF programs, administered by AAL. Endorsed by AAL's Radio Telescopes Advisory Committee (RTAC), the AAL Board, and the MWA partners, a decision in June 2011 to downscale to a 128 tile array provided fresh focus and saw the MWA Project Team launch into FY2011/12 with an ambitious agenda of development, procurement, deployment and commissioning. Excellent progress over the past year should see MWA delivered by the end of CY2012. AAL continues to support this highly innovative project, securing $400,000 of DIISRTE funds in 2011/12 to support MWA operations during CY2013 and CY2014, to enable high priority science goals to be addressed.

MWA comprises 128 aperture arrays (known as tiles) distributed over a 3 km diameter area. MWA uses novel hybrid hardware/software correlation and real-time imaging and calibration systems. Data products are transferred from the MRO to repositories in Perth via a dedicated high capacity link and will eventually be warehoused and processed at the Pawsey Supercomputing Centre.

The MWA is an inherently versatile instrument with a wide range of potential science goals. The four main science goals of the MWA are to: search for neutral atomic Hydrogen emission from the cosmological Epoch of Reionisation (EoR); study the Sun, the heliosphere, and the Earth's ionosphere; undertake all-sky surveys of the Milky Way galaxy and extragalactic objects; and study transient and variable phenomena.

In late January 2012 the 32 tile MWA prototype (32T) was decommissioned in preparation for the contractor taking control of the site. 32T exceeded the project's expectations for its scientific productivity and provided a tantalising glimpse of the potential of the MWA. Contractor works commenced on site in February 2012. Over the next four months, the site underwent a major transformation—10,000 metres of electrical cable and 16,000 metres of fibre optic cable were laid into more than 6000 metres of trenching; routed to a central hub; and terminated at a compact electrical sub-station and a high density fibre optic patch panel respectively.

The deployment of the MWA 'tiles' was achieved quickly and efficiently thanks to the efforts of the MWA Team and the 'Student Army'.

Image credit: MWA

The first half of FY2011/12 had seen the procurement of most of the major components and sub-systems that make up the MWA, including contracts for the production of the receiver sub-system, antennas, beamformers and timing distribution components. The procurement of ancillary and supporting equipment including ground screens occurred during this busy period. Systems and components continued to be delivered throughout the second half of FY2011/12.

Field trips in Q4 FY2011/12 saw 128 tile locations surveyed and prepared, 128 ground screens assembled, 2048 dipoles assembled and installed, and 60 (of 128) beamformers installed in preparation for the first stages of instrument commissioning. The success of these field trips can be attributed to the dedicated efforts of the MWA Project Team and a 'Student Army' of Curtin University and University of Western Australia (UWA) undergraduates. The MWA project is currently in the final stages of instrument deployment with commissioning scheduled to commence in August 2012.

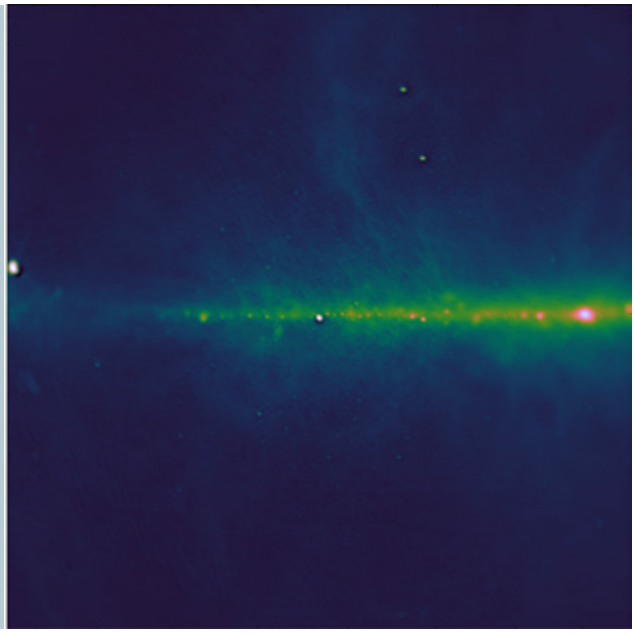
Science with MWA 32T prototype

The science conducted with the 32T prototype during 2011/12 matched or exceeded expectations. Eleven papers were submitted to refereed journals based on science conducted with MWA 32T during this period. Highlights include:

- Preliminary power spectra for the Epoch of Reionization that characterized foregrounds and confirmed design choices for the 128T system;
- The first detection of a polarised source and the first images of the diffuse polarised emission from the Galaxy using the MWA;
- The first detection of a transient source with MWA, a flare star, using the pipeline developed for the Australian Square Kilometre Array Pathfinder (ASKAP) Variables and Slow Transients project;
- The first systematic survey of a large (2400 square degree) region of the southern sky at these frequencies.

Mosaic of two hours of 32T-prototype data taken over 150MHz of bandwidth in 5-minute 30MHz snapshots. The central source is the W44 supernova remnant (SNR); other compact sources visible are HII regions, extragalactic radio sources and other SNRs. The diffuse emission, which is normally resolved out by the MWA, has been reconstructed using a scaled version of the 408MHz Haslam et. al map. With the many shorter baselines present in the full MWA array, more of this diffuse emission will be measured directly; with the many longer baselines, the resolution will improve six-fold, and the survey will cover an even larger sky area.

Credit: Dr Natasha Hurley-Walker, CIRA; image courtesy of MWA.

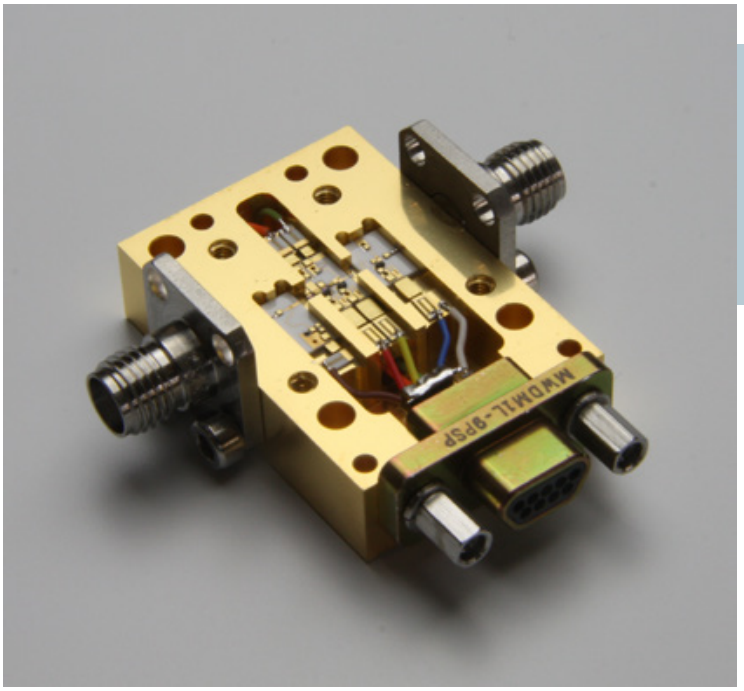


Australia Telescope Compact Array C/X upgrade

Maintaining existing National Facilities at the leading-edge of technological performance was a priority of the Decadal Plan. Australia's premier radio interferometer is the Australia Telescope Compact Array (ATCA) operated by Commonwealth Scientific and Industrial Research Organisation (CSIRO) Astronomy and Space Science (CASS). AAL has helped to support ATCA's ongoing competitiveness by investing in an upgrade of the important C/X receiver systems.

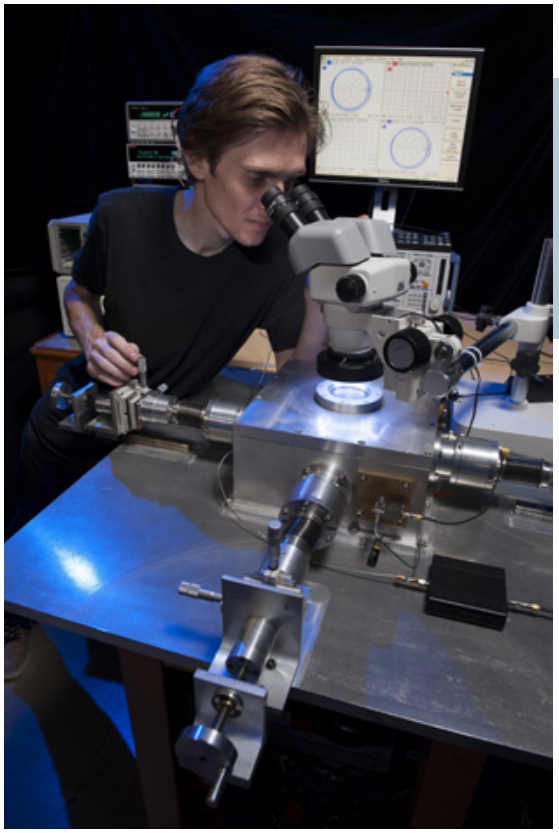
In conjunction with other ATCA upgrades funded by CSIRO, this will improve sensitivity across the centimetre radio spectrum by more than a factor of two, enabling survey speed to increase by more than a factor of four. In addition, the new receiver systems will have an exceptionally low system temperature that will improve system noise and operating bandwidth. The dramatically enhanced performance of the ATCA will enable fundamentally new scientific programs.

The C/X upgrade project is the third and final phase of the ATCA centimetre receiver upgrade, involving replacement of the core components of the existing 6/3cm receiver systems. The project merges the 6cm and 3cm bands from the current (4.4 – 6.9GHz & 8.0 – 9.2GHz) bands to provide continuous coverage of approximately 4 – 12GHz. Together with the ATCA "L/S" upgrade to the 13cm and 20cm bands, completed in 2011, this project will give the ATCA unprecedented access to the centimetre radio spectrum from 1.1 GHz to 12 GHz at more than twice the current sensitivity. This high performance capability will open up new science areas, including identifying and understanding transients detected by ASKAP in Western Australia, and understanding magnetic field origins in galaxy disks and Active Galactic Nuclei. These new scientific windows will maintain the ATCA's competitive position in era of next generation telescopes like ALMA, ASKAP and MeerKAT.



The new 4 -12GHz Low Noise Amplifier, top cover removed.

Image credit: Alex Dunning, CSIRO



Alex Dunning using a cryogenic wafer probe station to characterise the devices used in the 4 – 12GHz Low Noise Amplifier.

Image credit: Tim Wheeler

The project is currently on schedule and is now in transition from prototype development to the roll out of production receivers across the entire ATCA. A single prototype receiver system that included a new Ortho Mode Transducer (OMT), Low Noise Amplifiers (LNAs) and support electronics was installed on the ATCA during November 2011. Evaluation of this receiver showed that the system temperature was less than 20 Kelvin over the frequency range 4.2 – 10.8GHz. This constitutes a greater than 40% improvement in the system noise performance and a 25% increase in the operating bandwidth when compared to the existing ATCA C/X receiver systems. On the basis of this result the production of hardware and electronics required to outfit the entire ATCA commenced in February 2012. The first two upgraded receiver systems are scheduled for installation during September 2012.

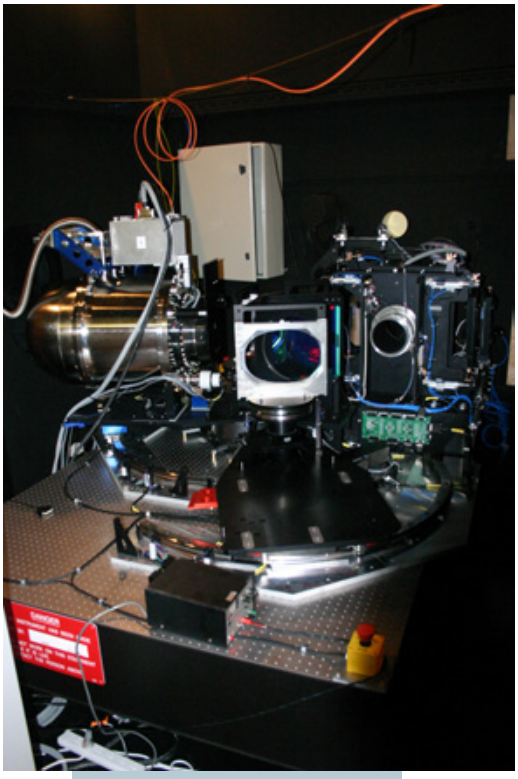
The new broadband LNAs and OMT are central to the receiver upgrade. The LNAs were designed using device parameters measured on wafer at cryogenic temperatures. The ATCA centimetre upgrade is the first time this method of amplifier design has been used at the CSIRO. This allows much more accurate modelling of the amplifier performance at the operating temperature, thus removing a significant amount of uncertainty from the design process. Some fine tuning of the prototype LNA was still necessary, however this focussed on making minor improvements in the performance of the production LNAs, principally as a means of making the system more robust and improving long term reliability. Testing of the final production LNA was completed during May 2012 and the manufacture of the LNA hardware necessary for the upgrade is well underway.

Anglo-Australian Telescope Instrumentation

In keeping with the Australian Astronomy community's strategy of maintaining its front-rank National Facilities at the leading edge of technology, AAL has, throughout its history, funded new instruments, refurbishment and upgrades at the AAT. The two EIF funded projects that AAL currently supports at the AAT are described below.

AAOmega upgrade

AAOmega is an existing spectrograph on the AAT. The spectrograph is a dual beam system, with a blue arm and a red arm. The dual beam system covers the wavelength range 370–850nm at low resolution, and is tuneable over this entire range at higher resolutions. AAOmega can be fed either by the 2dF robotic positioner in Multi-Object Spectroscopy mode, or it can be fed by the SPIRAL Integral Field Unit. AAL is funding an upgrade of AAOmega with new CCDs for the blue and red arms, which will open up new scientific opportunities by improving the sensitivity of the spectrograph at both the ends of the spectrum. For instance, stellar observing programs will benefit from increased efficiency at near-UV wavelengths, while the enhanced red-sensitivity will enable a new generation of spectroscopic surveys to be conducted with the AAT. The AAO placed the order for the two new detectors in June 2012, and the project is scheduled for completion in June 2013.

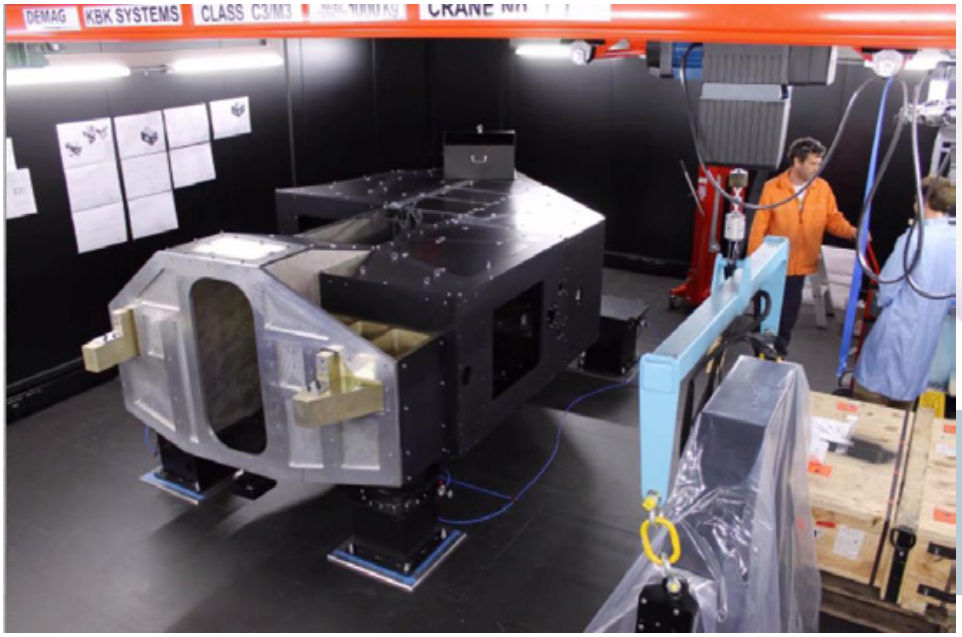


AAOmega instrument.
Image credit: AAO

HERMES

The HERMES (High Efficiency and Resolution Multi-Element Spectrograph) is a world-class instrument currently under development at the AAO. HERMES will allow the simultaneous spectroscopic observation of up to nearly 400 targets at a spectral resolving power of about 30,000 in four separate wavelength bands. Through the flagship Galactic Archaeology survey with HERMES (GALAH) survey of up to a million stars, HERMES will unravel the Milky Way's formation history using chemical tagging and velocity measurements. HERMES was predominantly funded from AAL's NCRIS grant. AAL-managed EIF funds are now being used to increase the instrument's capability by adding a fourth wavelength channel to the original three-channel design. This addition will increase the wavelength coverage and, importantly, will enable stellar oxygen abundance to be measured.

2011/12 saw significant progress on the HERMES project. Most of the mounts for the optics were manufactured and tested, the slit systems were received and tested, all cryostat casings were leak-tested, the integration



HERMES spectrograph frame.
Image credit: AAO

of the cryostat for the blue channel of the spectrograph was completed and six of the seven electronics cabinets were fitted out. In addition, the HERMES software team resolved a long-standing problem with CCD readout speed calculations, and the software can now control the focus mechanism (having previously been tested with the slit mechanism). The control task modifications to support four CCDs are now complete. Most HERMES-related software interlocks have been enabled. The software for the CCD controllers is now capable of reading out through four corners at non-astro speed in 10 seconds - this is the most extreme test possible with only one controller.

The HERMES optical team has also been busy testing optic components received from the vendors. The blue grating and the blue beamsplitter have been coated. Fold mirrors were tested and one of them has been mounted. The blue camera has been coated and the other three camera lenses (green, red and infrared) have been manufactured and polished and are waiting to be coated. The collimator field lens was received by AAO and the collimator mirror was received and tested.

The fibre optic team completed the preparation of the 800-fibre, 49.95-metre HERMES cable and the new 800-fibre, 39.15-metre AAOmega cable. All these fibres have been fully tested, the polyimide tubes, slitlets, prisms, ferrules, magnets have been installed, and the full assembly inserted into the conduit. The cable is now ready for installation on 2dF, which will take place between August and October 2012.

eResearch

AAL recognises the growing importance of eResearch and High-Performance Computational (HPC) to Australian astronomy. In 2009 AAL created a HPC Working Group and in 2010 AAL held a data workshop and an astronomy eResearch meeting. These activities resulted in the creation of the Astronomy eResearch Advisory Committee (AeRAC) in 2011 to give AAL ongoing advice in matters of eResearch. AAL also formulated a strategy to advance the federation of national astronomy datasets, while continuing to facilitate national astronomy-dedicated access to HPC resources. Progress in 2011/12 towards these objectives is described below.

HPC access & support

In 2010 AAL worked with National Computational Infrastructure (NCI) to enable astronomy to become part of NCI's Specialised Support Program. Through this program, one million CPU Hours per year through to 2013 on the NCI Peak System has been dedicated to highly scalable flagship quality astrophysics research problems. A further one million CPU hours is also available for national astronomy use on the upgraded Swinburne University of Technology (SUT) supercomputing system.

Two support personnel have also been established at NCI and the Swinburne Centre for Astrophysics and Supercomputing through the NCI Computational Tools and Techniques Program and are available to assist the Australian astronomical community in the use of current and future national supercomputing facilities.

The GPU Supercomputer for Theoretical Astrophysics Research (gSTAR) is a next-generation graphics processing unit (GPU)-based supercomputer built by SUT and partially funded through AAL's EIF grant (see below for more details about the gSTAR project), with arrangements in place for 75% of time on this machine to be dedicated to national astronomy use. Phase 1 of gSTAR began normal operations in March 2012, with phase 2 to go online in the second half of 2012.

Astronomy Supercomputer Time Allocation Committee

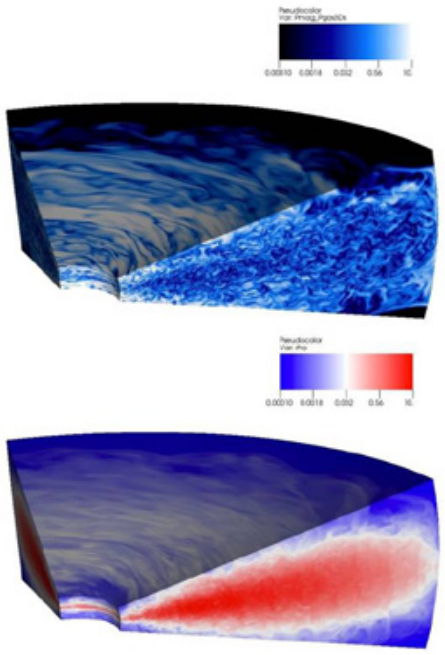
In November 2011 AAL established the Astronomy Supercomputer Time Allocation Committee (ASTAC), with responsibility for allocating dedicated computing resources for astronomy on the NCI peak system and gSTAR, ASTAC convened in March 2012 to allocate time on these facilities as well as the iVEC Pawsey Centre supercomputer, Epic. An allocation meeting for Epic time was also held in December 2011. Access to Epic is not funded or enabled by AAL, however iVEC has requested that ASTAC allocate time made available for national astronomy use.

ASTAC allocated dedicated national astronomy time on the following supercomputer resources in the 2011/12 year.

Facility	Notes
Peak System, NCI National Facility	One million core-hours per calendar year as per NCI guidelines
Swinburne Supercomputer	One million core-hours per calendar year as per AAL guidelines
gSTAR, Swinburne	GPU-based supercomputer. 75% of time is available: 50% of this via grand-plan proposals
Epic@Murdoch, iVEC	Part of the Pawsey Centre project

ASTAC met again in June 2012 to allocate supercomputer time in Quarters 3 and 4 of 2012. As well as time on the facilities listed above, this allocation round also included time on the new Pawsey Centre GPU-based machine, Fornax.

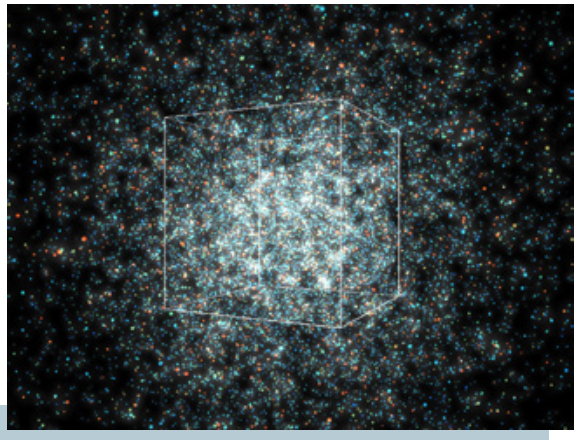
HPC Science Highlights



Black hole accretion disks play an important part in the formation of structure in the Universe. The current leading theory is that the disks are largely turbulent on the inside, and the net effect of this turbulence is to transport angular momentum outwards allowing matter to flow inwards. Ross Parkin and Geoff Bicknell of RSAA, ANU have been using the NCI peak system to create 3D simulations of magnetized turbulence in the accretion disks around black holes. These simulations are used to study the processes that occur within the disks, principally the production of turbulence through shearing of magnetic field lines in a rotating disk.

A snapshot of a simulated accretion disk. The turbulent structure of the magnetic field is apparent in the black/blue image of the ratio of magnetic to thermal pressure. The density structure is shown in the red/blue image.

Image credit: Ross Parkin and Geoff Bicknell



Simulation of a young star cluster with 20,000 stars in real (but exaggerated) colours. The white box has a size of about 1.3 parsecs

Image credit: Anna Sippel and Jarrod Hurley

AAL-funded HPC hardware has also facilitated new studies of star clusters. Star clusters can be extremely dense and hence it is computationally expensive to model their evolution. Only the newest generation of computing hardware has made it possible to compute the direct and realistic globular cluster models needed for comparison with observations. Anna Sippel and Jarrod Hurley, of the Centre for Astrophysics and Supercomputing at the SUT have been using gSTAR to study the effects of various parameters, such as metallicity, on the evolution of star clusters. They utilize an N-body code with a hybrid approach using GPUs and CPUs in combination on a single compute node, making the gSTAR facility particularly suited to this task.

gSTAR

AAL has funded SUT to build the gSTAR supercomputer, which provides the Australian astronomy community with a next-generation computing cluster based on GPU technology. There is a growing reliance on HPC to solve some of the most complex problems in astrophysics, with the emerging technology of GPUs offering an affordable path to a massive boost in processing power. Thus the key objectives of the gSTAR project are to: provide national access to a large-scale GPU-based supercomputer; keep Australian astronomers at the cutting-edge of theoretical research; enhance the capacity of the national astronomy community to undertake world-leading research and provide scientific innovation; and facilitate training to graduate students in this important new area of computation. Science drivers range from simulations of galaxy formation to large-volume data processing.

The first phase of hardware was delivered to SUT in September 2011 from Silicon Graphics International. This included 50 standard compute nodes each with two C2070 NVIDIA GPUs, three high-density GPU compute nodes each with seven M2090 NVIDIA GPUs, QDR infiniband networking and 200 terabytes of disk storage. Handover of the hardware to SUT occurred in December 2011, and normal operations commenced in March 2012.

In readiness for gSTAR, a GPU/Compute Unified Device Architecture workshop was held at SUT in November 2011 in collaboration with NVIDIA. Currently there are approximately 20 users on the system from institutions across Australia. The merit-based allocation of time for grand plan proposals has commenced through ASTAC. A second phase of hardware was ordered in March 2012, including next generation K10 NVIDIA GPUs, and will be available at the start of the next fiscal year.

gSTAR Science Highlight

Amr Hassan (SUT PhD student) has been using gSTAR to show that real-time, interactive visualisation and data analysis of tera-byte scale datasets is achievable. Using 32 gSTAR nodes (64 GPUs), Amr has demonstrated that a 300 GB spectral data cube can be volume rendered at better than 10 frames/second, and that common data analysis tasks such as calculating statistical properties (mean, standard deviation, median) of such large datasets can also be achieved in close to real-time. By using a distributed solution, the processing capabilities of the GPUs turn a computationally-limited problem into a bandwidth-limited one. Although the main target of this work is visualisation of ASKAP spectral data cubes, the GPU framework also works with other three-dimensional datasets (e.g. medical imaging). Details of the GPU implementation will appear in publication shortly.

SUT PhD student Anna Sippel and gSTAR compute nodes

All-Sky Virtual Observatory

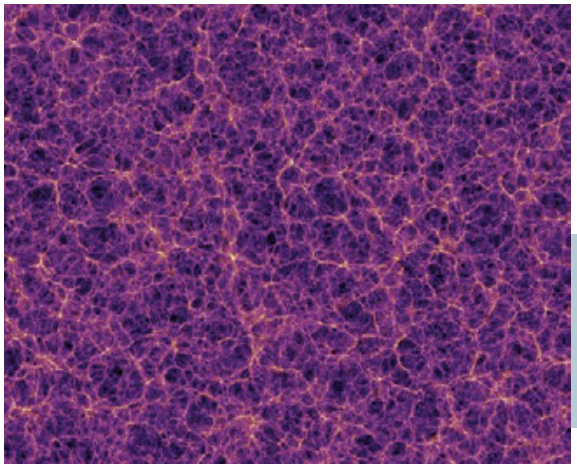
The All-Sky Virtual Observatory (ASVO) is part of AAL's longer-term vision to develop a Federation of National Astronomy Datasets, in which a central facility will house an infrastructure development and research support team. The Federation of National Astronomy Datasets will build services and provide on-going support for astronomers, to enable widespread access to radio, optical, and theoretical data and facilitate the upcoming needs of data intensive research. Intersect Australia Ltd was commissioned by AAL to conduct a Concept Design Study to articulate this vision, and their Final Report is available on the AAL website (http://astronomyaustralia.org.au/publications.html). ASVO represents the first step towards that vision, bringing together two nationally-significant datasets, chosen after extensive consultation with the astronomy community:

- The primary observational dataset will come from the **SkyMapper** telescope, built by ANU, which is producing the most detailed and sensitive digitized map of the southern sky at optical wavelengths.
- The **Theoretical Astrophysical Observatory** (TAO), being developed at SUT, will house a growing ensemble of theory data sets and galaxy formation models, with value-add tools including custom telescope simulators, beginning with SkyMapper.

SkyMapper telescope.
Image credit: Stefan Keller, RSAA, ANU

ASVO is a partnership between AAL, SUT, ANU, NCI, Intersect Australia Ltd, and sponsor National eResearch Collaboration Tools and Resources (NeCTAR). Using NeCTAR, EIF and NCRIS funds, this project will create hardware, tools and services to maximise the scientific return from this data.

ASVO will be rolled out during 2013 and there will be ongoing support for astronomers until at least mid-2015. Researchers from various areas of astronomy will be engaged during design and development, to ensure that ASVO meets the needs of the community. ASVO is designed to be flexible and expandable, to provide a platform for incorporating a broad range of datasets in the future, such as MWA, ASKAP and SKA radio data.



Large-scale light distribution in the Universe from the Millennium Simulation.
Image credit: Max Planck Institute for Astrophysics

Scientific Publications

View from the flight to the South Pole on the mission to install PLATO-R and a 0.6-metre aperture terahertz telescope at one of the most remote places on Earth: Ridge A, Antarctica. A glacier can be seen winding its way over a mountain pass to lower altitudes, forming a treacherous crevasse field at bottom left.

Image credit: Luke Bycroft

Gemini

Papers published in refereed journals in the last year that have been based on Gemini data and involve Australian authors (shown in bold face).

1. **Miszalski**, B., Crowther, P., **De Marco**, O., Koppen, J., Moffat, A., Acker, A., Hillwig, T. (2012). ``IC 4663: The first unambiguous [WN] Wolf-Rayet central star of a planetary nebula", Monthly Notices of the Royal Astronomical Society, 423, p. 934-947.

2. De Rosa, R., Patience, J., Vigan, A., Wilson, P., Schneider, A., McConnell, N., Wiktorowicz, S., Marois, C., Song, I., Macintosh, B., Graham, J., **Bessell**, M., Doyon, R., Lai, O. (2012). ``The Volume-limited A-Star (VAST) survey - II. Orbital motion monitoring of A-type star multiples", Monthly Notices of the Royal Astronomical Society, 422, p. 2765-2785.

3. **Soria**, R., Kuntz, K., Winkler, F., Blair, W., Long, K., Plucinsky, P., Whitmore, B. (2012). ``The Birth of an Ultraluminous X-Ray Source in M83", Astrophysical Journal, 750:152.

4. **Graham, A., Spitler, L., Forbes, D.,** Lisker, T., Moore, B., Janz, J. (2012). ``LEDA 074886: A remarkable rectangular-looking galaxy", Astrophysical Journal, 750:121.

5. Arnold, T., Eisner, J., Monnier, J., **Tuthill**, P. (2012). ``New Spatially Resolved Mid-infrared Observations of the Transitional Disk TW Hya and Tentative Evidence for a Self-luminous Companion", Astrophysical Journal, 750:119.

6. Bilikova, J., Chu, Y.-H., Gruendl, R., Su, K., **De Marco**, O. (2012). ``Spitzer Search for Dust Disks around Central Stars of Planetary Nebulae", Astrophysical Journal Supplement, 200:3.

7. Dupree, A., Brickhouse, N., Cranmer, S., Luna, G., Schneider, E., **Bessell**, M., Bonanos, A., Crause, L., **Lawson**, W., Mallik, S., Schuler, S. (2012). ``TW Hya: Spectral Variability, X-Rays, and Accretion Diagnostics", Astrophysical Journal, 750:73.

8. Pinfield, D., Burningham, B., Lodieu, N., Leggett, S., **Tinney**, C., van Spaandonk, L., Marocco, F., Smart, R., Gomes, J., Smith, L., Lucas, P., Day-Jones, A., Murray, D., Katsiyannis, A., Catalan, S., Cardoso, C., Clarke, J., Folkes, S., Galvez-Ortiz, M., Homeier, D., Jenkins, J., Jones, H., Zhang, Z. (2012). ``Discovery of the benchmark metal-poor T8 dwarf BD +01 2920B", Monthly Notices of the Royal Astronomical Society, 422, p. 1922-1932.

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10. Norris, M., Gebhardt, K., Sharples, R., Faifer, F., Bridges, T., **Forbes**, D., Forte, J., Zepf, S., Beasley, M., Hanes, D., Proctor, R., Kannappan, S. (2012). ``The globular cluster kinematics and galaxy dark matter content of NGC 3923", Monthly Notices of the Royal Astronomical Society, 421, p. 1485-1498.

11. **Alves-Brito, A., Yong, D.**, Melendez, J., Vasquez, S., **Karakas, A.** (2012). ``CNO and F abundances in the globular cluster M22 (NGC 6656)", Astronomy and Astrophysics, 540:A3.

12. Littlejohns, O., Willingale, R., O'Brien, P., Beardmore, A., Covino, S., Perley, D., Tanvir, N., Rol, E., **Yuan**, F., Akerlof, C., D'Avanzo, P., Bersier, D., Castro-Tirado, A., Christian, P., Cobb, B., Evans, P., Filippenko, A., Flewelling, H., Fugazza, D., Hoversten, E., Kamble, A., Kobayashi, S., Li, W., Morgan, A., Mundell, C., Page, K., Palazzi, E., Quimby, R., Schulze, S., Steele, I., de Ugarte Postigo, A. (2012). ``The origin of the early-time optical emission of Swift GRB 080310", Monthly Notices of the Royal Astronomical Society, 421, p. 2692-2712.

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19. **Bailey, J., Kedziora-Chudczer, L**. (2012). ``Modelling the spectra of planets, brown dwarfs and stars using VSTAR", Monthly Notices of the Royal Astronomical Society, 419, p. 1913-1929.

20. Clayton, G., Sugerman, B., Stanford, S., Whitney, B., Honor, J., Babler, B., Barlow, M., Gordon, K., Andrews, J., Geballe, T., Bond, H., **De Marco, O., Lawson, W**., Sibthorpe, B., Olofsson, G., Polehampton, E., Gomez, H., Matsuura, M., Hargrave, P., Ivison, R., Wesson, R., Leeks, S., Swinyard, B., Lim, T. (2011). ``The Circumstellar Environment of R Coronae Borealis: White Dwarf Merger or Final-helium-shell Flash?", Astrophysical Journal, 743:44.

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22. **Alves-Brito, A., Karakas, A., Yong, D.,** Melendez, J., Vasquez, S. (2011). ``CNO and F abundances in the barium star HD 123396", Astronomy & Astrophysics, 536:A40.

23. Conn, B., Pasquali, A., Pompei, E., Lane, R., Chene, A., Smith, R., **Lewis**, G. (2011). ``A New Collisional Ring Galaxy at z = 0.111: Auriga's Wheel", Astrophysical Journal, 741:80.

24. **Mahony, E., Sadler, E., Croom, S., Ekers, R., Bannister, K., Chhetri, R., Hancock, P., Johnston, H.,** Massardi, M., **Murphy, T**. (2011). ``Optical properties of high-frequency radio sources from the Australia Telescope 20 GHz (AT20G) Survey", Monthly Notices of the Royal Astronomical Society, 417, p. 2651-2675.

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27. Damjanov, I., Abraham, R., **Glazebrook**, K., McCarthy, P., Caris, E., Carlberg, R., Chen, H.-W., Crampton, D., **Green**, A., Jorgensen, I., Juneau, S., Le Borgne, D., Marzke, R., Mentuch, E., Murowinski, R., Roth, K., Savaglio, S., Yan, H. (2011). ``Red Nuggets at High Redshift: Structural Evolution of Quiescent Galaxies Over 10 Gyr of Cosmic History", Astrophysical Journal Letters, 739:L44.

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29. Wilman, R., Edge,A., **McGregor**, P., McNamara, B. (2011). ``Molecular accretion in the core of the galaxy cluster 2A 0335+096", Monthly Notices of the Royal Astronomical Society, 416, p. 2060-2067.

30. Lin, D., Carrasco, R., Grupe, D.,Webb, N., Barret, D., **Farrell**, S. (2011). ``Discovery of an Ultrasoft X-Ray Transient Source in the 2XMM Catalog:A Tidal Disruption Event Candidate",Astrophysical Journal, 738:52.

31. Faifer, F., Forte, J., Norris, M., Bridges,T., **Forbes**, D., Zepf, S., Beasley, M., Gebhardt, K., Hanes, D., Sharples, R. (2011). ``Gemini/GMOS imaging of globular cluster systems in five early-type galaxies", Monthly Notices of the Royal Astronomical Society, 416, p. 155-177.

32. **Foster, C., Spitler, L.,** Romanowsky,A., **Forbes, D., Pota,V., Bekki, K.**, Strader, J., Proctor, R.,Arnold, J., Brodie, J. (2011). ``Global properties of 'ordinary' early-type galaxies: photometry and spectroscopy of stars and globular clusters in NGC 4494", Monthly Notices of the Royal Astronomical Society, 415, p. 3393-3416.

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34. O'Dowd, M., **Bate, N., Webster, R., Wayth, R.,** Labrie, K. (2011). ``Differential microlensing measurements of quasar broad-line kinematics in Q2237+0305", Monthly Notices of the Royal Astronomical Society, 415, p. 1985-1998.

35. Sullivan, M., Guy, J., Conley,A., Regnault, N.,Astier, P., Balland, C., Basa, S., Carlberg, R., Fouchez, D., Hardin, D., Hook, I, Howell, D., Pain, R., Palanque-Delabrouille, N., Perrett, K., Pritchet, C., Rich, J., Ruhlmann-Kleider,V., Balam, D., Baumont, S., Ellis, R., Fabbro, S., Fakhouri, H., Fourmanoit, N., Gonzalez-Gaitan, S., Graham, M., Hudson, M., Hsiao, E., Kronborg,T., **Lidman**, C., Mourao,A., Neill, J., Perlmutter, S., Ripoche, P., Suzuki, N.,Walker, E. (2011). ``SNLS3: Constraints on Dark Energy Combining the Supernova Legacy Survey Three-year Data with Other Probes", Astrophysical Journal, 737:102.

36. Matsuoka,Y., **Peterson**, B., Murata, K., Fujiwara, M., Nagayama,T., Suenaga,T., Furusawa, K., Miyake, N., Omori, K., Suzuki, D.,Wada, K. (2011). ``1 micron Excess Sources in the UKIDSS. I.Three T Dwarfs in the Sloan Digital Sky Survey Southern Equatorial Stripe",Astronomical Journal, 142:64.

37. Gal-Yam,A., Kasliwal, M.,Arcavi, I., Green,Y.,Yaron, O., Ben-Ami, S., Xu, D., Sternberg,A., Quimby, R., Kulkarni, S., Ofek, E.,Walters, R., Nugent, P., Poznanski, D., Bloom, J., Cenko, B., Filippenko,A., Li,W., Silverman, J.,Walker, E., Sullivan, M., Maguire, K., Howell,A., Mazzali, P., Frail, D., Bersier, D., James, P.,Akerlof, C., **Yuan**, F., Law, N., Fox, D., Gehrels, N. (2011). ``Real-time Detection and Rapid Multiwavelength Follow-up Observations of a Highly Subluminous Type II-P Supernova from the Palomar Transient Factory Survey", Astrophysical Journal, 736:159.

38. Levan,A., Tanvir, N., Cenko, S., Perley, D.,Wiersema, K., Bloom, J., Fruchter,A., Postigo,A., O'Brien, P., Butler, N., van der Horst,A., Leloudas, G., Morgan,A., Misra, K., Bower, G., Farihi, J.,Tunnicliffe, R., Modjaz, M., Silverman, J., Hjorth, J.,Thone, C., Cucchiara,A., Ceron, J., Castro-Tirado,A., Arnold, J., Bremer, M., Brodie, J., Carroll,T., Cooper, M., Curran, P., Cutri, R., Ehle, J., **Forbes**, D., Fynbo, J., Gorosabel, J., Graham, J., Hoffman, D., Guziy, S., Jakobsson, P., Kamble, A., Kerr,T., Kasliwal, M., Kouveliotou, C., Kocevski, D., Law, N., Nugent, P., Ofek, E., Poznanski, D., Quimby, R., Rol, E., Romanowsky,A., Sanchez-Ramirez, R., Schulze, S., Singh, N., van Spaandonk, L., Starling, R., Strom, R.,Tello, J.,Vaduvescu, O.,Wheatley, P.,Wijers, R.,Winters, J., Xu, D. (2011). ``An Extremely Luminous Panchromatic Outburst from the Nucleus of a Distant Galaxy", Science, 333, p. 199-202.

39. Cucchiara, A., Levan, A., Fox, D., Tanvir, N., Ukwatta, T., Berger, E., Kruhler, T., Kupcu Yoldas, A., Wu, X., Toma, K., Greiner, J., Olivares, F., Rowlinson, A., Amati, L., Sakamoto, T., Roth, K., Stephens, A., Fritz, A., Fynbo, J., Hjorth, J., Malesani, D., Jakobsson, P., Wiersema, K., O'Brien, P., Soderberg, A., Foley, R., Fruchter, A., Rhoads, J., Rutledge, R., **Schmidt, B., Dopita, M.,** Podsiadlowski, P., Willingale, R., Wolf, C., Kulkarni, S., D'Avanzo, P. (2011). ``A Photometric Redshift of z ~ 9.4 for GRB 090429B", Astrophysical Journal, 736:7.

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41. **Miszalski**, B., Jones, D., Rodriguez-Gil, P., Boffin, H., Corradi, R., Santander-Garcia, M. (2011). ``Discovery of close binary central stars in the planetary nebulae NGC 6326 and NGC 6778", Astronomy & Astrophysics, 531:A158.

42. De Rosa, R., Bulger, J., Patience, J., Leland, B., Macintosh, B., Schneider, A., Song, I., Marois, C., Graham, J., **Bessell**, M., Doyon, R. (2011). ``The Volume-limited A-Star (VAST) survey - I. Companions and the unexpected X-ray detection of B6-A7 stars", Monthly Notices of the Royal Astronomical Society, 415, p. 854-866.

43. Burningham, B., Leggett, S., Homeier, D., Saumon, D., Lucas, P., Pinfield, D., **Tinney**, C., Allard, F., Marley, M., Jones, H., Murray, D., Ishii, M., Day-Jones, A., Gomes, J., Zhang, Z. H. (2011). ``The properties of the T8.5p dwarf Ross 458C", Monthly Notices of the Royal Astronomical Society, 414, p. 3590-3598.

Magellan

Papers published in refereed journals in the last year that have been based on Magellan data and involve Australian authors (shown in bold face).

1. **Spitler**, L., Labbe, I., **Glazebrook**, K., Persson, S., Monson, A., Papovich, C., Tran, K.-V., **Poole**, G., Quadri, R., van Dokkum, P., Kelson, D., **Kacprzak**, G., McCarthy, P., Murphy, D., Straatman, C., Tilvi, V. (2012). ``First Results from Z-FOURGE: Discovery of a Candidate Cluster at z = 2.2 in COSMOS", Astrophysical Journal Letters, 748:L21.

2. Cracco, V., Ciroi, S., **di Mille**, F., Vaona, L., Frassati, A., Smirnova, A., La Mura, G., Moiseev, A., Rafanelli, P. (2011). ``The origin of gas in extended narrow-line regions of nearby Seyfert galaxies - I. NGC 7212", Monthly Notices of the Royal Astronomical Society, 418, p. 2630-2641.

3. **Diaz, G., Ryan-Weber, E., Cooke, J.,** Pettini, M., Madau, P. (2011). ``A galaxy as the source of a C IV absorption system close to the epoch of reionization", Monthly Notices of the Royal Astronomical Society, 418, p. 820-827.

4. Angeloni, R., **Di Mille, F., Bland-Hawthorn, J.,** Osip, D. (2011). ``Discovery of a Giant, Highly Collimated Jet from Sanduleak's Star in the Large Magellanic Cloud", Astrophysical Journal Letters, 743:L8.

5. Ruchti, G., Fulbright, J., Wyse, R., Gilmore, G., Grebel, E., Bienayme, O., **Bland-Hawthorn**, J., **Freeman**, K., Gibson, B., Munari, U., Navarro, J., **Parker**, Q., **Reid**, W., Seabroke, G., Siebert, A., Siviero, A., Steinmetz, M., **Watson**, F., Williams, M., Zwitter, T. (2011). ``Metal-poor Lithium-rich Giants in the Radial Velocity Experiment Survey", Astrophysical Journal, 743:107.

6. Bean, J., Desert, J.-M., Kabath, P., Stalder, B., Seager, S., Miller-Ricci Kempton E., Berta, Z., Homeier, D., **Walsh**, S., Seifahrt, A. (2011). ``The Optical and Near-infrared Transmission Spectrum of the Super-Earth GJ 1214b: Further Evidence for a Metal-rich Atmosphere", Astrophysical Journal, 743:92.

7. Fadely, R., Willman, B., Geha, M., **Walsh**, S., Munoz, R., **Jerjen**, H., Vargas, L., **Da Costa**, G. (2011). ``Segue 3: An Old, Extremely Low Luminosity Star Cluster in the Milky Way's Halo", Astronomical Journal, 142:88.

8. Sternberg, A., Gal-Yam, A., Simon, J., Leonard, D., Quimby, R., Phillips, M., Morrell, N., Thompson, I., Ivans, I., Marshall, J., Filippenko, A., Marcy, G., Bloom, J., Patat, F., Foley, R., **Yong**, D., Penprase, B., Beeler, D., Allende Prieto, C., Stringfellow, G. (2011). ``Circumstellar Material in Type Ia Supernovae via Sodium Absorption Features", Science, 333, p. 856-859.

9. Ruchti, G., Fulbright, J., Wyse, R., Gilmore, G., Bienayme, O., **Bland-Hawthorn**, J., Gibson, B., Grebel, E., Helmi, A., Munari, U., Navarro, J., **Parker, Q., Reid, W.,** Seabroke, G., Siebert, A., Siviero, A., Steinmetz, M., **Watson**, F., Williams, M., Zwitter, T. (2011). ``Observational Properties of the Metal-poor Thick Disk of the Milky Way and Insights into its Origins", Astrophysical Journal, 737:9.

10. Arnold, J., Romanowsky, A., Brodie, J., Chomiuk, L., **Spitler**, L., Strader, J., Benson, A., **Forbes**, D. (2011). ``The Fossil Record of Two-phase Galaxy Assembly: Kinematics and Metallicities in the Nearest S0 Galaxy", Astrophysical Journal Letters, 736:L26.

11. Bensby, T., Alves-Brito, A., Oey, M., **Yong**, D., Melendez, J. (2011). ``A First Constraint on the Thick Disk Scale Length: Differential Radial Abundances in K Giants at Galactocentric Radii 4, 8, and 12 kpc", Astrophysical Journal Letters, 735:L46.

12. Burgasser, A., Cushing, M., Kirkpatrick, J., Gelino, C., Griffith, R., Looper, D., **Tinney**, C., Simcoe, R., Bochanski, J., Skrutskie, M., Mainzer, A., Thompson, M., Marsh, K., Bauer, J., Wright, E. (2011). ``FIRE Spectroscopy of Five Late-type T Dwarfs Discovered with the Wide-field Infrared Survey Explorer", Astrophysical Journal, 735:116.

13. Finkelstein, S., Cohen, S., Windhorst, R., Ryan, R., Hathi, N., Finkelstein, K., Anderson, J., Grogin, N., Koekemoer, A., Malhotra, S., Mutchler, M., Rhoads, J., McCarthy, P., O'Connell, R., Balick, B., Bond, H., Calzetti, D., Disney, M., **Dopita**, M., Frogel, J., Hall, D., Holtzman, J., Kimble, R., Luppino, G., Paresce, F., Saha, A., Silk, J., Trauger, J., Walker, A., Whitmore, B., Young, E. (2011). ``Hubble Space Telescope Imaging of Ly-alpha Emission at z~4.4", Astrophysical Journal, 735:5.1, 735:5.

PLATO-R/AST3

Publications from PLATO/AST3 (Australian authors in bold face).

Refereed journals:

1. **Sims, G., Ashley, M. C. B.**, Cui, X., **Everett, J. R.**, Feng, L., Gong, X., **Hengst, S.,** Hu, Z., Kulesa, C., **Lawrence, J. S., Luong-van, D. M.**, Ricaud, P., Shang, Z., **Storey, J. W.V.**, Wang, L., Yang, H., Yang, J., Zhou, X., Zhu, Z., 2012, Precipitable Water Vapor above Dome A, Antarctica, Determined from Diffuse Optical Sky Spectra, Publications of the Astronomical Society of the Pacific, 124, 74–83.

2. Tremblin, P., Minier, V., Schneider, N., Durand, G.A., **Ashley, M. C. B., Lawrence, J. S., Luong-van, D. M., Storey, J. W.V.**, Durand, G.A., Reinert, Y., Veyssiere, C., Walter, C., Ade, P., Calisse, P. G., Challita, Z., Fossat, E., Sabbatini, L., Pellegrini, A., Ricaud, P., Urban, J., 2011, Site testing for submillimetre astronomy at Dome C, Antarctica, Astronomy and Astrophysics, 535, A112.

3. Wang, L., Macri, L. M., Krisciunas, K., Wang, L., **Ashley, M. C. B.**, Cui, X., Feng, L.-L., Gong, X., **Lawrence, J. S.**, Liu, Q., **Luong-Van, D.,** Pennypacker, C. R., Shang, Z., **Storey, J. W.V.,** Yang, H., Yang, J., Yuan, X., York, D. G., Zhou, X., Zhu, Z., 2011, Photometry of Variable Stars from Dome A, Antarctica, The Astronomical Journal, 142, 155.

4. **Sims, G., Ashley, M. C. B.,** Cui, X., **Everett, J. R.**, Feng, L., Gong, X., **Hengst, S.,** Hu, Z., **Lawrence, J. S., Luong-Van, D. M.,** Moore, A. M., Riddle, R., Shang, Z., **Storey, J. W.V., Tothill, N.**, Travouillon, T., Wang, L., Yang, H., Yang, J., Zhou, X., Zhu, Z., 2012, Airglow and Aurorae at Dome A, Antarctica, Publications of the Astronomical Society of the Pacific, 124, 637–649.

Proceedings:

1. Epchtein, N., Abe, L., Ansorge, W., Langlois, M., Vauglin, I., Argentini, S., Esau, I., David, C., Bryson, I., Dalton, G., **Ashley, M. C. B., Lawrence, J. S.,** 2011, A project for an infrared synoptic survey from Antarctica with the Polar Large Telescope (PLT), SF2A-2011: Proceedings of the Annual meeting of the French Society of Astronomy and Astrophysics Eds.: G. Alecian, K. Belkacem, R. Samadi and D. Valls-Gabaud, pp. 107-110, 107–110.

2. **Michael C. B. Ashley, Yael Augarten, Colin S. Bonner, Michael G. Burton, Luke Bycroft, Jon S. Lawrence, Daniel M. Luong-Van, Scott McDaid, Campbell McLaren, Geoff Sims, John W.V. Storey**, 2012, PLATO-R: a new concept for Antarctic science, Proceedings SPIE, 8444-63.

3. **Geoff Sims,** Craig Kulesa**, Michael C. B. Ashley, Jon S. Lawrence, Will Saunders, John W.V. Storey**, 2012, Where is Ridge A?, Proceedings SPIE, 8444-209.

Murchison Widefield Array

Papers from MWA published in refereed journals, with Australian authors.

1. Williams et al., (2012). Low Frequency Imaging of Fields at High Galactic Latitude with the Murchison Widefield Array 32-Element Prototype, Astrophysical Journal, 755, 47
2. Beardsley et al., (2012). A new layout optimization technique for interferometric arrays, applied to the MWA, Monthly Notices of the Royal Astronomical Society, 425, 1781-1788

At the close of FY2011/12 there were 11 papers submitted to journals or at various stages of the collaboration's internal publication review process.

gSTAR

Papers from gSTAR published in refereed journals (Australian authors in bold face).

1. **Bate, N.F., Fluke, C.J.,** 2012, A GPU-Enabled, High-Resolution Cosmological Microlensing Parameter Survey, Astrophysical Journal, 744, 90

Pierre Auger Observatory

Papers from Pierre Auger Observatory published in refereed journals (the Pierre Auger Collaboration includes Australian authors).

1. The Pierre Auger Collaboration, "Measurement of the proton-air cross-section at sqrt(s) = 57 TeV with the Pierre Auger Observatory" Physical Review Letters, in press, 2012
2. The Pierre Auger Collaboration, "Ultra-High Energy Neutrinos at the Pierre Auger Observatory" Advances in High Energy Physics, in press, 2012
3. The Pierre Auger Collaboration, "Search for point-like sources of ultra-high energy neutrinos at the Pierre Auger Observatory and improved limit on the diffuse flux of tau neutrinos" Astrophysical Journal Letters, 755 (2012) L4
4. J. Horandel and the Pierre Auger Collaboration, "Nature and origin of very high-energy cosmic rays" Europhysics News, 43 (2012) 24
5. The Pierre Auger Collaboration, "A search for anisotropy in the arrival directions of ultra high energy cosmic rays recorded at the Pierre Auger Observatory" JCAP 04 (2012) 040
6. The Pierre Auger Collaboration, "Description of Atmospheric Conditions at the Pierre Auger Observatory using the Global Data Assimilation System (GDAS)" Astroparticle Physics, 35 (2012), 591-607
7. The Pierre Auger Collaboration, "Search for signatures of magnetically-induced alignment in the arrival directions measured by the Pierre Auger Observatory" Astroparticle Physics 35 (2012) 354
8. The Pierre Auger Collaboration, "The Rapid Atmospheric Monitoring System of the Pierre Auger Observatory" JINST, (2012), in press
9. The Pierre Auger Collaboration, "Search for ultrahigh energy neutrinos in highly inclined events at the Pierre Auger Observatory" Physical Review D 84, 122005 (2011)
10. The Pierre Auger Collaboration, "The effect of the geomagnetic field on cosmic ray energy estimates and large scale anisotropy searches on data from the Pierre Auger Observatory" JCAP 11 (2011) 022

AAL in 2011/12

2011/12 AGUSS student Aina Musaeva gets to grips (literally) with the 8m Gemini South telescope in Chile.

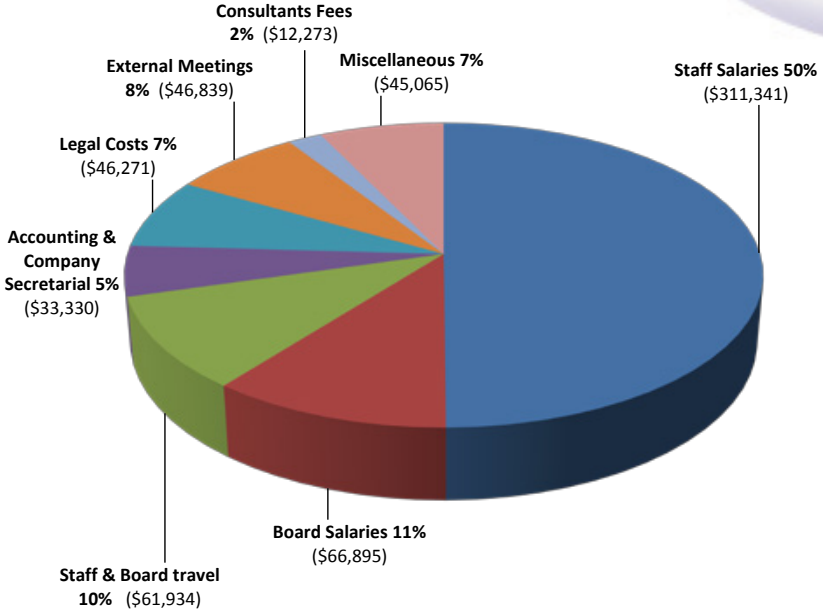
Image credit: Aina Musava (University of Sydney).

Financial summary

The following summary highlights the key financial transactions (GST exclusive) for the 2011/12 financial year, specifically: the cost of running AAL; the Government grants received and awarded to projects; and, the balance of grants and reserves held by AAL on 30th June 2012. The financial accounts are available on pages 43-79 of this report.

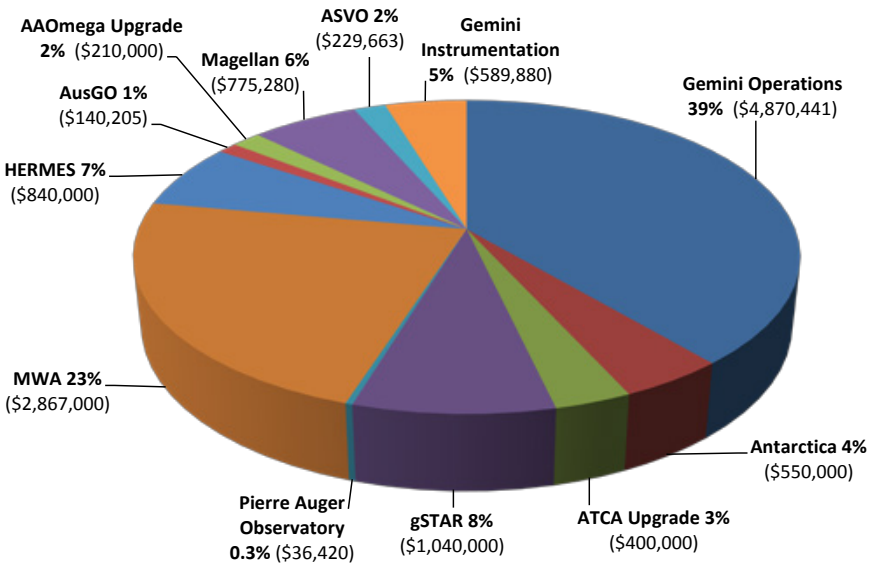
AAL operating expenses

Actual expenses for 2011/12 were $623,948.



Grants paid to projects during 2011/12

Total grants paid for 2011/12 were $12,548,889 which includes $1,028,681 paid from Reserves for Magellan, ASVO and AusGO ($23,738) projects.



Grants received during 2011/12

AAL received the following grants during 2011/12:

Astronomy EIF (from DIISRTE)	$7,500,000
Magellan and AusGO (from AAO)	$967,000
MWA (from DIISRTE)	$400,000
AST3 and ALMA (from DIISRTE)	$30,000
Total	**$ 8,897,000**

Balance of grants held by AAL as of 30th June 2012

NCRIS grant held by AAL as at 30 June 2012	
AAL operations	**$390,470**
DIISRTE grants held by AAL as at 30 June 2012	
MWA	$400,000
AST3	$30,000
Total	**$430,000**
AAO grant held by AAL as at 30 June 2012	
Magellan	$700,000
AusGO	$200,000
AGUSS	$27,000
Astronomers travel	$40,000
Total	**$967,000**
EIF grant held by AAL as at 30 June 2012	
AAOmega Upgrade	$210,000
ASVO	$300,000
HERMES	$420,000
Gemini	($155,300)
MWA	$203,000
Pierre Auger Observatory	($11,000)
Total	**$966,700**

Reserves

AAL currently maintains three reserves:

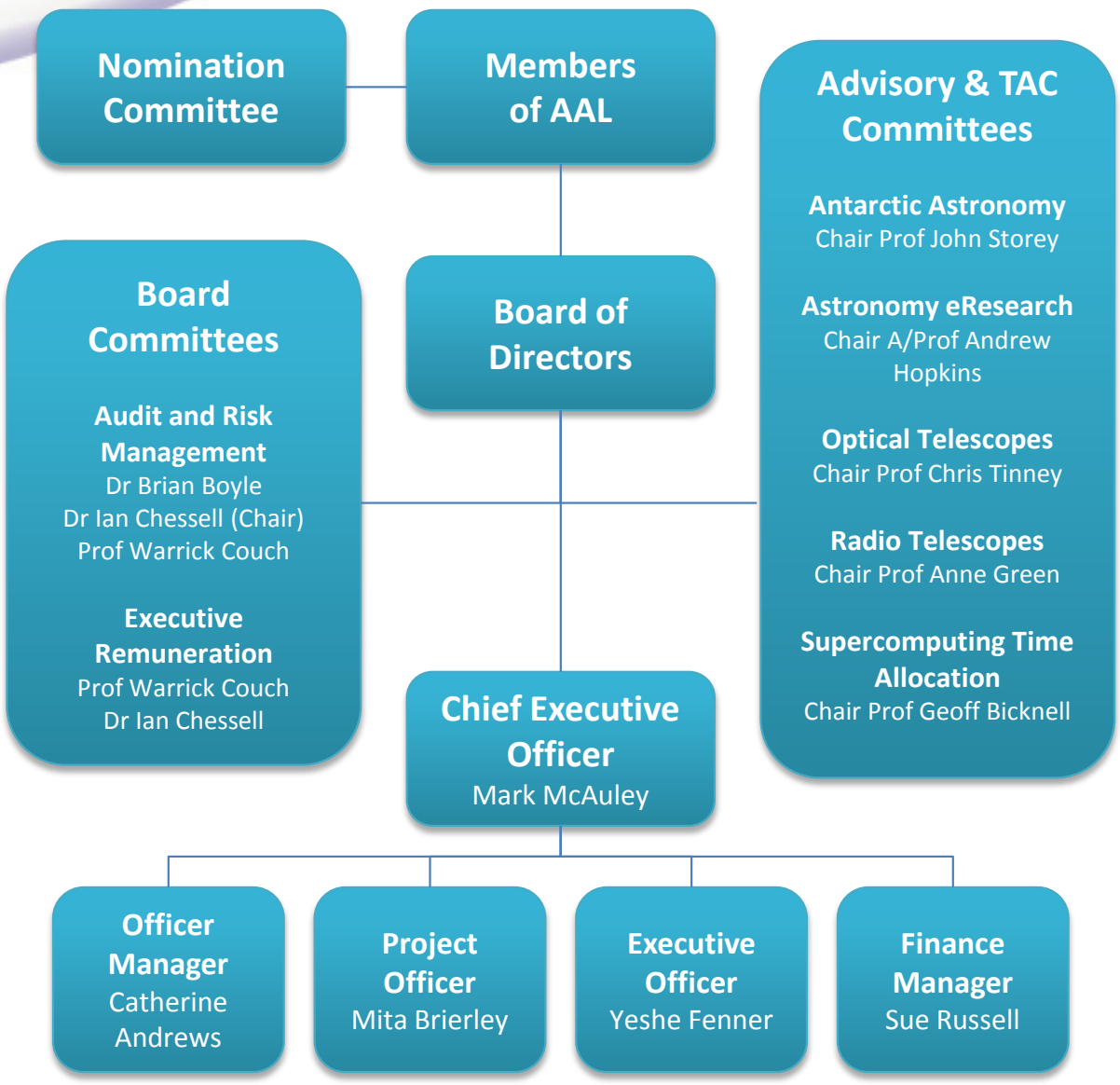
The **Astronomy NCRIS Reserve** ($423,670) results from interest earned from the NCRIS grant and must be used for projects associated with the Astronomy NCRIS funding agreement. During 2011/12 $396,185 has been committed to the ASVO project for 2012/13 and 2013/14.

The **Overseas Optical Reserve** ($2,515,019) is primarily used to cover shortfalls in payments to overseas optical telescope facilities. During 2010/11 the primary use of the Overseas Optical Reserve was $1,550,562 contractually committed (to be paid equally during 2011/12 and 2012/13) to continue Australian access to fifteen nights per year on the Magellan telescopes from semester 2011B until semester 2013A inclusive. AAL also draws down 2% of the balance of the reserve each year as a management fee ($48,630).

The **EIF Reserve** ($86,150) results from interest earned from the EIF grant. During 2011/12 $22,565 has been committed to the ASVO project for 2012/13 and 2013/14.

Organisational Chart

Organisational chart as of 30th June 2012



Board of Directors

Board of Directors as of 30th June 2012

Prof Warrick Couch (Chair)
Appointed 18th April
2007 until 2013 AGM

Dr Brian Boyle
Appointed 5th November
2009 until 2012 AGM

Dr Ian Chessell
Appointed 5th November
2010 until 2013 AGM

Prof Anne Green
Appointed 5th November
2010 until 2013 AGM

Prof Stuart Wyithe
Appointed 11th November
2011 until 2014 AGM

Prof Brian Schmidt
Appointed 18th April
2007 until 2014 AGM

Prof Mark Wainwright
Appointed 5th November
2009 until 2012 AGM

Images credit: Colonial Photo Studio (Chessell), U. Sydney School of Physics (Green), Lisa Germany (Couch, Boyle, Schmidt, Wainwright), Prime Minister's Science Prizes/Bearcage (Wyithe).

Board committee membership as of 30th June 2012

Audit and Risk Management Committee

Chair

Dr Ian Chessell

Members

Dr Brian Boyle

Prof Warrick Couch

Executive Remuneration Committee

Chair

Prof Warrick Couch

Members

Dr Ian Chessell

Location of Board meetings held during 2011/12

- University of Sydney
- Swinburne University of Technology

Board Electronic Resolutions during 2011/12

- Accept Company Statement
- Accept Audited Financial Accounts

Project
Committees

Committee Membership as of 30th June 2012

Antarctic Astronomy Advisory Committee (AAAC)

Prof Tim Bedding, University of Sydney, until 31 December 2012

Prof Michael Burton, University of New South Wales, until 31 December 2012

Dr Gary Hill, University of Adelaide, until 31 December 2013

Dr Mike Ireland, Macquarie University, until 31 December 2013

Prof Jon Lawrence, Australian Astronomical Observatory, until 31 December 2013

Prof Brian Schmidt, Astronomy Australia Ltd, until 31st December 2014

Prof John Storey (Chair), University of New South Wales, until 31 December 2012

Dr Nick Tothill, University of Western Sydney, until 31 December 2013

Astronomy eResearch Advisory Committee (AeRAC)

Prof Lindsay Botten, NCI Director (ex-officio)

Dr Tim Cornwell, CSIRO, until 31 December 2012

A/Prof Darren Croton, Swinburne University of Technology, until 31 December 2013

Dr Christopher Fluke, Swinburne University of Technology, until 31 December 2013

A/Prof Andrew Hopkins (Chair), Australian Astronomical Observatory, until 31 December 2013

Dr Bärbel Koribalski, CSIRO, until 31 December 2012

Prof Andrew Rohl/Paul Nicholls, iVEC Director (ex-officio)

Prof Mark Wainwright, Astronomy Australia Ltd, until 31 December 2012

Prof Andreas Wicenec, University of Western Australia, until 31 December 2013

Dr Ross Wilkinson, Australian National Data Service, until 31 December 2012

Astronomy Supercomputer Time Allocation Committee (ASTAC)

Dr George Beckett, iVEC Representative (ex-officio)

Prof Geoff Bicknell (Chair), Australian National University, until 31 December 2012

Dr Ben Evans, NCI Representative (ex-officio)

A/Prof Jarrod Hurley, Swinburne Supercomputer Manager (ex-officio)

Prof John Lattanzio, Monash University, until 31 December 2013

Prof Geraint Lewis, University of Sydney, until 31 December 2013

Optical Telescopes Advisory Committee (OTAC)

Dr Sarah Brough, Australian Astronomical Observatory, until 31 December 2013
Dr Michael Brown, Monash University, until 31 December 2012
Prof Matthew Colless, Australian Astronomical Observatory Director (ex-officio)
A/Prof Michael Murphy, Swinburne University of Technology, until 31 December 2013
Prof Quentin Parker, Macquarie University, until 31 December 2013
Prof Stuart Wyithe, Astronomy Australia Ltd, until 31 December 2014
Prof Stuart Wyithe, Gemini Board Member (ex-officio)
Dr Stuart Ryder, Australian Gemini Scientist (ex-officio)
Prof Chris Tinney (Chair), University of New South Wales, until 31 December 2012

Radio Telescopes Advisory Committee (RTAC)

Prof Frank Briggs, Australian National University, until 31 December 2012
Dr Kate Brooks, CSIRO, until 31 December 2012
Dr Phil Diamond, CASS Director, CSIRO (ex-officio)
Prof John Dickey, University of Tasmania, until 31 December 2013
Prof Anne Green (Chair), Astronomy Australia Ltd, until 31 December 2013
Prof Minh Huynh, University of Western Australia, until 31 December 2013
Dr Naomi McClure-Griffiths, CSIRO, until 31 December 2013
Prof Lister Staveley-Smith, University of Western Australia, until 31 December 2012
Prof Rachel Webster, University of Melbourne, until 31 December 2012

Nominations to Overseas Committees

Giant Magellan Telescope

Board

Prof Matthew Colless (Deputy Chair),
Australian Astronomical Observatory,
Mr Mark McAuley,
Astronomy Australia Ltd

Finance Committee

Mr Mark McAuley (Chair),
Astronomy Australia Ltd

Science Advisory Committee

Prof Chris Tinney,
University of New South Wales

Gemini

Board

Prof Stuart Wyithe,
Astronomy Australia Ltd

Finance Committee

Prof Stuart Wyithe,
Astronomy Australia Ltd

Science and Technology Advisory Committee

Prof Karl Glazebrook (Deputy Chair),
Swinburne University of Technology

Members and their representatives as of 30th June 2012

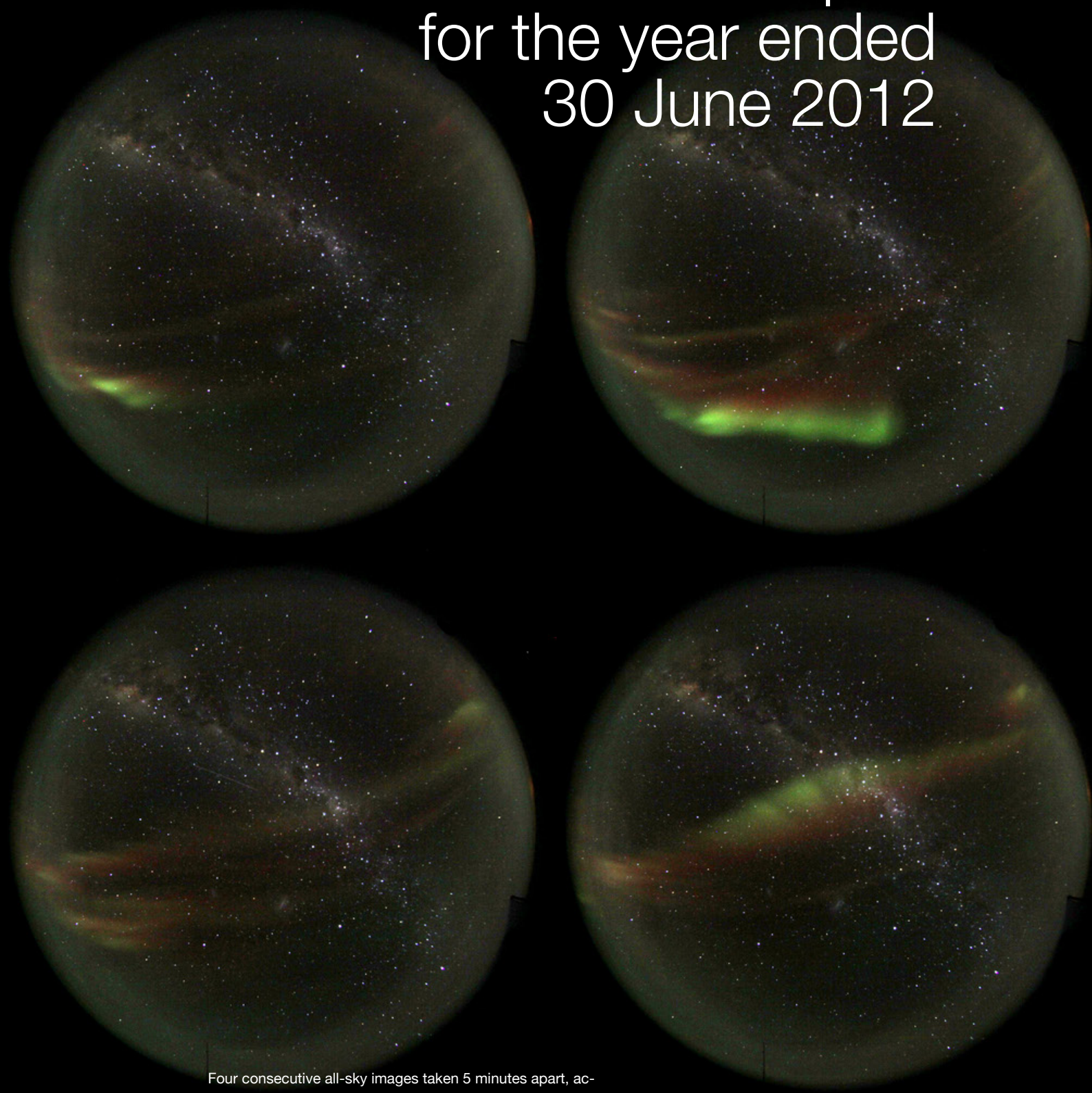
Australian Astronomical Observatory	Prof Matthew Colless
Australian National University	Prof Harvey Butcher
Commonwealth Scientific and Industrial Research Organisation	Dr Robert Braun
Curtin University	Prof Steven Tingay
James Cook University	A/Prof Andrew Walsh
Macquarie University	Prof Quentin Parker
Monash University	Prof John Lattanzio
Swinburne University of Technology	Prof Karl Glazebrook
University of Adelaide	Dr Gavin Rowell
University of Melbourne	Prof Rachel Webster
University of New South Wales	Prof John Storey
University of Queensland	Prof Halina Rubinsztein-Dunlop
University of Sydney	Prof Peter Tuthill
University of Tasmania	Prof John Dickey
University of Western Australia	Prof Peter Quinn

Nomination Committee (For the 2011 AGM election)

Prof Mark Wainwright (Chair) Astronomy Australia Ltd
Dr Gavin Rowell, University of Adelaide
Prof Karl Glazebrook, Swinburne University of Technology
Dr Kate Brooks, Astronomical Society of Australia
Prof Matthew Colless, Australian Astronomical Observatory

Astonomy Australia Limited
A.B.N 19 124 973 584

Financial report for the year ended 30 June 2012



Four consecutive all-sky images taken 5 minutes apart, acquired by the PLATO-R robotic observatory at Ridge A on the Antarctic plateau summit during a bright auroral event.

Image credit: Michael Ashley / UNSW

Directors' report and
financial statements

Astronomy Australia Limited

A.B.N 19 124 973 584

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General Information

The financial report covers Astronomy Australia Limited as an individual entity. The financial report is presented in Australian Dollars, which is Astronomy Australia Limited's functional and presentation currency.

The financial report consists of the financial statements, notes to the financial statements and directors' declaration.

Astronomy Australia Limited is a not for profit unlisted public company limited by guarantee, incorporated and domiciled in Australia, Its registered office and principal place of business are:

Registered Office

Swinburne University of Technology
Centre for Astrophysics and Supercomputing
Room AR 201
1 John Street
Hawthorn VIC 3122

Principal Place of Business

Swinburne University of Technology
Centre for Astrophysics and Supercomputing
Room AR 201
1 John Street
Hawthorn VIC 3122

A description of the nature of the company's operation and its principal activities are included in the directors' report, which is not part of the financial report.

The financial report was authorised for issue, in accordance with a resolution of directors, on 31 August 2012. The directors have the power to amend and reissue the financial report.

Directors' Report

Your directors present their report together with the financial statements on the company for the financial year ended 30 June 2012. Astronomy Australia Ltd. is a company limited by guarantee and is an income tax exempt charitable institution.

The names of the directors in office at any time during, or since the end of, the year are:

Prof. Warrick J. Couch (appointed 18 April 2007 reappointed 5 November 2010)

Prof. Anne Green (appointed 5 November 2010)

Prof. Brian P. Schmidt (appointed 18 April 2007 reappointed 11 November 2011)

Prof. Jeremy R. Mould (appointed 30 September 2008 retired 11 November 2011)

Emeritus Prof. Mark S. Wainwright AM (appointed 5 November 2009)

Prof. Brian J. Boyle (appointed 5 November 2009)

Dr. Ian Chessell (appointed 5 November 2010)

Prof. Stuart Wyithe (appointed 11 November 2011)

The surplus of the company for the financial year after providing for income tax of $Nil, amounted to $126,021 (2011 profit of ($1,323,309)).

Objectives

The Australian Government has defined the science of astronomy as one of only a few Super Sciences (Super Science Initiative, available online: http://www.innovation.gov.au/Science/ResearchInfrastructure/Pages/SuperScience.aspx). To support this definition, Astronomy Australia Limited's core objective is to ensure that astronomers in Australia have access to the best astronomical research infrastructure, including Australian participation in international facilities

Strategy for achieving the objectives

During the financial year the company worked to achieve its core objective by:

1. Engaging with Australian astronomers to advance the national research infrastructure priorities of the Australian astronomy decadal plan.
2. Advising the Australian Government on future investments in national astronomical research infrastructure.
3. Managing investments in national astronomical research infrastructure as required.

Principal activities

During the financial year the company's principal activities were:

1. Communicating directly with every Australian institution with a significant astronomy research capability, regardless of whether they were a member of the company.
2. Managing several major grants from the Australian Government for astronomical research infrastructure: National Collaborative Research Infrastructure Strategy; Australian Research Council Linkage Infrastructure, Equipment and Facilities; Education Investment Fund; and, Australian Astronomical Observatory – Gemini grant.

Performance measures

The company measures its performance in two different ways. For facilities that are currently operational the company measures the cost of access to the facility and its scientific return (through number of refereed journal articles). For facilities still under construction, a range of technical and construction milestones exist by which the performance of the project is measured. Both sets of measures are included in the company's annual report to DIISRTE.

Company Secretary

The following person held the position of company secretary at the end of the financial year:

Mr. Robert W. Osborne, Chartered Accountant

Mr. Osborne is the principal of the firm R.W. Osborne & Associates and has held a Certificate of Public Practice since 1980. He is a Fellow of the Institute of Chartered Accountants in Australia and a Fellow of CPA Australia. Mr. Osborne is contracted to Astronomy Australia Ltd. and was appointed company secretary on 18 April, 2007 and retired on 2 July 2012.

Mrs. Sue H.M Russell, CPA was appointed Company Secretary on 1 July 2012.

Contribution on winding up

In the event of the company being wound up, ordinary members are required to contribute a maximum $10 each. The total amount that members of the company are liable to contribute if the company is wound up is $150 based on 15 current members.

Directors' Report

Information on Directors

Prof. Warrick J. Couch (Non Executive Chair)

QUALIFICATIONS:

Bachelor of Science with Honours
Master of Science
Doctor of Philosophy (Astronomy)
Doctor of Science
FAA, FASA, FAIP

EXPERIENCE:

Prof. Couch has a research career spanning 30 years in optical astronomy, with an extensive and distinguished track record in terms of (i) use of university, national and international telescope facilities (including the AAT, Gemini, VLT, HST), (ii) research publications (career total of 220 refereed journal papers) and citation impact (Australian citation laureate and "Highly Cited" researcher), and (iii) securing external research grant funding (career total of more than A$4M.).

His research has involved numerous and often high profile national and international collaborations, the most notable examples being: the Supernova Cosmology Project (whose leader, Saul Perlmutter, was awarded the 2011 Nobel Prize in Physics), the MORPHS HST Distant Cluster Imaging Program (Australia, UK, US), the 2dF Galaxy Redshift Survey (Australia-UK), and the "WiggleZ" Dark Energy Survey (Australia, US, Canada).

He is or has been an active member of key national astronomy committees and bodies that are responsible for dealing with research policy and priorities, including the Australian Academy of Science's National Committee for Astronomy (at the time when it had oversight of the last decadal planning process), the Anglo-Australian Telescope Board, the Australian Astronomical Observatory Advisory Committee, and the Executive of the Australian Institute of Physics. These responsibilities have given him considerable experience in developing short- and long-term strategies and priorities for our national astronomy infrastructure, and implementing related funding programs (e.g. MNRF and NCRIS).

SPECIAL RESPONSIBILITIES:

Chair	Board
Member	Audit and Risk Management Committee
Chair	Executive Remuneration Committee

Directors' Report

Information on Directors

Prof. Brian P. Schmidt (Non Executive Director)

QUALIFICATIONS:
Bachelor of Science
(Physics and Astronomy)
A.M. in Astronomy
Doctor of Philosophy (Astronomy)
FAA, NAS, FRS

EXPERIENCE:
Prof. Schmidt's work has focused on the physics of supernovae and gamma ray bursts, and using these objects for cosmological studies. He is the Project scientist for the new SkyMapper telescope which will undertake a comprehensive optical survey of the southern skies. Prof. Schmidt has received a variety of awards over his career culminating in his sharing of the 2011 Nobel Prize for Physics.

Prof. Schmidt has undertaken research using radio facilities to understand supernovae and Gamma Ray Bursts, and involved in the development of radio transient astronomy with the Murchison Widefield Array, and the Australian SKA Pathfinder (ASKAP). He is actively involved in the development Murchison Wide Field array, has served as the Chair of the ATNF Time assignment committee, and as a member of the ASKAP Survey Science Proposal Committee.

Prof. Schmidt was leader of the High-Z team, a group of 20 astronomers on 6 continents whose 1998 discovery of an accelerating Universe was named Science Magazines Breakthrough of the Year. He has participated in several large international groups that have studied supernovae and gamma ray bursts, and is a member of the Australian and US National Academies of Science as well as Fellow of the Royal Society.

Prof. Schmidt has been an active member of several national astronomy and science bodies that are responsible for prioritizing and allocated resources for research. These include having served on the Major National Research Facilities selection panel in 2000, served as a member of the Australian Square Kilometre Array Steering Committee, chairing the Australian Decadal Working group on International Facilities, and co-Authoring The Mid-Term Review of the Australian Astronomy Decadal Plan.

Prof. Schmidt has taken a leading role in formulating strategy and implementation in Australian Astronomy. He is currently a member of the Murchison Widefield Array Board. He chaired the Australian National Academies LOFAR options working group.

SPECIAL RESPONSIBILITIES:

Member	Executive Remuneration Committee (until 31 December 2011)
Member	Optical Telescopes Advisory Committee (until 31 December 2011)
Member	Antarctic Astronomy Advisory Committee (from 1 January 2012)

Directors' Report

Information on Directors

Prof. Jeremy R. Mould
(Non Executive Director) - retired 11 November 2011

QUALIFICATIONS:
Bachelor of Science with Honours
Doctor of Philosophy (ANU)
Doctor of Science (Melb)
FAA, FRAS

EXPERIENCE:
Prof. Jeremy Mould is currently a Professor at Swinburne University with an honorary position at Melbourne University. He has extensive astronomical observatory management experience including a six year term as the Director of the National Optical Astronomy Observatory in Arizona, beginning in 2001. Prior to this Prof. Mould was Director of Mt Stromlo and Siding Spring Observatory at the Australian National University for seven years. He was Chair of the AATB 2000, 2001.

Prof Mould is a cosmologist and is the author of over 400 scientific publications. He was part of the team that won the prestigious Gruber Cosmology Prize in 2009, recognising their leadership in determining the Hubble Constant through their Hubble Space Telescope Key Project on the Extragalactic Distance Scale.

He has received other professional awards and honours, including the Newton Lacey Pierce Prize in Astronomy in 1984 by the American Astronomical Society and the Oort Professorship in 1998 by Leiden University in the Netherlands. He is a fellow of the Royal Astronomical Society and the Australian Academy of Science and a member of the American Astronomical Society.

Directors' Report

Information on Directors

Prof. Brian J. Boyle (Non Executive Director)

QUALIFICATIONS:
Bachelor of Science (Honours)
Doctor of Philosophy
FAA, FAICD

EXPERIENCE:
Prof. Brian Boyle was Director of the CSIRO Australia Telescope National Facility from July 2003 to February 2009. This is the largest cm-wavelength radio astronomical observatory in the Southern Hemisphere. He has experience with many aspects of cm-wave length radio astronomy technology, and has pioneered the use of 'image stacking' at radio wavelengths to extend the flux limits of current surveys. He is currently the Australian/NZ SKA Director, with a secondment to the Australian/NZ SKA Coordination Committee for 80% of his time.

He was Director of the Anglo-Australian Observatory for seven years, from 1996-2003. During that period, he oversaw the successful commissioning of the 2-degree field instruments and was the Australian-based leader of the 2dF QSO survey. He led the development of a strategy that saw the AAO become an instrumentation provider to international observatories. He has published over 130 refereed papers, principally in the field of optical astronomy, but also including X-ray and radio survey, infrared imaging and gamma-ray bursts.

During his career he has initiated and led six international scientific collaborations, including most recently the 2QZ survey and ATLAS program (now led by Ray Norris – due to his availability). He was also chairman of the International Square Kilometre Array (SKA) Steering Committee from 2006-2008.

Prof. Brian Boyle has been a Fellow of the Australian Institute of Company Directors since 2005.

As Chairman of the National Committee for Astronomy, he initiated and led the development of the Decadal Plan for Australian Astronomy 2006-15. He was also the facilitator for the NCRIS investment plan for optical and radio astronomy. This was, in effect, the implementation of the strategies outlined in the Decadal Plan.

As a member of CSIRO's Executive Management Council, he has also played a role in the implementation of CSIRO's 2003-07 strategy and the development of the 2007-11 strategy.

SPECIAL RESPONSIBILITIES:

Member Audit and Risk Management Committee

Directors' Report

Information on Directors

Emeritus Prof. Mark S. Wainwright AM FTSE (Non Executive Director)

QUALIFICATIONS:
Bachelor of Applied Science (Honours) (Applied Chemistry)
Master of Applied Science (Chemical Engineering)
Doctor of Philosophy (Chemical Engineering)
Doctor of Science, Doctor of Science (*honoris causa*)
FTSE, FIEAust, FIChemE, FRACI

EXPERIENCE:
Emeritus Professor Wainwright was Vice-Chancellor and President of the University of New South Wales for two years from 1 July 2004. Prior to that appointment, Professor Wainwright had been the Acting Vice-Chancellor of the University from mid April 2004. He was Deputy Vice-Chancellor (Research and International) from January 2001.

Professor Wainwright holds an Honours Degree in Applied Chemistry and a Master of Applied Science in Chemical Engineering from the University of Adelaide, a PhD in Chemical Engineering from McMaster University in Canada and a DSc for his research into skeletal catalysts from the University of South Australia. In 2007 he was awarded a Doctor of Science (honoris causa) by the University of New South Wales.

His academic career at UNSW commenced in 1974 as a lecturer in the School of Chemical Technology in the then Faculty of Applied Science and, in 1989, he was awarded a personal chair for his research in catalytic reaction engineering. In 1991 he was appointed Dean of Australia's largest Faculty of Engineering, a position he held until the end of 2000. During 1998 and 1999 he was also Pro-Vice-Chancellor (Research). Professor Wainwright is an Honorary Fellow of Engineers Australia, a Fellow of the Australia Academy of Technological Sciences and Engineering, a Fellow of the Institution of Chemical Engineers and a Fellow of the Royal Australian Chemical Institute.

In 2000 he was awarded the Centenary Medal for service to Australian society in research policy and management and engineering education. In 2004, Professor Wainwright was made a Member of the Order of Australia (AM) for his service to chemical engineering as a researcher and academic, and to tertiary education.

SPECIAL RESPONSIBILITIES:

Chair	Nomination Committee
Member	Astronomy eResearch Advisory Committee

Directors' Report

Information on Directors

Dr. Ian Chessell
(Non Executive Director)

QUALIFICATIONS:
Bachelor of Science (Hons.)
Doctor of Philosophy (Physics)
FTSE

EXPERIENCE:
After completing a PhD in physics at Melbourne University in 1970, Dr Chessell followed a career in the Defence Science and Technology Organisation, retiring as Australia's Chief Defence Scientist in 2003. Dr Chessell served as a member of the Prime Minister's Science, Engineering and Innovation Council (2001-2003) and in 2003 he was awarded the Centenary Medal for services to defence science. Dr Chessell was elected a Fellow of the Australian Academy of Technological Sciences and Engineering in 2003.

Dr Chessell was Chief Scientist of South Australia for the period 2008-2010 and is a member of the Defence South Australia Advisory Board. He was the Chair of the independent Technology Advisory Council of Tenix Pty Ltd for 2004-07. He was appointed Chair of the Goyder Institute for Water Research in 2010. Dr Chessell has been a non-Executive Director of QinetiQ Pty Ltd since 2008.

Dr Chessell chaired the Commonwealth Government's reviews of National ICT Australia in 2005 and of the Anglo-Australian Telescope in 2006. He was a member of the Board of the Anglo-Australian Telescope for the period 2007-2010. Dr Chessell was a member of the Commonwealth Government's Review of the CSIRO's Flagship Program in 2006 and chaired the Review of the CSIRO Climate Adaptation Flagship in 2011.

SPECIAL RESPONSIBILITIES:

Member	Australian Giant Magellan Telescope Oversight Committee (ANU)
Member	Executive Remuneration Committee (from 1 January 2012)
Chair	Audit and Risk Management Committee

Directors' Report

Information on Directors

Prof. Anne Green
(Non Executive Director)

QUALIFICATIONS:
Bachelor of Science (Honours)
Doctor of Philosophy
Graduate Diploma, Australian Institute of Company Directors
FASA, FAIP

EXPERIENCE:
Prof. Green has a research career spanning more than 20 years in radio astronomy. Her research is principally concerned with the structure and ecology of the Milky Way Galaxy and she has been responsible for several panoramic imaging radio surveys and has been a member of discovery teams for substantial numbers of supernova remnants, astrophysical masers and gas-rich galaxies in the Local Universe. Currently, she is Project Leader for the Square Kilometre Array Molonglo Project, a pathfinder instrument to study transient sources and the gas assembly of distant galaxies, as part of science and technology developments for the next generation of radio telescopes.

She has been an active member of several national and international astronomy committees which have had responsibility for setting strategy and managing competing priorities, including having served as a Member of the International Square Kilometre Array Steering Committee, been Chair of the Australia Telescope Users Committee and a Member of the Australia Telescope Steering Committee and President of the Astronomical Society of Australia.

Prof. Green has also gained experience in management and related roles responsible for prioritizing allocation of resources while Head of the School of Physics, Director of the Science Foundation for Physics and for twelve years as Director of the Molonglo Observatory, all associated with the University of Sydney. Since 2007, she has been a Graduate Member of the Australian Institute of Company Directors.

She has shown commitment to issues of equity as founding co-Chair of the Women in Astronomy Working Group of the International Astronomical Union.

SPECIAL RESPONSIBILITIES:

Deputy Chair	AAL Board
Chair	Radio Telescopes Advisory Committee

Directors' Report

Information on Directors

Prof. Stuart Wyithe (Non Executive Director)

QUALIFICATIONS:
Bachelor of Science with Honours
Doctor of Philosophy (Melb)

EXPERIENCE:
Prof. Stuart Wyithe is currently a Professor at The University of Melbourne, and an ARC Australian Laureate Fellow. Prof. Wyithe is a cosmologist and is the author of over 100 scientific publications. He has a history of collaboration at the national and international level, both with theoretical researchers and with observational programs. His personal research is theoretical in nature, and having worked extensively on modeling observations at both optical and radio wavelengths. He has received a range of professional awards and honours, including the Pawsey Medal from the Australian Academy of Science and the Malcome McIntosh prize. He is a fellow of the Astronomical Society of Australia.

Prof. Wyithe has contributed to the running of a range of national bodies. In particular he has been a member of the Time Allocation Committee for the Australia Telescope National Facility, of the Australian Time Allocation Committee, and of the ANITA steering committee. He currently sits on the Australian Academy of Science's National Committee for Astronomy, and was a member of the committee that oversaw the midterm review of the Australian Astronomy Decadal Plan. Prof. Wyithe served as MWA Science Council Chair from 2010-2011, during which he developed and implemented policies for publications, for the use of MWA data, and governance of student projects.

Prof. Wyithe worked as a University Associate Dean in the Melbourne School of Graduate research from 2009-2011.

SPECIAL RESPONSIBILITIES:

Member	Optical Telescopes Advisory Committee (from 1 January 2012)
Member	Gemini Finance Committee (from 27 February 2012)
Member	Gemini Board (from 12 May 2012)

Directors' Report

Register of Directors interests

Prof. Brian J. Boyle

1. Employed by CSIRO
2. Member, CSIRO Executive Management Council
3. Member, ICRAR Board
4. Member, Australia/New Zealand SKA Coordination Committee
5. Member, Pawsey HPC Centre for SKA Science Steering Committee
6. Member, CSIRO ASKAP Steering Committee

Prof. Warrick J. Couch

1. Employed by Swinburne University of Technology; Director of the Centre for Astrophysics and Supercomputing
2. Chair, Australian Astronomical Observatory Advisory Committee
3. ARC Grant holder and ARC Professorial Fellow
4. Chief Investigator within the ARC Centre of Excellence for All-Sky Astrophysics (CAASTRO)
5. Fellow of the Australian Academy of Science
6. Fellow of the Astronomical Society of Australia
7. Fellow of the Australian Institute of Physics
8. Member, ARC College of Experts (from 1 Jan 2010)

Dr. Ian Chessell

1. Chair, Goyder Institute for Water Research, SA
2. Member, Defence SA Advisory Board
3. Non-Executive Director, QinetiQ Pty, Ltd. (Aust)

Prof. Anne Green

1. Employed by the University of Sydney
2. Fellow, Astronomical Society of Australia
3. Fellow, Australian Institute of Physics
4. Graduate Member Australian Institute of Company Directors
5. ARC Grant holder
6. Member Advisory Board Macquarie Research Centre in Astronomy, Astrophysics, & Astrophysics.
7. Member Scientific Advisory Board Max Planck Institute for Radioastronomy

Prof. Jeremy R. Mould

1. Honorary Professorial Fellow, University of Melbourne
2. Fellow, Australian Academy of Science
3. Professor, Swinburne University
4. Chair, Advisory Board, CoEPP

Directors' Report

Register of Directors interests

Prof. Brian P. Schmidt

1. Employed by the Australian National University, RSAA
2. Board Member, MWA
3. Board Member, HAT-South Planetary Survey Project
4. Member, AURA-Gemini oversight committee
5. Fellow, Australian Academy of Sciences
6. Fellow, Royal Society
7. Fellow, United States National Academy of Sciences
8. ARC Grant and Fellowship holder
9. Member, Australia Telescope Steering Committee
10. Member, LIGO Program Advisory Committee
11. Member, Australian Academy's National Committee of Astronomy
12. Member, Australian Astronomical Observatory Advisory Committee
13. Member, Council of the Australian Academy of Sciences
14. Member, Questacon Advisory Board

Prof. Stuart Wyithe

1. Employed by the The University of Melbourne
2. ARC Grant and Fellowship holder
3. Member, Australian Academy's National Committee of Astronomy
4. Fellow, Astronomical Society of Australia

Emeritus Prof. Mark S. Wainwright

1. Fellow, Australian Academy of Technological Sciences and Engineering
2. Honorary Fellow, Engineers Australia, (formerly Institution of Engineers Australia)
3. Fellow, Institution of Chemical Engineers (IChemE)
4. Fellow, The Royal Australian Chemical Institute (RACI).
5. Chair, Foundation for Australian Studies in China
6. Chair, National Computational Infrastructure Steering Committee ANU
7. Chair, Intersect Australia Limited
8. Chair, New Horizons Project Collaborations Committee Monash University / CSIRO
9. Director, Engineering Aid Australia Limited
10. Member, Queensland University of Technology Council
11. Chair, TAFE NSW Higher Education Governing Council
12. Chair, Smart Services CRC Board
13. Chair, National Institute for Experimental Arts
14. Member, International Advisory Committee, Hong Kong Polytechnic University
15. Member, Hong Kong Universities Grants Commission
16. Director, AARNeT

Meetings of Directors

	Directors Meetings		Board Committee Meetings	
Name	**No. Eligible to Attend**	**No. Attended**	**No. Eligible to Attend**	**No. Attended**
Prof. Warrick J. Couch	5	5	2	1
Prof. Brian P. Schmidt	5	5	-	-
Prof. Jeremy R. Mould	3	2	-	-
Prof. Brian J. Boyle	5	5	1	1
Emeritus Prof. Mark S. Wainwright	5	4	-	-
Dr. Ian Chessell	5	5	2	2
Prof. Anne Green	5	5	-	-
Prof. Stuart Wyithe	2	2	-	-

Auditors' Independence Declaration

A copy of the auditor's independence declaration as required under section 307C of the Corporations Act 2001 is set out on page 58.

Signed in accordance with a resolution of the Board of Directors:

Director:

Prof. Warrick J. Couch

Director:

Dr. Ian Chessell

Dated this 31st day of August 2012

Astronomy Australia Limited A.B.N 19 124 973 584

Auditor's Independence Declaration under section 307C of the Corporation Act 2001 to the directors of Astronomy Australia Limited

I hereby declare, that to the best of my knowledge and belief, during the financial year ended 30 June 2012 there have been no:

(i) contraventions of the auditor independence requirements as set out in the Corporations Act 2001 in relation to the audit; and

(ii) contraventions of any applicable code of professional conduct in relation to the audit.

Name of Firm: E. Townsend & Co.
Chartered Accountants

Name of Partner:

Eric Townsend

Address: 35 Mereweather Avenue, Frankston. Vic. 3199.

Dated this 31st day of August 2012

Liability limited by a scheme approved under Professional Standards Legislation.

Statement of comprehensive income for the year ended 30 June 2012

	Note	2012 $	2011 $
Revenues including Government Grants	2	12,293,915	20,758,583
Less expenditure			
Grants paid		(11,543,946)	(21,502,607)
Auditor's remuneration	3	(4,800)	(6,000)
Bad and doubtful debt expenses		-	-
Depreciation and amortisation expenses		(1,881)	(2,356)
Employee benefits expenses		(364,830)	(350,509)
Finance costs		-	-
Other expenses		(252,437)	(220,420)
Surplus (Deficit) before income tax attributable to members of the entity	**4**	**126,021**	**(1,323,309)**
Income Tax		-	-
Surplus (Deficit) after income tax attributable to members of the entity		**126,021**	**(1,323,309)**
Other comprehensive income		**Nil**	**Nil**
Total comprehensive income for the year attributable to members of the entity	**4**	**126,021**	**(1,323,309)**

The accompanying notes form part of these financial statements.

The Company is an income tax exempt charitable institution.

Statement of Financial Position as at 30 June 2012

	Note	2012 $	2011 $
CURRENT ASSETS			
Cash and cash equivalents	**5**	6,700,645	9,970,303
Trade and other receivables	**6**	69,837	444,386
TOTAL CURRENT ASSETS		6,770,482	10,414,689
NON-CURRENT ASSETS			
Property, plant and equipment	**7**	8,501	3,859
TOTAL NON-CURRENT ASSETS		8,501	3,859
TOTAL ASSETS		**6,778,983**	**10,418,548**
CURRENT LIABILITIES			
Trade and other payables	**8**	3,664,160	7,451,652
Short-term Provisions payable	**9**	31,697	9,791
TOTAL CURRENT LIABILITIES		3,695,857	7,461,443
TOTAL LIABILITIES		**3,695,857**	**7,461,443**
NET ASSETS		**3,083,126**	**2,957,105**
EQUITY			
Reserves		3,024,839	2,892,601
Retained earnings		58,287	64,504
TOTAL EQUITY		**3,083,126**	**2,957,105**

The accompanying notes form part of these financial statements

Statement of changes in equity for the year ended 30 June 2012

	Retained Earnings Account $	NCRIS Reserve Account $	Overseas Optical Reserve Account $	EIF Reserve Account $	Total $
Balance at 30 June 2010	**62,728**	**282,757**	**3,934,929**	**-**	**4,280,414**
Surplus attributable to equity members	(1,323,309)	-	-	-	(1,323,309)
Allocated to Reserves	(558,781)	407,464	151,317	-	-
Transfers from Reserves	1,883,866	(229,090)	(1,654,776)	-	-
Balance at 30 June 2011	**64,504**	**461,132**	**2,431,469**	**-**	**2,957,105**
Surplus attributable to equity members	126,021	-	-	-	126,021
Allocated to Reserves	(281,855)	39,788	155,917	86,150	-
Transfers from Reserves	149,618	(77,250)	(72,368)	-	-
Balance at 30 June 2012	**58,287**	**423,670**	**2,515,019**	**86,150**	**3,083,126**

The accompanying notes form part of these financial statements

Statement of cash flows for the year ended 30 June 2012

	Note	2012 $	2011 $
CASH FLOWS FROM OPERATING ACTIVITIES:			
Receipts from Grants/Members		10,029,699	11,434,297
Interest Received		220,802	588,874
Payments to Suppliers, Employees &Taxes (Net)		(334,118)	(728,925)
Payments of Grants		(13,179,588)	(21,046,698)
Net Cash Generated by (Used in) Operating Activities	**10**	**(3,263,205)**	**(9,752,452)**
CASH FLOWS FROM INVESTING ACTIVITIES:			
Proceeds from Sale of Property, Plant & Equipment		-	-
Payment for Property, Plant & Equipment		(6,453)	-
Net Cash Generated (Used in) Investing Activities		**(6,453)**	**-**
CASH FLOWS FROM FINANCING ACTIVITIES:			
Proceeds from Borrowings		-	-
Repayment of Borrowings		-	-
Distributions/Dividend by Chief Entities		-	-
Net Cash Generated (Used in) Financing Activities		-	-
Net Increase (Decrease) in Cash Held		(3,269,658)	(9,752,452)
Cash at Beginning of the financial year		9,970,303	19,722,755
Cash at 30 June 2012	**5**	**6,700,645**	**9,970,303**

The accompanying notes form part of these financial statements

Notes to the financial statements for the year ended 30 June 2012

The financial statements cover Astronomy Australia Limited as an individual entity. It is a company limited by guarantee incorporated and domiciled in Australia and is a not-for-profit income tax exempt charitable institution.

1 Summary of Significant Accounting Policies

Basis of Preparation

The financial statements are general purpose financial statements that have been prepared in accordance with Accounting Standards, including Australian Accounting Interpretations and the Corporations Act 2001.

Australian Accounting Standards set out accounting policies that the AASB has concluded would result in financial statements containing relevant and reliable information about transactions, events and conditions. Material accounting policies adopted in the preparation of these financial statements are presented below and have been consistently applied unless otherwise stated.

Reporting basis and conventions

The financial statements have been prepared on an accruals basis and are based on historical costs modified where applicable by the measurement at fair value of selected non-current assets, financial assets and financial liabilities.

Accounting Policies

Revenue

Interest revenue is recognised on a proportional basis taking into account the interest rates applicable to the financial assets.

Revenue from the rendering of a service is recognised upon the delivery of the service to the customers.

Grants are recognised at fair value where there is reasonable assurance that the grant will be received and all grant conditions will be met. Grants relating to expense items are recognised as income over the periods necessary to match the grant to the costs they are compensating. Grants relating to assets are credited to deferred income at fair value and are credited to income over the expected useful life of the asset on a straight-line basis.

All revenue is stated net of the amount of Goods and Services Tax (GST)

Goods and Services Tax (GST)

Revenues, expenses and assets are recognised net of the amount of GST, except where the amount of GST incurred is not recoverable from the Australian Tax Office. In these circumstances, the GST is recognized as part of the cost of acquisition of the asset or as part of an item of the expense. Receivables and payables in the balance sheet are shown inclusive of GST.

Cash flows are presented in the cash flow statement on a gross basis, except for the GST component of investing and financing activities, which are disclosed as operating cash flows.

Comparative Figures

When required by Accounting Standards, comparative figures have been adjusted to conform to changes in presentation for the current financial year.

Critical Accounting Estimates and Judgments

The directors evaluate estimates and judgments incorporated into the financial report based on historical knowledge and best available current information. Estimates assume a reasonable expectation of future events and are based on current trends and economic data, obtained both externally and within the group.

Key estimates – Impairment

The company assesses impairment at each reporting date by evaluating conditions specific to the entity that may lead to impairment of assets. Where an impairment trigger exists, the recoverable amount of the asset is determined. Value-in-use calculations performed in assessing recoverable amounts incorporate a number a key estimates.

No impairment has been recognised in respect of this financial year.

Notes to the financial statements for the year ended 30 June 2012

Income Taxation

The company is endorsed by the Taxation Office as a Charitable Institution. Therefore no income tax is payable by the company.

Property, Plant and Equipment

Buildings, Motor Vehicles, Office Furniture and Equipment and Plant and Equipment

Buildings, Motor Vehicles, Office Furniture and Equipment and Plant and Equipment are carried at cost or fair value less, where applicable, any accumulated depreciation and impairment losses.

Property

Freehold land is at cost.

Depreciation

The depreciable amount of Buildings (but not freehold land), Motor Vehicles, Office Furniture and Equipment and Plant and Equipment are depreciated on a written down value (WDV) or a straight line basis over their useful lives to the company commencing from the time the asset is held ready for use. Leasehold improvements are depreciated over the shorter of either the unexpired period of the lease or the estimated useful lives of the improvements.

The depreciation rates used for each class of depreciable assets are:

Class of Fixed Assets	**Depreciation rate**	**Method**
Office Furniture & Equipment	15% to 50%	Written down value

The assets' residual values and useful lives are reviewed, and adjusted if appropriate, at each balance sheet date.

An asset's carrying amount is written down immediately to its recoverable amount if the asset's carrying amount is greater than its estimated recoverable amount.

Gains and losses on disposals are determined by comparing proceeds with the carrying amount. These gains or losses are included in the income statement.

When revalued assets are sold, amounts included in the revaluation reserve relating to that asset are transferred to retained earnings.

Leases

Leases of fixed assets where substantially all the risks and benefits incidental to the ownership of the asset, but not the legal ownership that are transferred to the company, are classified as finance leases.

Finance leases are capitalised by recording an asset and a liability at the lower of the amounts equal to the fair value of the leased property or the present value of the minimum lease payments, including any guaranteed residual values. Lease payments are allocated between the reduction of the lease liability and the lease interest expense for the period.

Leased assets are depreciated on a straight-line basis over the shorter of their estimated useful lives or the lease term.

Lease payments for operating leases, where substantially all the risks and benefits remain with the lessor, are charged as expenses in the periods in which they are incurred.

Lease incentives under operating leases are recognised as a liability and amortised on a straight-line basis over the life of the lease term.

Financial Instruments

Recognition

Financial instruments are initially measured at cost on trade date, which includes transaction costs, when the related contractual rights or obligations exist. Subsequent to initial recognition these instruments are measured as set out below.

Financial assets at fair value through profit and loss

A financial asset is classified in this category if acquired principally for the purpose of selling in the short term or if so designated by management and within the requirements of AASB 139: Financial Instruments: Recognition and Measurement. Derivatives are

also categorised as held for trading unless they are designated as hedges. Realised and unrealised gains and losses arising from changes in the fair value of these assets are included in the income statement in the period in which they arise.

Loans and receivables

Loans and receivables are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market and are stated at amortised cost using the effective interest rate method.

Held-to-maturity investments

These investments have fixed maturities, and it is the entity's intention to hold these investments to maturity. Any held-to-maturity investments held by the entity are stated at amortised cost using the effective interest rate method.

Available-for-sale financial assets

Available-for-sale financial assets include any financial assets not included in the above categories. Available-for-sale financial assets are reflected at fair value. Unrealised gains and losses arising from changes in fair value are taken directly to equity.

Financial liabilities

Non-derivative financial liabilities are recognised at amortised cost, comprising original debt less principal payments and amortisation.

Derivative instruments

Derivative instruments are measured at fair value. Gains and losses arising from changes in fair value are taken to the income statement unless they are designated as hedges.

Fair value

Fair value is determined based on current bid prices for all quoted investments. Valuation techniques are applied to determine the fair value for all unlisted securities, including recent arm's length transactions, reference to similar instruments and option pricing models.

Impairment

At each reporting date, the company assesses whether there is objective evidence that a financial instrument has been impaired. In the case of available-for-sale financial instruments, a prolonged decline in the value of the instrument is considered to determine whether impairment has arisen. Impairment losses are recognised in the income statement.

As a not-for-profit entity the value in use of an asset may be equivalent to the depreciated replacement cost of that asset when the future economic benefits of the asset is not primarily dependent on the asset's ability to generate net cash inflows and where the entity would, if deprived of the asset, replace its remaining future economic benefits.

Provisions

Provisions are recognised when the company has a legal or constructive obligation, as a result of past events, for which it is probable that an outflow of economic benefits will result and that outflow can be reliably measured.

Employee Benefits

Provision is made for the company's liability for employee benefits arising from services rendered by employees to balance date. Employee benefits that are expected to be settled within one year have been measured at the amounts expected to be paid when the liability is settled, plus related on-costs. Employee benefits payable later than one year have been measured at the present value of the estimated future cash outflows to be made for those benefits.

Cash and Cash Equivalents

Cash and cash equivalents include cash on hand, deposits held at call with banks, other short-term highly liquid investments with original maturities of three months or less, and bank overdrafts. Bank overdrafts are shown within short-term borrowings in current liabilities on the balance sheet.

Notes to the financial statements for the year ended 30 June 2012

Unspent Grant Funds

Unspent Grant Funds available as revenue or liable to be returned to the grant provider in the following year are recognised as a current liability in the balance sheet. They are not treated as an operating surplus or profit.

Overseas Optical Reserve

As part of the Australian Research Council's financial arrangements with Sydney University for paying for the Australian share of Gemini, a substantial reserve was established. When the ARC LIEF grant for Gemini was transferred from Sydney University to AAL, this "Gemini Reserve" was also transferred to AAL. AAL and the ARC have agreed that the primary use of this reserve would be to cover shortfalls in payments to overseas optical telescope facilities due to currency fluctuations. AAL therefore renamed this reserve the "Overseas Optical Reserve".

A 2% (2011 – 2%) administration fee totalling $48,630 (2011 - $78,699) has been transferred from the Reserve.

Grant payments totalling $23,738 (2011 - $1,576,077) have been transferred from the Reserve.

AASB 101 – Presentation of Financial Statements

There have been changes in the Australian Accounting Standards Board (AASB) standards AASB101 that requires changes to the presentation of certain information within the financial statements. Below is an overview of the key changes and their impact on these financial statements.

Disclosure impact

Terminology changes:- The revised version of AASB 101 contains a number of terminology changes, including to the names of the primary financial statements. Put simply the Profit and Loss Statement is now termed the 'Statement of Comprehensive Income' and the Balance Sheet is now the 'Statement of Financial Position'.

Reporting changes in equity:– The revised AASB 101 requires all changes in equity arising from transactions with owners, in their capacity as owners, to be presented separately from "non-owner" changes in equity. "Non-owner" changes are shown in the Statement of Comprehensive Income and "Owner changes" are shown in the Statement of Changes in Equity.

Other comprehensive income:- AASB 101 introduces the concept of 'Other Comprehensive Income" which is income and expense items that are not required to be shown in the Profit and Loss under other Australian Accounting Standards.

New Accounting Standards for Application in Future Periods

Australian Accounting Standards and Interpretations that have recently been issued or amended but are not yet mandatory, have not been early adopted by the company for the annual reporting period ended 30 Jun 2012. The company has not yet assessed the impact of these new or amended Accounting Standards and Interpretations.

2 Revenue including Government Grants

	Note	2012 $	2011 $
Operating activities			
Grants		11,520,208	19,697,440
Administration Grant		262,160	255,886
Members subscriptions		220,908	240,930
Interest received – General Account		8,683	5,284
Interest received – Grants Account		39,889	407,726
Interest received – Overseas Optical Reserve Account		155,917	151,317
Interest received - EIF Account		86,150	-
Total revenue		12,293,915	20,758,583
Movement in Grants Allocation for the Year			
NCRIS Grants yet to be Allocated			
Opening Balance		1,679,538	11,994,864
Grants Paid		(1,289,068)	(16,253,326)
Grants Received		-	5,938,000
Closing Balance	8	390,470	1,679,538
LIEF Grants yet to be Allocated			
Opening Balance		3,000,000	3,700,000
Grants Paid		(3,000,000)	(3,700,000)
Grants Received		-	3,000,000
Closing Balance	8	-	3,000,000
OOR Grants yet to be Allocated			
Opening Balance		1,550,562	-
Grants Paid		(775,280)	-
Grants Received		-	1,550,562
Closing Balance	8	775,282	1,550,562
AAO Gemini Grant yet to be Allocated			
Opening Balance		960,000	-
Grants Paid		(960,000)	-
Grants Received		-	960,000
Closing Balance	8	-	960,000

Notes to the financial statements for the year ended 30 June 2012

	Note	2012 $	2011 $
NCRIS Reserve Grant yet to be Allocated			
Opening Balance		229,090	-
Grants Paid		(229,090)	-
Grants Received		-	229,090
Closing Balance	8	-	229,090
DIISRTE AST3 - ALMA Grant yet to be Allocated			
Opening Balance		-	-
Grants Paid		-	-
Grants Received		30,000	-
Closing Balance	8	30,000	-
DIISRTE MWA Grant yet to be Allocated			
Opening Balance		-	-
Grants Paid		-	-
Grants Received		400,000	-
Closing Balance	8	400,000	-
AAO Grant yet to be Allocated			
Opening Balance		-	-
Grants Paid		-	-
Grants Received		967,000	-
Closing Balance	8	967,000	-
EIF Grant yet to be Allocated			
Opening Balance		-	-
Grants Paid		-	-
Grants Received		966,700	-
Closing Balance	8	966,700	-

3 Auditor's Remuneration

	2012 $	2011 $
Audit Services	4,800	6,000

4 Significant Revenue and Expense items

The following significant changes in revenue and expense items are relavant in explaining the financial performance.

	2012 $ Change	2011 $ Change
Income		
Membership fees	(20,022)	50,011
Interest Received	(273,688)	(223,017)
Administration Grants	6,274	4,093
Grants paid from Reserves	1,781,429	(1,414,751)
Expenses		
Legal Costs	(26,597)	(11,537)
Meeting and Travel Expenses	(30,964)	(2,728)
Consultant Fees	33,181	(45,454)
Salaries and Directors Fees	(14,321)	(40,686)
Miscellaneous Expenses	(5,962)	8,643
Total change in surplus/deficit	**1,449,330**	**(1,675,426)**

5 Cash and Cash Equivalents

Reconciliation of cash

Cash at the end of the financial period as shown in the cash flow statement is reconciled to the related items in the statement of financial position as follows:

	2012 $	2011 $
Current		
Cash on Hand	65	33
Term Deposit - Grant Account	2,364,327	2,428,997
Term Deposit - Grant Account USD	862,058	7,085,248
Cash at Bank - General Account	3,960	39,571
Cash at Bank - General Maximiser Account	113,295	48,167
Cash at Bank - Grant Account	440,089	89
Cash at Bank - Grant Maximiser Account	2,916,851	368,198
	6,700,645	**9,970,303**

6 Trade and Other Receivables

	2012 $	2011 $
Current		
Trade Debtors	-	2,613
Other Debtors	69,837	-
GST Receivable	-	441,773
	69,837	**444,386**

7 Property, Plant and Equipment

PLANT AND EQUIPMENT

	2012 $	2011 $
Plant and equipment:		
At cost	20,450	13,997
Accumulated depreciation	(11,949)	(10,138)
Total Plant and Equipment	8,501	3,859
Office Furniture and Equipment		
Opening Balance	3,859	6,215
Purchases	6,453	-
Accumulated depreciation	(1,811)	(2,356)
Closing Balance at 30th June 2012	**8,501**	**3,859**

Movement in the carrying amounts for each class of property, plant and equipment

	Office furniture & equipment	Total
2010		
Carrying amount at end year	**6,215**	**6,215**
2011		
Additions at cost	-	-
Disposals		
Depreciation Expense	(2,356)	(2,356)
Carrying amount at end year	**3,859**	**3,859**
2012		
Additions at cost	6,453	6,453
Disposals	-	-
Depreciation Expense	(1,811)	(1,811)
Carrying amount at end year	**8,501**	**8,501**

8 Trade and Other Payables

	2012 $	2011 $
Current		
NCRIS Grants to be allocated	390,470	1,679,538
LIEF Grants to be allocated	-	3,000,000
OOR Grants to be allocated	775,282	1,550,562
AAO Gemini Grant to be allocated	-	960,000
NCRIS Reserve Grant to be allocated	-	229,090
Other Creditors	44,677	32,462
GST Payable	90,031	-
DIISRTE AST3 - ALMA Grant yet to be allocated	30,000	-
DIISRTE MWA Grant yet to be allocated	400,000	-
AAO Grant yet to be allocated	967,000	-
EIF Grant yet to be allocated	966,700	-
	3,664,160	**7,451,652**

9 Provisions

Provision for Long Service Leave	11,906	-
Provision for Recreational Leave	19,791	9,791
Total provisions	**31,697**	9,791
Analysis of Total Provisions		
Current	31,697	9,791
Opening balance	**9,791**	**14,085**
Additional provisions raised during year	21,906	-
Amount used	-	4,294
Balance at end of period	**31,697**	**9,791**

10 Cash Flow Information

Reconciliation of Cash flow from Operations with Surplus after Income Tax		
Surplus from ordinary activities after tax	126,021	(1,323,309)
Non-cash flows in surplus (deficit)		
Depreciation	1,811	2,356
Changes in assets and liabilities, net of the effects of purchase and disposal of subsidiaries		
(Increase)/decrease in trade and other receivables	374,549	(149,262)
Increase/(decrease) in trade and other payables	(3,787,492)	(8,277,943)
Increase/(decrease) in current provisions	21,906	(4,294)
Cash flow from operations	**(3,263,205)**	**(9,742,452)**

11 Events After the Balance Sheet Date

There have been no material non-adjusting events after the reporting date, nor has any information been received about conditions at reporting date that have not been included in this report.

12 Capital & Leasing Commitments

There are no Capital or Lease Commitments.

13 Segment Reporting

The company operates predominantly in one business and geographical segment being liaison with the astronomy community and managing capital grant funds to astronomy projects throughout Australia.

14 Economic Dependency, Contingent Assets & Contingent Liabilities

The company receives the majority of its grant funds from the Department of Industry, Innovation, Science Research and Tertiary Education (DIISRTE). This funding source establishes certain procedures for grant expenditure and acquittal. If grants are not expended and acquitted in accordance with grantor's procedures, the Grantor can refuse to make further grants and request repayments of grants made.

The company has entered into a long funding agreement with the Department of Industry, Innovation, Science Research and Tertiary Education (DIISRTE) for the receipt of A$10,000,000 over 2 years to 2013 of which a portion is for the company's operating costs and the majority is for projects to be undertaken by third parties.

15 Financial Risk Management

The entity's financial instruments consist mainly of deposits with banks, local money market instruments, short-term investments, accounts receivable and payable, loans and borrowings and mortgages.

The totals for each category of financial instruments, measured in accordance with AASB 139 is as follows:-.

	2012 $	2011 $
Financial assets		
Cash and cash equivalents	6,700,645	9,970,303
Loans and Receivables	69,837	444,392
Total financial assets	**6,770,482**	**10,414,695**
Financial liabilities		
Financial liabilities at amortised cost		
- Trade and other payables	134,708	32,462
Grants yet to be allocated	3,529,452	7,419,190
Total financial liabilities	**3,664,160**	**7,451,652**

Financial risk management policies

The directors' overall risk management strategy is to assist the entity in meeting its financial targets, whilst minimising potential adverse effects or financial performance. Risk management policies are approved and reviewed by the Board of Directors on a regular basis. These include credit risk policies and future cash flow requirements.

The entity does not have any derivative instruments at the end of the reporting period.

Specific Financial Risk Exposures and Management

The main risks the entity is exposed to through its financial instruments are interest rate risk, liquidity risk and credit risk.

(a) Credit risk

Credit risk is the risk that parties that owe money do not pay it.

The maximum exposure to credit risk, excluding the value of any collateral or other security, at balance date to recognised financial assets, is the carrying amount, net of any provisions for impairment of those assets, as disclosed in the statement of financial position and notes to the financial statements.

The entity does not have any significant concentration of credit risk exposure to any single, or group, of counter-parties under financial instruments entered into by the entity. A profile of credit risk appears above under the Note on 'Trade and Other Receivables'.

(b) Liquidity risk

Liquidity risk arises due the possibility that the entity might encounter difficulty in settling its own debts or other liabilities. The entity manages this risk by managing credit risk on amounts owed to it, monitoring forecast cash flows and ensuring that adequate unutilised borrowing facilities are maintained.

Financial liability and financial asset maturity analysis

	Within 1 Year		1 to 5 years		Over 5 years		Total	
	2012 $	2011 $	2012 $	2011 $	2012 $	2011 $	2012 $	2011 $
Financial liabilities due for payment								
Trade and other payables (excluding employee benefit provisions and deferred income)	134,708	32,462					134,708	32,462
Grants yet to be allocated	3,529,452	7,419,190					3,529,452	7,419,190
Total expected outflows	**3,664,160**	**7,451,652**					**3,664,160**	**7,451,652**
Financial assets - cash flows realizable								
Cash and cash equivalents	6,700,645	9,970,303					6,700,645	9,970,303
Trade and other receivables	69,837	444,392					69,837	444,392
Total anticipated inflows	**6,700,482**	**10,414,695**					**6,700,482**	**10,414,695**
Net inflow (outflow) on financial instruments	**3,036,322**	**2,963,043**					**3,036,322**	**2,963,043**

(c) Market Risk

Interest rate risk

Exposure to interest rate risk arises whereby future changes in interest rates will affect future cash flows or the fair value of financial assets and liabilities.

Foreign exchange risk

Exposure to foreign exchange risk may result in the fair value or future cash flows of a financial instrument fluctuating due to movement in the foreign exchange rates of currencies in which the entity holds financial instruments other than the Australian Dollar (AUD) functional currency of the entity.

The following table shows the foreign currency risk of the entity:

Net financial assets (liabilities) in AUD	2012 $	2011 $
Term Deposit – Grant Account USD	862,058	7,085,248

Forward US Dollar Contracts

There were no such contracts held at 30 June 2012.

Price Risk

Price risk relates to the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in their market price.

Sensitivity analysis

The following table illustrates sensitivities to the entity's exposure in interest rates and equity prices (if equities held). The table indicates the impact on how profit and equity values reported at the end of the reporting period would have been affected by changes in the relevant
risk variable that management considers to be reasonably possible. These sensitivities assume that the movement in any particular variable is independent of other variables.

	2012 $	2011 $
	Profit $'000	Equity $'000
Year ended 30th June 2011		
+ or – 2% in interest rates	+/- 199	+/- 199
+ or - 10% in listed investments	-	-
+ or - 5% in $A / $US	+/- 354	+/- 354
Year ended 30th June 2012		
+ or – 2% in interest rates	+/- 134	+/- 134
+ or - 10% in listed investments	-	-
+ or - 5% in $A / $US	+/- 43	+/- 43

Net Fair Values

The net fair values of listed investments have been valued at the quoted market bid price at balance date adjusted for transaction costs expected to be incurred. For other assets and other liabilities the net fair value approximates their carrying value. No financial assets and financial liabilities are readily traded on organised markets in standardised form other than listed investments.

The differences between fair values and carrying values of financial instruments with fixed interest rates are due to the change in discount rates being applied by the market to those instruments since their initial recognition by the entity. Most of these instruments which are carried at amortised cost (e.g. trade receivables, loan liabilities) are to be held until maturity and therefore their current net fair values bear little relevance to the entity.

As appropriate the net fair values and carrying amounts of financial assets and financial liabilities are disclosed in the Statement of Financial Position and in the notes to the financial statements.

Notes to the financial statements for the year ended 30 June 2012

16 Key Management Personnel Compensation

The total of remuneration paid to key management personnel (KMP) of the entity during the year is as follows:

	2012 $	2011 $
Short-term employee benefits	196,794	219,962
Post-employment benefits	-	-
Other long-term benefits	-	-
Termination benefits	-	-
	196,794	**219,962**

17 Contingent Liability/Forward Commitments

NCRIS & EIF Reserves to be allocated for future Commitments as at 30 June 2012 (2011 - NIL)

Reserve	Amount Allocated	Purpose of Commitment
NCRIS Reserve	$396,185	To be allocated to All-Sky Virtual Observatory project for 2012-2014
EIF Reserve	$22,565	To be allocated to All-Sky Virtual Observatory project for 2012-2014

18 Member's Guarantee

Astronomy Australia Limited is a company limited by guarantee. Every member of the company undertakes to contribute to the assets of the company in the event of its being wound up while he/she is a member or within one year after he or she ceases to be a member for the payment of the debts and liabilities of the company contracted before he/she ceases to be a member and the costs, charges and expenses of winding up and for the adjustment of the rights of the contributories among themselves such amount as may be required not exceeding 10 dollars.

19 Related Party Transactions

Transactions between related parties are on normal commercial terms and conditions no more favorable than those available to the other parties unless otherwise stated.

20 Company Details

The registered office of the company is:

Swinburne University

John Street

Hawthorn. Vic. 3122.

The principal place of business is:

Swinburne University

John Street

Hawthorn. Vic. 3122

Astronomy Australia Limited A.B.N 19 124 973 584

Directors' Declaration

In the directors' opinion:

1. The financial statements and notes, as set out on pages 43 to 79, are in accordance with the Corporations Act 2001:

   (a) comply with Australian Accounting Standards and the Corporations Regulations 2001 mandatory professional reporting requirements, International Financial Reporting Standards; and

   (b) give a true and fair view of the financial position as at 30 June 2012 and of the performance for the year ended on that date of the company; and

2. There are reasonable grounds to believe that the company will be able to pay its debts as and when they become due and payable.

This declaration is made in accordance with a resolution of the Board of Directors.

On behalf of the Directors

Director:

Prof. Warrick J. Couch

Director:

Dr. Ian Chessell

Dated this 31st day of August 2012

Astronomy Australia Limited A.B.N 19 124 973 584

Independent Auditor's Report to the members of Astronomy Australia Limited

Report on the Financial Report

I have audited the accompanying financial statements of Astronomy Australia Limited, which comprises the statement of financial position as at 30 June 2012, and the statement of comprehensive income , statement of changes in equity and statement of cash flows for the year then ended, notes comprising a summary of significant accounting policies and other explanatory information and the director's declaration.

Directors' Responsibility for the Financial Report

The directors of the company are responsible for the preparation and fair presentation of the financial statements that gives a true and fair view in accordance with Australian Accounting Standards (including the Australian Accounting Interpretations) and the Corporations Act 2001 and for such internal control as the directors determine is necessary to enable the preparation of the financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

My responsibility is to express an opinion on the financial statements based on my audit. I conducted my audit in accordance with Australian Auditing Standards. These Auditing Standards require that I comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditors consider internal control relevant to the entity's preparation of the financial statements that gives a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by the director, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Independence

In conducting my audit, I have complied with the independence requirements of the Corporations Act 2001. I confirm that the independence declaration required by the Corporations Act 2001, provided to your directors and included in the financial statements, would be in the same terms if provided to the directors as at the date of this auditors' report.

Astronomy Australia Limited A.B.N 19 124 973 584

Independent Auditor's Report to the members of Astronomy Australia Limited

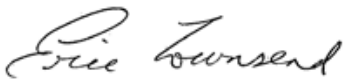
Auditors' Opinion

In my opinion the financial statements of Astronomy Australia Ltd. is in accordance with the Corporations Act 2001, including:

(i) Giving a true and fair view of the company's financial position as at 30 June 2012 and of its performance for the year ended on that date; and

(ii) Complying with Australian Accounting Standards and the Corporations Regulations 2001.

Name of Firm: E. Townsend & Co.



Name of Auditor Eric Townsend, Chartered Accountant

Address 35 Mereweather Avenue, Frankston. Vic. 3199

Dated this 31st day of August 2012

Liability limited by a scheme approved under Professional Standards Legislation.

Astronomy Australia Limited A.B.N 19 124 973 584

Profit and Loss Statement for the year ended 30 June 2012

	2012 $	2011 $
REVENUE		
Administration Grant - NCRIS	262,160	255,886
Membership Subscriptions - Level 1	203,916	221,196
Membership Subscriptions - Level 2	16,992	19,734
Administrative Services	-	-
Gemini Reserve Received	-	-
Grants Allocated	11,520,208	19,697,440
	12,003,276	20,194,256
LESS: GRANTS PAID		
Grants Paid	11,520,208	19,697,440
Grants Paid from Reserves	23,738	1,805,167
	11,543,946	21,502,607
GROSS SURPLUS FROM TRADING	459,330	(1,308,351)
OTHER INCOME		
Interest Received - General Account	8,683	5,284
Interest Received - Grants Account	39,889	407,726
Interest Received - Overseas Optical Reserve Account	155,917	151,317
Interest Received - EIF Account	86,150	-
	290,639	564,327
	749,969	(744,024)

	2012 $	2011 $
EXPENSES		
Accountancy	28,843	25,890
Auditor's Remuneration	4,800	6,000
Bank Charges	998	1,095
Company Secretarial Fees	4,487	19,590
Consultant Fees	12,273	45,454
Depreciation	1,811	2,356
Filing Fees	42	41
Fringe Benefits Tax	1,202	1,004
Insurance	10,485	9,609
Legal Costs	46,271	19,674
Long Service Leave	11,906	-
Meeting Expenses	46,839	32,700
Printing & Stationery	12,452	10,825
Office Expenses	1,235	-
Salaries	273,972	243,700
Salaries - Board	61,560	73,344
Subscriptions	1,025	795
Superannuation - Board	5,335	11,142
Superannuation Contributions	23,963	22,323
Telephone	2,767	2,665
Training/Conference	8,248	4,822
Travel - Staff	33,065	20,369
Travel - Board	28,869	24,025
Travel - Board - Salary	-	715
Worksafe Insurance	1,500	1,147
	623,948	579,285
Surplus before income tax	**126,021**	**(1,323,309)**

Astronomy Australia Ltd Code of Conduct

AAL is a public, non-profit company of limited liability, the principle object of which is the advancement of the science of astronomy within the principles of the National Collaborative Research Infrastructure Strategy (Constitution 3.). AAL is ultimately controlled by the members, who appoint the board and vote on matters of community importance, normally at the annual general meeting.

This Code of Conduct establishes ethical standards for the conduct of AAL's directors, executives, and employees ("Officers" herein) as they strive to achieve the company objectives within this framework.

The Code stands beside but does not exclude or replace other legally binding obligations.

Organisational Principles

- Officers will use their best efforts to pursue the furtherment of Australian Astronomy within Australia and abroad.
- Officers will treat all people with respect and will not discriminate on grounds of race, religion, gender, marital status or disability.
- Officers will observe all relevant laws and regulations in the execution of AAL business.
- Officers will at all times act with honesty and integrity, both internally and externally, when representing AAL.
- The company promotes a zero tolerance approach for any deliberate illegal acts such as but not limited to theft, fraud, embezzlement, bribery, or the receiving of bribes.
- Officers shall when actively engaged in AAL business be always unimpaired by alcohol or substance abuse.

Good Standing of the Company

AAL is responsible to the astronomy community and to the Australian Government. It is paramount that the good standing of the company within the community be fostered and protected. Community lack of respect and credibility is failure.

Public Image and Media Relations

- Officers must execute their duty with due care to the public image of AAL.
- Particular diligence must be observed in dealing with the news media.
- Officers must avoid making statements purporting to represent the views or position of AAL unless formally empowered to do so.
- An Officer may communicate with the news media as a representative of AAL strictly as formally empowered to do so.

Confidentiality

It is the nature of AAL's business that Officers will share information of a sensitive nature. The confidentiality of our Members and of all affiliated bodies and third parties must be respected. Officers will make best efforts to protect confidentiality at all times. Leaks represent failure.

An Officer of the Company will not use such confidential information for personal gain or promotion.

Conflict of Interest

- It is the nature of the Australian astronomical community that individuals will have many intersecting interests.
- Conflict of interest is inevitable and unavoidable within AAL's ambit. This must be recognized and dealt with accordingly.
- AAL will keep a register of Officers interests which should be reviewed at least annually.
- Officers will be aware of section 40 of the AAL Constitution pertaining to conflict of interest.
- If in the progress of a Board meeting a Director or Officer recognizes that a conflict exists, or might reasonably exist, he or she must declare this interest.
- Should a Member of the Board or Officer recognise that another Member or Officer has a conflict of interest, he or she must declare this to the Board without fear or favour.
- Any declared conflict of interest will be evaluated by the Board at the time. The Board will decide how to proceed. In the event that the Board is locked, the Chairman shall resolve the matter. (Such resolution will normally be positive but may include declaring a topic unresolved for reasons of conflict. Such should be minuted.)
- The conflicted Members and Officers may be asked to abstain from either discussion or voting.
- The conflicted Members and Officers may be asked to absent the meeting for the duration of entertainment of the identified item of conflict.

Strategic Alliances

Many of AAL's highest goals involve alliances and partnerships. Alliance partners should be treated with confidentiality, integrity, honesty, and openness. Officers will represent AAL to strategic alliance partners strictly as formally empowered to do so.

Dealing with Government

- It is the nature of AAL's business that Officers must interact with Government.
- Officers will represent AAL to Government strictly as formally empowered to do so.
- The highest standards of diligence are required.
- AAL must endeavor to present the most accurate possible information to Government, and to act upon the directions of Government visibly, properly, and accountably.

Living Document

- This Code of Conduct should be reviewed annually by the Audit and Risk Management Committee.
- It can be extended or truncated provided this represents improvement.
- It can be improved at any time by the Board.

Acronyms used in this report

AAAC	Antarctic Astronomy Advisory Committee
AAL	Astronomy Australia Limited
AAO	Australian Astronomical Observatory
AARNet	Australia's Academic and Research Network
AAT	Anglo-Australian Telescope
AATB	Anglo-Australian Telescope Board
AeRAC	Astronomy eResearch Advisory Committee
AGMTPO	Australian Giant Magellan Telescope Project Office
AGUSS	Australian Gemini Undergraduate Summer Studentships
ALMA	Atacama Large Millimeter/submillimeter Array
ANU	The Australian National University
ARC	The Australian Research Council
ASA	The Astronomical Society of Australia
ASKAP	Australian Square Kilometre Array Pathfinder
ASTAC	Astronomy Supercomputer Time Allocation Committee
AST3	Antarctic Schmidt Telescopes
ASVO	All-Sky Virtual Observatory
ATCA	Australia Telescope Compact Array
ATLAS	Australia Telescope Large Area Survey
ATNF	Australia Telescope National Facility
AURA	Association of Universities for Research in Astronomy
AusGO	Australian Gemini Office
CASS	CSIRO Astronomy and Space Science
CCD	Charge-coupled device
CoEPP	Centre of Excellence for Particle Physics at the Terascale
CPU	Central Processing Unit
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DIISRTE	Department of Industry, Innovation, Science, Research and Tertiary Education
DOC	Data-Over-Coax
EIF	Education Investment Fund
ELT	Extremely Large Telescope
ESO	European Southern Observatory
ESPaDOnS	Echelle SpectroPolarimetric Device for the Observation of Stars
FAA	Fellow of the Australian Academy of Science
FAICD	Fellow of the Australian Institute of Company Directors.
FAIP	Fellow of the Australian Institute of Physics
FASA	Fellow of the Astronomical Society of Australia
FIEAust	Fellow of the Institution of Engineers Australia
FIEChemE	Fellow of the Institution of Chemical Engineers
FRACI	Fellow of the Royal Australian Chemical Institute
FRAS	Fellow of the Royal Astronomical Society
FTE	Full time equivalent
FTSE	Fellow of the Australian Academy of Technological and Engineering Sciences
GALAH	Galactic Archaeology survey with HERMES
GeMS	Gemini Multi-Conjugate Adaptive Optics System
GHOS	Gemini High-resolution Optical Spectrograph
GMOS	Gemini Multi-Object Spectrograph
GMT	Giant Magellan Telescope
GMTO	Giant Magellan Telescope Organisation
GPU	Graphics Processing Unit
GSAOI	Gemini South Adaptive Optics Imager
GST	Goods and Services Tax
gSTAR	GPU Supercomputer for Theoretical Astrophysics Research
HEAT	High Elevation Antarctic Terahertz (telescope)
HERMES	High Efficiency and Resolution Multi-Element Spectrograph
HPC	High Performance Computing
HST	Hubble Space Telescope
IChemE	Institution of Chemical Engineers
ICRAR	International Centre for Radio Astronomy Research
LIEF	Linkage Infrastructure Equipment and Facilities
LIGO	Laser Interferometer Gravitational-Wave Observatory
LNA	Low Noise Amplifier
MIT	Massachusetts Institute of Technology
MNRF	Major National Research Facility
MRO	Murchison Radio-astronomy Observatory
MWA	Murchison Widefield Array
NAS	National Academy of Sciences
NBN	National Broadband Network
NCI	National Computational Infrastructure
NCRIS	National Collaborative Research Infrastructure Strategy
NeCTAR	National eResearch Collaboration Tools and Resources
NSF	National Science Foundation

OMT	Ortho Mode Transducer
OOR	Overseas Optical Reserve
OTAC	Optical Telescopes Advisory Committee
PDR	Preliminary Design Review
PLATO	Plateau Observatory
QSO	Quasi-stellar object
RACI	The Royal Australian Chemical Institute
RSAA	Research School of Astronomy and Astrophysics (ANU)
RTAC	Radio Telescopes Advisory Committee
SKA	Square Kilometre Array
SNR	Supernova remnant
SUT	Swinburne University of Technology
TAO	Theoretical Astrophysical Observatory
TB	Terabytes
UNSW	University of New South Wales
UTAS	University of Tasmania
UWA	University of Western Australia
VLT	Very Large Telescope

Astronomy Australia Ltd

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