Anglo-Australian Observatory

Annual Report

of the Anglo-Australian Telescope Board

1 July 2001 to 30 June 2002

ANGLO-AUSTRALIAN OBSERVATORY

PO Box 296, Epping, NSW 1710, Australia
167 Vimiera Road, Eastwood, NSW 2122, Australia
PH (02) 9372 4800 (international) + 61 2 9372 4800
FAX (02) 9372 4880 (international) + 61 2 9372 4880
e-mail director@aaoepp.aao.gov.au

ANGLO-AUSTRALIAN TELESCOPE BOARD

PO Box 296, Epping, NSW 1710, Australia
167 Vimiera Road, Eastwood, NSW 2122, Australia
PH (02) 9372 4813 (international) + 61 2 9372 4813
FAX (02) 9372 4880 (international) + 61 2 9372 4880
e-mail ljw@aaoepp.aao.gov.au

ANGLO-AUSTRALIAN TELESCOPE/UK SCHMIDT TELESCOPE

Private Bag, Coonabarabran, NSW 2357, Australia
PH (02) 6842 6291 (international) + 61 2 6842 6291
AAT FAX (02) 6884 2298 (international) + 61 2 6884 2298
UKST FAX (02) 6842 2288 (international) + 61 2 6842 2288
WWW http://www.aao.gov.au/

ISSN 1443-8550

COVER: The cover image shows a slice through the three-dimensional map of 221,000 galaxies obtained with the 2dF spectrograph on the AAT, colour-coded to show the density of the structures. By analysing these structures, an Anglo-Australian team of astronomers have determined several fundamental cosmological constants with unprecedented precision. (Credit: The 2dF Galaxy Redshift Survey team and Paul Bourke, Swinburne University)

COVER DESIGN: Ellipse Design

COMPUTER TYPESET AT THE: Anglo-Australian Observatory

PICTURE CREDITS: The editors would like to thank AAO staff Jonathan Pogson, David Malin and Lachlan Campbell from Mount Stromlo Observatory, for their photographs throughout Chapters 1-3.

The Right Honourable Patricia Hewitt, MP,
Secretary of State for Trade and Industry, Government of the United Kingdom of Great Britain and Northern Ireland

The Honourable Dr Brendan Nelson, MP,
Minister for Education, Science and Training
Government of the Commonwealth of Australia

In accordance with Article 8 of the Agreement between the Australian Government and the Government of the United Kingdom to provide for the establishment and operation of an optical telescope at Siding Spring Mountain in the state of New South Wales, I present herewith a report by the Anglo-Australian Telescope Board for the year from 1 July 2001 to 30 June 2002. The report summarises the operations of the Board for the period under review and includes financial statements and statements of estimated expenditure in accordance with the provisions of the Agreement.

M J Barlow
Chair
Anglo-Australian Telescope Board
7 November 2002

Contents

Anglo-Australian Telescope Board

1. The Anglo-Australian Observatory

Statement of purpose 1
History and governing legislation 1
Ministers responsible 2
Designated agencies 2
Structure of the AAO 3
Board members 3
Advisory committees 3

2. Scientific Highlights 5

World's largest galaxy survey 6
Gamma-ray burst revealed as exploding star 10
New-found planetary system looks like home 12
Star seen to be "Doin' the twist" 14

3. The year in review

Operational environment 17
Strategic directions 19
Key result area: telescope operations 20
Key result area: research 27
Key result area: instrumentation 32
Key result area: resources 39
Key result area: external communications 42

Appendices
A. Financial statements 45
B. OH&S policy and Client Service Charter 71
C. AAT Board members and committees 75
Abbreviations for institutions 79
Glossary, abbreviations and acronyms 82

Anglo-Australian Telescope Board
30 June 2002

United Kingdom

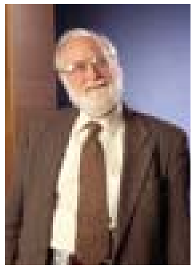
Chair
Prof. M J Barlow
Professor of Astrophysics, University College London

Prof. M Birkinshaw
William P Coldrick Professor of Cosmology & Astrophysics, University of Bristol

Mr G Brooks
Head of Astronomy Division, Particle Physics and Astronomy Research Council

Australia

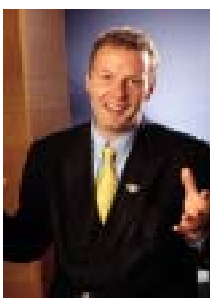
Deputy Chair
Prof. R D Ekers
Director, Australia Telescope National Facility



Prof. K C Freeman
Research School of Astronomy and Astrophysics, Australian National University

Prof. L Cram
Australian Research Council

Anglo-Australian Observatory



Prof. B J Boyle
Director, AAO

1. About the Anglo-Australian Observatory

Statement of purpose

The Anglo-Australian Observatory provides world-class optical and infrared observing facilities for British and Australian astronomers to ensure the best possible science. It also takes a leading role in the formulation of long-term plans and strategies for astronomy in both countries and, through its research and development of new instrumentation, contributes to the advance of astronomy internationally.

History and governing legislation

The Anglo-Australian Telescope Board is an independent, bi-national authority funded equally by the Governments of Australia and the United Kingdom. The Board operates under *The Anglo-Australian Telescope Agreement* which came into operation in February 1971 for an initial period of 25 years. If either Government wishes to withdraw from the Agreement after this period it must give five years notice. So far, neither party has done so, and both have indicated their support for the AATB until at least 2010.

The Board's facilities consist of the 3.9-metre Anglo-Australian Telescope (AAT) and the 1.2-metre UK Schmidt Telescope (UKST) on Siding Spring Mountain, outside Coonabarabran, NSW, and a laboratory in the Sydney suburb of Epping. Collectively, these are known as the Anglo-Australian Observatory (AAO).

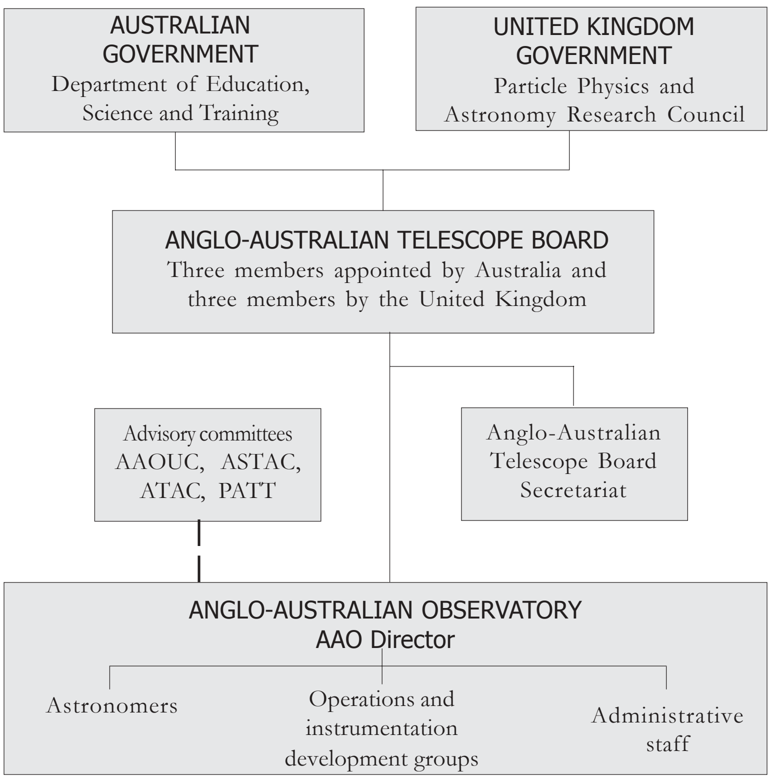
Ministers responsible

The Minister responsible for the AAT Board in the United Kingdom is The Right Hon. Patricia Hewitt, MP, as Secretary of State for Trade and Industry. The Minister responsible in Australia is The Hon. Dr Brendan Nelson MP, Minister for Education, Science and Training.

Designated agencies

Pursuant to Article 1(2) of the Anglo-Australian Telescope Agreement, each Government acts through an agency

Figure 1.1 General structure of the AAT Board and the AAO



designated for the purpose. These Designated Agencies are the Australian Department of Education, Science and Training (DEST) and the Particle Physics and Astronomy Research Council (PPARC) of the United Kingdom. These agencies are jointly responsible for implementing the Agreement.

Structure of the AAO

The AAT Board oversees the operations of the Anglo-Australian Observatory, as Figure 1.1 shows. Apart from an active research group, the Observatory has internationally recognised optical, mechanical and electronics engineering groups and a specialised software group. These five groups are critical to the maintenance and the day-to-day operations of both the telescopes and to the development of state-of-the-art instrumentation. A small administration group contributes significantly to the effective operation of the Observatory.

Board members

The AAT Board has six members, three appointed by each country, and the role of Chair alternates between the two countries. At 30 June 2002 the members were:

United Kingdom

Professor M J Barlow, (Chair) Professor M Birkinshaw, Mr G Brooks

Australia

Professor R D Ekers (Deputy Chair), Professor K C Freeman, Professor L Cram

Further details of Board members, special responsibilites and Board meetings are included in Appendix C.

Advisory committees

The Anglo-Australian Observatory User's Committee (AAOUC) advises the Director on aspects of the Observatory's operation.

Observing time on the AAT is allocated by two national committees: the Australian Time Assignment Committee (ATAC) and the UK Panel for the Allocation of Telescope Time (PATT). Observing time on the UKST is allocated by PATT and the Australian Schmidt Time Assignment Committee (ASTAC)

Details of these committees are also included in Appendix C.

2. Scientific highlights

Introduction

The 3.9-m Anglo-Australian Telescope and the 1.2-m UK Schmidt Telescope continue to carry out a wide range of scientific projects. This year sees the completion of a number of major AAO surveys which are now producing results of key scientific importance. We also see the first scientific results from the new infrared instrument at the AAT, IRIS2. In total, 80 programs were carried out at the AAT this year. On average, each program results in about one publication.

Drs Terry Bridges and Scott Croom, of the 2dFGRS and 2QZ teams respectively, holding a plaque commemorating the completion of the 2dF Redshift Surveys

In addition to providing support for the Observatory, astronomical staff carry out their own research programs, with strong links to the world-wide astronomical community. In addition to AAO facilities, they make use of major international facilities such as the Hubble Space Telescope, the National Radio Astronomy Observatory, the Australia Telescope Compact Array and the new Gemini telescopes.

A number of examples of this year's scientific highlights follow, showing the significant contribution made by the AAO to a wide range of scientific questions. Two of these demonstrate research carried out by AAO astronomers making joint use of the AAT and international facilities.

View from above of the robot fibre positioner for the 2dF instrument, and the 3.9m mirror of the AAT. (Photo: AAO / Jonathan Pogson)

World's largest galaxy survey

This year sees the completion of observations for the Two Degree Field Galaxy Redshift Survey (2dFGRS), carried out at the Anglo-Australian Telescope since 1997. This survey has mapped the 3-D positions in space of 221,283 galaxies, making it the largest galaxy survey to date. Professor Peacock of the University of Edinburgh and Dr Colless of the Australian National University head the 30-strong 2dFGRS team, which includes several AAO staff astronomers.

The sheer size of the survey has allowed astronomers to pit theory against observation in ways not previously possible. Three recent results using the 2dFGRS provide valuable clues as to the nature of the Universe.

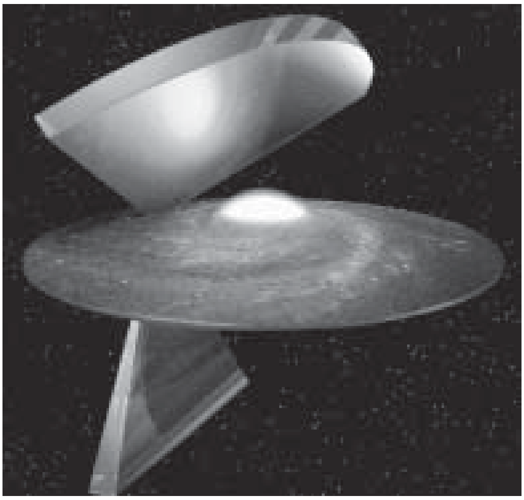
2000 Square Degrees Mapped

The 2dF instrument used in this survey is one of the world's most complex astronomical instruments, able to capture 400 spectra simultaneously. A robot arm positions up to 400 optical fibres on a field plate, each to within an accuracy of 20 micrometers. Light from up to 400 objects is collected by the AAT and fed into two spectrographs for analysis.

The expansion of the Universe shifts galaxy spectra to longer wavelengths. By measuring this "redshift" in a galaxy's spectrum, the galaxy's distance can be determined. The galaxy survey, completed this year, includes measurements of 220,000 galaxies spread over 2000 square degrees of the sky. By covering such a large area, the team can be sure that they are measuring typical regions of the Universe.

New evidence that the Universe is accelerating

Astronomers have known for decades that the Universe is expanding. Until 1998 they believed that this expansion was slowing down, with the gravitational attraction of the Universe's matter gradually putting the brakes on. But then two research teams found that instead the Universe is accelerating like a runaway car, expanding faster and faster as time goes on.



Schematic drawing showing the directions of the two survey regions. Actually, the regions surveyed extend more than 100,000 times further. (Artwork: RSAA / Robert Smith)

This shock finding was based on the brightness of supernovae (exploding stars) in extremely distant galaxies. However, this result was regarded as extremely controversial, because both teams used the same basic method, and because the result was so unexpected. The 2dfGRS team headed by Professor Efstathiou (Cambridge) have now discovered new and independent evidence that the expansion of the Universe is accelerating, using the 2dF Galaxy Redshift Survey.

The Springiness of Spacetime

To understand this result, cosmologists revived a concept first proposed by Einstein - "dark energy" or the "cosmological constant". It's this energy which powers the acceleration. The cosmological constant is really the springiness of spacetime. Spacetime wants to unfurl itself. The cosmological constant is a measure of how hard it's pushing. Einstein himself abandoned the notion of a cosmological constant because it spoilt the simplicity and elegance of his General Theory of Relativity. Even after the evidence from the supernovae teams, some theoretical physicists were reluctant to revive the idea.

Structure of the Universe

The new result from 2dFGRS makes use of the fact that galaxies are not spread evenly through the sky, but cluster together. The pattern of clustering represents the "structure" of the Universe now, some 15 billion years after the Big Bang. The researchers then compared this structure with the clumpiness in the microwave background radiation, which shows the structure of the Universe when it was only 150,000 years old. Looking at how the early structure evolves into the structure we see today allows the astronomers to calculate the cosmological constant.

Nearby spiral galaxy M100. Mapping galaxies provides clues as to the nature of the Universe. (Photo: AAO / David Malin)

It looks like Einstein was right after all - dark energy appears to exist and to dominate over more conventional types of matter. An explanation of the dark energy may involve String Theory, extra dimensions, or even what happened before the Big Bang. At present, nobody knows. It is now up to the theoreticians to explain the findings.

Not Enough Neutrinos

It has been recognised for some time that when it comes to the Universe, what you see isn't necessarily what you've got. While we see radiation from stars and gas, the majority of the mass of matter in the universe is in the form of "dark matter", which we can only detect through the effect of its mass. One of the biggest puzzles in astronomy today is to understand what makes up dark matter, and how it behaves.

Neutrinos are the lightest of the known elementary particles. It was long thought that they had no mass at all, but in recent years that idea was overturned. The Universe is awash with neutrinos, most left over from the Big Bang. So even with a tiny mass they could make up the dark matter of the Universe.

The value of the mass of the neutrino affects how tightly galaxies are clustered together. So the 2dFGRS team calculated how galaxies would be clustered for different values of the neutrino mass, and then compared their predictions with what the galaxy survey actually mapped.

They found that the neutrinos are extremely light, and that means that they can make up no more than 13% of the Universe's dark matter. The mystery of the nature of dark matter continues, but one popular theory has been disproven.

More Matter = More Dark Matter

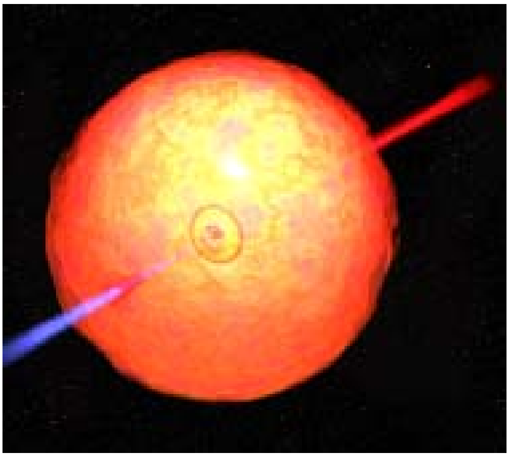
A cluster of galaxies in Hydra. We now know that dark matter clusters in the same way. (Photo: AAO / David Malin)

Another important finding from the 2dFGRS is that dark matter is distributed on large scales in exactly the same way as the galaxies. This finding means that the Universe is surprisingly simple. The dark matter could have been clumpier than normal matter, or vice versa. Instead, they are the same.

Astronomers believe that slight clumping in the dark matter in the very early Universe "seeded" the growth of galaxies. This result limits theories of where and when galaxies formed. Galaxies are pulled around by the gravity of the dark matter, forming into large sheets and filaments.

Drs Heavens and Verde (Rutgers and Princeton Universities, USA) and the 2dFGRS team show that on large scales the sheets and filaments in the galaxy distribution revealed by the 2dF Survey are just what is expected if the galaxies and dark matter cluster in the same way. Drs Lahav and Bridle of IoA (UK) and the 2dFGRS team have obtained the same answer from a comparison of fluctuations in the 2dF galaxy distribution with those in the Cosmic Microwave Background - radiation left over from the Big Bang.

So even though we can't detect dark matter directly, we now know where it is - hanging around with normal matter.



Gamma-Ray Burst revealed as exploding star

Artist's impression of a gamma-ray burst in progress, Artwork: Caltech/ Jonathan Williams

Australian telescopes have helped provide the clinching evidence that gamma-ray bursts - the biggest bangs in the Universe after the Big one - are produced when massive stars explode and their cores collapse to form black holes.

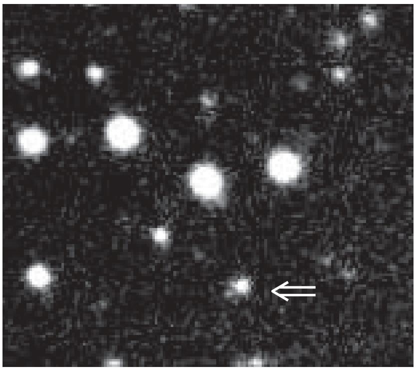
An international team headed by Professor Kulkarni (Caltech, USA) got its proof from a gamma-ray burst that occurred in November 2001, GRB 011121. Gamma-ray bursts are enormous blasts of gamma rays, often accompanied by an "afterglow" of light, X-rays and radio waves. Their cause has been unknown since their discovery in 1967, though evidence has been building that massive stars were responsible.

A Concerted Effort

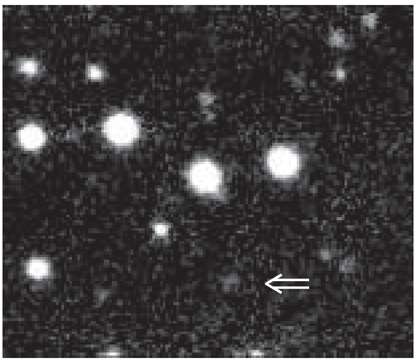
Careful sleuthing with the Hubble Space Telescope, CSIRO's Australia Telescope Compact Array radio telescope, the Anglo-Australian Telescope and telescopes in Chile showed that gamma-ray burst GRB 011121 had indeed been accompanied by the explosion of a massive star - a supernova.

The Hubble Space Telescope picked up the tell-tale light "signature" of a supernova while the ground-based telescopes showed that the explosion had taken place in a cocoon of matter shed by the star before its demise.

Clues from the Infrared



Dr Stuart Ryder of the AAO made infrared observations with the AAT's new IRIS2 instrument. Infrared radiation penetrates dust better than does light. By comparing the infrared and optical observations we were able to determine the amount of dust between us and the gamma-ray burst - something that hasn't been done before. The dust data confirmed that the gamma-ray burst occurred inside matter shed by the parent star.



Infrared images taken at the AAT showing (top) the gamma-ray burst and (below) a frame taken 5 nights later. The star has faded, leaving only the smudge of its parent galaxy.

Violent Death of a Star

As the core region of a massive star collapses, it forms a rapidly-spinning black hole that is surrounded by a ring of dense material. This ring interacts with the black hole to power two narrow, extremely energetic jets of radiation that shoot out of the star and beam first gamma-rays, and later X-ray, optical and radio emission. Drs McFadyen and Woosley first suggested in 1999 that as the jets shoot out of the star they blow the star apart, producing a supernova at the same time as the gamma-ray burst.

Gamma-ray bursts can be seen for vast distances across the Universe. If they are caused by the core collapse by massive stars, it may be possible to use them to trace star formation in the early universe, perhaps even back to the first generation of stars.

New-found planetary system looks like home

What the new planetary system might look like. (Artwork: NASA / Lynette Cook)

An international team including Dr Chris Tinney of the AAO has finally found a planetary system that reminds them of our own solar system. They have found a Jupiter-like planet orbiting a Sun-like star at nearly the same distance as Jupiter orbits our Sun.

This is the first near analog to our Jupiter. All other extrasolar planets discovered up to now orbit closer to the parent star, and most of them have elongated, eccentric orbits.

A New Solar System

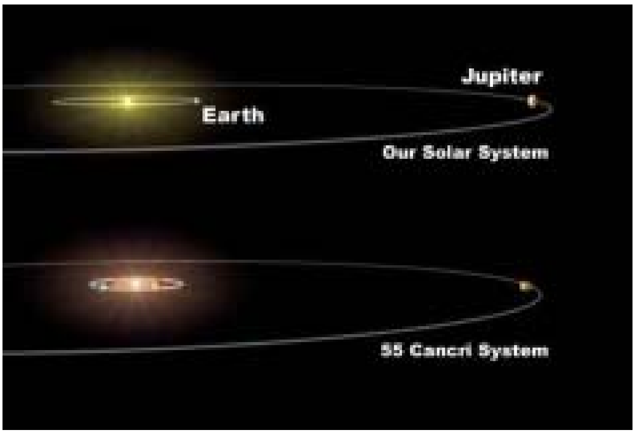
The star, 55 Cancri in the constellation Cancer, was already known to have one planet, discovered by the group in 1996. That planet is a gas giant slightly smaller than the mass of Jupiter. It whips around the star in 14.6 days at a distance only one-tenth that from Earth to the Sun.

The new planet is between 3 and 3.5 times the mass of Jupiter, and orbits the star in about 13 years, as compared to Jupiter's orbital period of 11.86 years, in a slightly elongated orbit. While not an exact copy of our solar system, this discovery shows that the Planet Search Program is getting close, and are able to find planets at distances greater than 4 AU (where 1 AU is the distance of Earth from the Sun). The new planet in 55 Cancri is 5.5 AU from its sun.

Searching for Planets

The astronomers make use of a sensitive technique for measuring the slight Doppler shift in starlight caused by a wobble in the position of a star. From measurements made over a period of years, they are able to infer the period of a planet, its approximate mass and the orientation of the orbit - whether we are seeing it edge -on or tilted to face towards us.

The team are monitoring 300 stars with the Lick telescope, 250 with the Anglo-Australian Telescope, and 650 with the Keck Telescope. The team announced the discovery of 13 new planets in June 2002, including two discovered at the AAT. This brings the total number of known planets outside our solar system to more than 90.

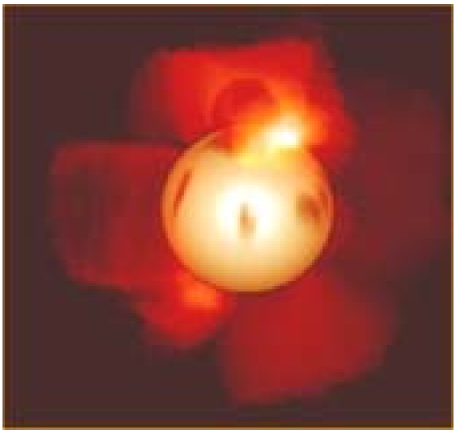


Comparison of our Solar system and the 55 Cancri system (JPL).

Finding the second planet around 55 Cancri took 15 years of patient observations. There may even be another planet around 55 Cancri, because the two known planets do not yet explain all the observed Doppler wobbling. One possibility is a Saturn-sized planet orbiting close to the star.

Best Candidate

The team of astronomers passed their data to theoretical astronomer Greg Laughlin (UC Santa Cruz) who showed that an Earth-sized planet could survive in a stable orbit between the two gas giants. While the current project cannot hope to detect an Earth-sized planet, NASA is planning a space-borne imaging telescope designed to take pictures of Earth-sized planets - the Terrestrial Planet Finder. This planetary system is now the best candidate for this mission when it is lauched later this decade.



Star seen to be "Doin' the twist"

Model of the star which does the twist. Credit: St Andrews / A. Cameron, M. Jardine & K. Wood.

A team of Scottish and French astronomers has discovered a festive star that does the twist. This new phenomenon of twisting behaviour demonstrates a slow change in the way the star spins on its axis. This motion has been predicted by some theories of the way in which stars generate their magnetic fields, but until now it has never been observed directly.

The phenomenon provides crucial new insights into the way the Sun generates the magnetic fields that give rise to the 11-year sunspot cycle, deepening our understanding of the dynamics of our parent star whilst solving a long-standing mystery concerning the erratic orbits of some closely-orbiting binary stars.

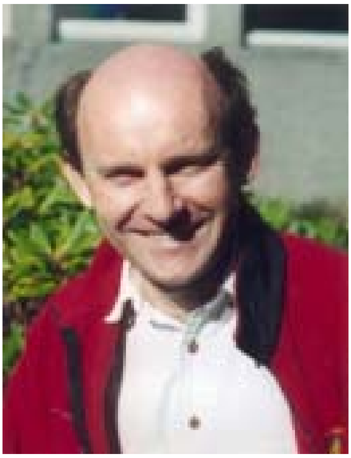
Christmas at the AAT

The discovery stems from a painstaking analysis of observations made annually since 1988 by Drs Collier-Cameron (St Andrews) and Donati (Observatoire Midi-Pyrenees) at the Anglo-Australian Telescope. The team spent many a Christmas using the UCL Coude Spectrograph combined with the Semel Polarimeter, a visitor instrument provided by Semel (Paris-Meudon) and Donati. The team observed a young Sun-like star named AB Doradus, located 50 light-years from Earth, over an 8-year period, to track individual star spots at different lattitudes on the surface.

Observing the star for a few nights each year, the team mapped the changing pattern of dark starspots on the star's surface. Like sunspots, starspots are produced where loops of strong magnetic field erupt from deep inside the star, blocking the flow of energy from the star's interior. The new result provides the first clear observational evidence that magnetic fields generated inside the star also act as "glue", altering the circulation of gas inside the star.

Racing Sunspots

Since the time of Galileo, astronomers have watched sunspots drift across the face of the Sun. From this motion, they have deduced that the Sun spins on its axis once a month and that spots near the equator spin faster than spots at the poles. As spots at different latitudes race around the Sun, it takes a sunspot near the equator about 3 months to gain a complete lap on a spot located near the Sun's poles. AB Doradus rotates 50 times faster than the Sun, spinning on its own axis in a mere 12.3 hours. Four years ago, the astronomers discovered that AB Doradus showed a pattern of rotation similar to the Sun, with its equator spinning slightly faster at its poles.



Andrew Collier-Cameron (St. Andrews) - one of the researchers who have discovered the twisting motion of AB Dor.

New Technique

Last year, the team applied a sensitive new starspot tracking technique to measure how long individual spots took to complete one circuit of the star. Encouraged by a clear vindication of the earlier result, they set about re-analysing data from previous years to build up a more complete picture of how the spin rate of each spot depended on its distance from the star's equator. The surprise came when the team found that they could not reconcile the pattern of spin rates of spots near the star's equator and poles from one year to the next.

Answer to Binary Puzzle

The confirmation of a link between magnetic activity and twisting rotation in stars could also solve a long-standing mystery involving close binary stars whose orbits speed up and slow down for no apparent reason. As long ago as 1992, Jim Applegate of Columbia University suggested that if the strength of the magnetic "glue" inside a star changed with the star's magnetic cycle, the star's shape would change too. This change in shape of the star alters slightly the gravitational pull on its companion, and would explain the changes in orbital speed. The periodic twisting seen in AB Dor's spin rate is the first direct observation of the "Applegate mechanism" in action. The amount of twist is sufficient to produce the observed orbital changes in binaries containing stars similar to AB Dor.

3. The year in review

The Hon Peter McGauran, MP, the Australian Federal Minister for Science, is shown here with the Echidna test rig during his visit to the AAO on February 15.

Operational environment

Astronomy excites the imagination of scientist and lay-person alike and it provides an important framework for many of the major ideas that underpin our society. The long-term nature of the scientific questions being investigated demands exceptional intellectual and scientific skills and sophisticated equipment. To be effective, astronomical research requires stable, long term funding.

The British and Australian Governments demonstrated a substantial commitment to astronomical research by establishing the Anglo-Australian Telescope Board, which has operated the Anglo-Australian Observatory for twenty-seven years.

The Observatory provides world-class optical astronomy facilities for scientists from both countries. The telescopes of the AAO have been responsible for many fundamental discoveries and continue to provide a large portion of the data used by astronomers in Australia and the UK. The results of the observing programs carried out using these facilities are published in the scientific and technical media for the benefit of other scientists and the academic community. They are also widely publicised in more accessible places for the general public.

The intellectual challenge of astronomical research attracts some of the finest scientific minds. Astronomy is both international and highly competitive. The AAO maintains strong links with other scientific organisations on astronomical and technical matters, particularly in the development of new instrumentation, and therefore plays a major role in the international astronomical community. AAO staff collaborate on a range of scientific research programs with other astronomers around the world. Through its strong links with the universities in both Australia and the United Kingdom, the Observatory also plays an active role in higher education.

IRIS 2 mounted at the Cassegrain focus of the 3.92-m Anglo-Australian Telescope

The AAT is the largest optical telescope in Australia and remains one of the world's most scientifically productive telescopes. The UKST is the most productive survey telescope in operation anywhere. Both telescopes were state-of-the-art when observing commenced in the early 1970s. Thirty years later, as a consequence of the vision of their designers, a long period of stable funding and a continuing program of enhancements, the telescopes of the AAO remain at the leading edge of astronomical research, against considerable international competition. The Observatory's expert scientific and engineering staff have constantly upgraded the telescopes by incorporating the latest technological developments into instrument design. Staff are considered world leaders in many areas of astronomical instrumentation and are often asked to provide advice to other organisations and build instruments for their telescopes.

The new generation of telescopes with mirrors eight metres or more in diameter is beginning to come online. These telescopes will be able to carry out many of the scientific programs currently undertaken with the AAT much more efficiently. To ensure a stable future, it is important the AAO demonstrates it can compete effectively with these larger telescopes, concentrating on those programs which the eight-metre-class telescopes will not be able to do, or which are complementary. To this end, Observatory staff have developed facilities that exploit the unique wide-field capabilities of the AAT and the UKST. The Two-degree Field (2dF) facility for the AAT and the Six-degree Field (6dF) for the UKST are examples of this. Developments such as IRIS2 will ensure a continued high international profile and scientific productivity for the telescopes for many years to come.

Strategic directions

The AAO is committed to achieving results in five key areas, with the principal aim of obtaining the best possible science for the available resources. The AAO is not exclusively responsible for the scientific results that arise from use of its facilities: external users do most of the research. The AAO nevertheless makes a significant contribution to the quality of the results in the following ways:

First, by running the telescopes efficiently and providing good support during observing runs, the likelihood of good results is maximised.

Second, by ensuring that the best mix of instrument and software development is undertaken, the Board, the AAO Users' Committee and AAO staff contribute very positively to the kind of science possible with AAO facilities.

Third, by recruiting first-class research astronomers to support visiting astronomers and encouraging and supporting the AAO astronomers in their own research, the Observatory creates a climate which facilitates the best possible scientific output from all astronomers using the AAO's telescopes.

The five key result areas are:

- Telescope operations
- Research
- Instrumentation
- Use of AAO resources
- External communications

The range of strategies adopted to achieve the AAO's objectives fall into two main groups. The first group involves staying in touch with developments in astronomy, instrumentation, telescope operations and management; listening to, and anticipating, the needs of the astronomy community; and publishing and publicising the research and other outcomes achieved. The second group encompasses technical, professional and administrative excellence and an ethos of continuous improvement.

Key result area: telescope operations

Key outcome: satisfied users and good data

Strategies

An important strategy is to listen carefully to the astronomy community, especially the users of the AAO's telescopes, to assess and anticipate their needs. Several avenues are available for this. The time assignment panels, the AAO Users' Committee and the Board, all have a strong influence on the strategic directions of the AAO and are representative of the astronomy community. AAO astronomers and other staff are encouraged to observe at or visit major telescopes overseas and to provide feedback on world best practice. Informal networks and attendance at conferences, seminars and colloquia are also important ways of staying in touch.

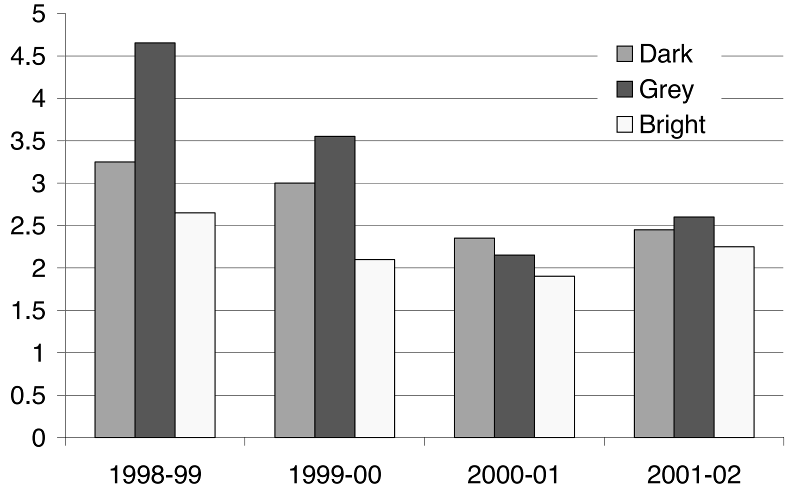
A second strategy is to ensure that users' needs are met. This is achieved by maintaining and consolidating existing instrumentation and associated software; by developing first-rate new instrumentation; by providing good support in setting up the instruments, operating the telescope and with observing; and by soliciting users' comments.

The third strategy for achieving satisfied users is to seek ever greater efficiency in running the telescopes.

AAT organisational statistics

The high standard of the AAO's facilities and new developments in its instrumentation ensure that observing time on the AAT is always heavily over-subscribed. Figure 3.1 shows the oversubscription rates for the AAT over the past four years, sorted by moon phase. In 2001-02 we saw a rise in oversubscription rates for all phases. Most notable is the increase in requests for bright time due mostly to the commissioning of the new infrared instrument IRIS2, and the AAT Planet Search program. More than twice the available time was requested during the period 1 July 2000–30 June 2001. AAT users belong to a wide range of institutions from Australia, the U.K., U.S.A., and many other countries.

Figure 3.1 Oversubscription rates for the AAT



AAT performance indicators

The use of observing time for the period 1 July 2001–30 June 2002 is shown in Figure 3.2. This year there were 3617 night hours available. In addition, a further 23 hours of commissioning time were used. The continuation of unusually good weather during this period is evident in Figure 3.3, which compares the use of observing time for the past four years.

Figure 3.2 The use of observing time at the AAT in 2001-02

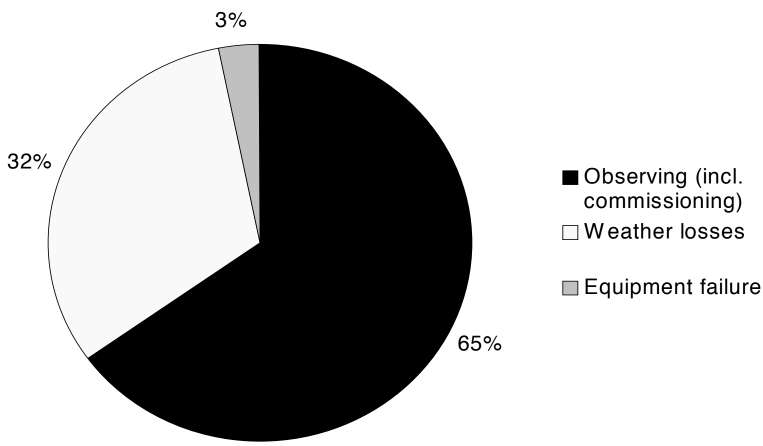
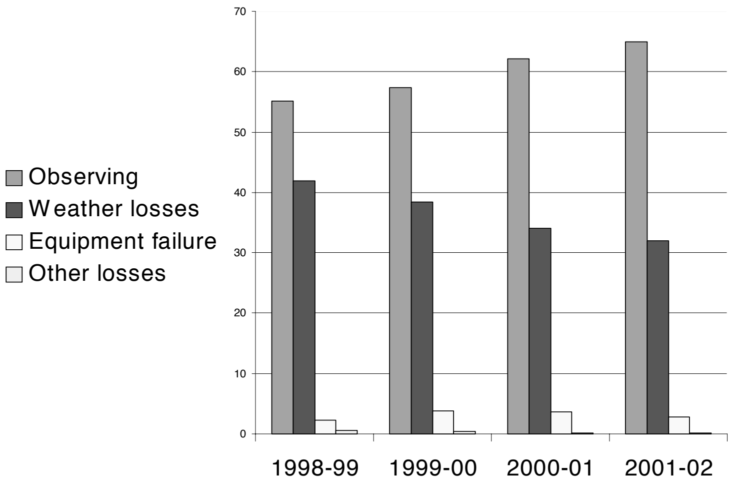


Figure 3.3 The use of observing time at the AAT



One measure of the extent to which users are likely to be satisfied with the levels of service provided at the AAT is the amount of available observing time lost through AAT equipment failure. In 2001–2002, this was 2.8 percent, which is a significant improvement over the previous year, and is lower than the corporate goal of three percent. The bulk of problems arose from aging infrastructure, in particular the CCD controllers and computer links. Upgrades to these systems are currently underway. The 2dF spectrograph showed significantly improved reliability over the period. The combination of good weather and lower fault rates resulted in an increase of 3% in useful observing time over the period.

User feedback

Another constructive way to assess user satisfaction is to ask users how well they regard the level of service offered. All AAT and UKST observers are encouraged to complete the web feedback form, which asks how well the AAO has fulfilled its obligations under its Client Service Charter. The responses cover key areas of observing support, instrumentation, technical manuals, administration and web pages. These are ranked in five steps ranging from well below (1) to well above (5) acceptable. Users are also asked to flag key items and to comment on any issues of concern.

During the period 1 July 2001–30 June 2002, 60% of users completed feedback forms for the AAT. This is somewhat higher than the average over the past few years, although lower than for 2000-2001. Users are actively encouraged to submit feedback forms at the end of their observing runs.

The average scores over the year are shown in Table 3.1, together with those for the previous two years. The statistical error on these mean grades is ~0.2. They show that the level of user satisfaction is generally high, and fairly consistent over the three years.

The Corporate Plan sets a goal of at least 3.8 in all categories. This was achieved throughout except for general computing, which now reamins the only category with a score below 4.0. While significant improvements have already been made to the systems environment, this area continues to receive particular attention. Many of the feedback forms contain suggestions for improvements, most of which have been acted upon. Many involved small, instrument-specific changes to improve ease of observing. All comments, both positive and negative, are followed up through appropriate management channels and acknowledged.

Table 3.1 User feedback at the AAT

	Average rank (maximum 5)		
	1999–00	2000–01	2000-01
Night assistant support	4.9	4.6	4.8
Staff astronomer support before observing.	4.5	4.5	4.6
Staff astronomer support during observing.	4.6	4.6	4.7
Other technical support	4.5	4.5	4.6
Instrumentation and related software	3.9	3.7	4.0
General computing	3.8	3.7	3.7
Working environment	3.9	3.9	4.1
Travel and admin support	4.4	4.2	4.2
Data reduction software	4.0	3.9	4.1
Instrument manuals	3.6	3.8	4.0
Library facilities	4.4	3.9	4.1
AAO Web pages	4.3	4.0	4.0

On 1st June 2000, a new feedback form was introduced. It differs from the old one in having a five-step scale rather than a four-step scale. To aid comparison with previous years, the earlier results have been scaled to a maximum of five.

UKST Organisational Statistics and Performance Indicators

Statistics for the use of the UKST during the reporting year are shown in the pie chart at *Figure 3.4*, and statistics for the reporting year together with the previous three years are at *Figure 3.5*.

The small amount of time lost to the weather results from a combination of generally very good conditions and the ability of 6dF to use marginal conditions. The time lost to faults includes down-time due to 6dF and is a relatively small loss rate for a telescope operating a complex new instrument. However, at present the loss is masked by the UKST's (temporary) ability to revert to photography when conditions permit. In particular, during February 2002, the 6dF robot suffered a mechanical failure of the R-arm causing approximately two weeks of down-time. No 6dF observations were obtained during the lunation, but the photographic program continued.

Approximately 75% of scheduled time throughout the year has been used for 6dF operations, with the remainder going to photography. This reflects a concerted effort to clear the outstanding photographic survey fields within the RA range corresponding to short summer nights, as well as the effect of the 6dF failure noted above. Observations were also made on 10 unscheduled nights, of which six were tests for the Tokyo CCD camera and the remainder for pointing tests.

During the year, 141 photographic exposures were made (including 16 test exposures). A total of 75 were on film, and the overall A-grade success rate was 67%, considerably lower than usual because a number of 'I' survey plates were attempted in marginal conditions to hasten completion of the survey.

Table 3.2 Plates and films taken 2001-02

Use	Films	Plates
H-alpha Survey (Galactic plane)	45	
H-alpha Survey (Magellanic Clouds)	4	
I Survey (South)		20
I Survey (North)		21
Non Survey	26	9

Figure 3.4 The use of observing time at the UKST in 2001-02

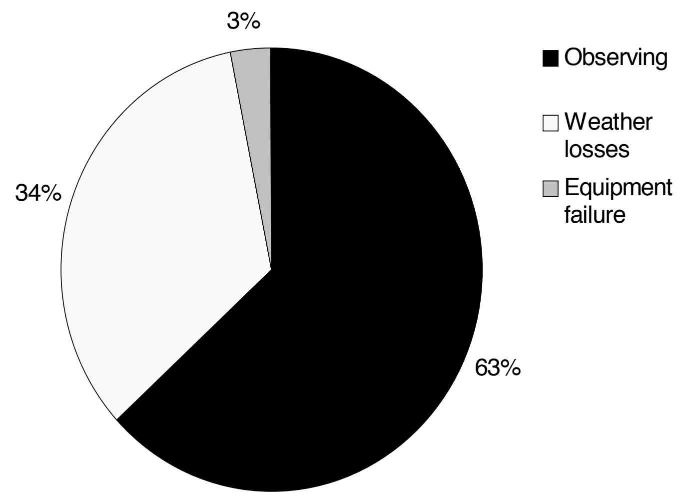
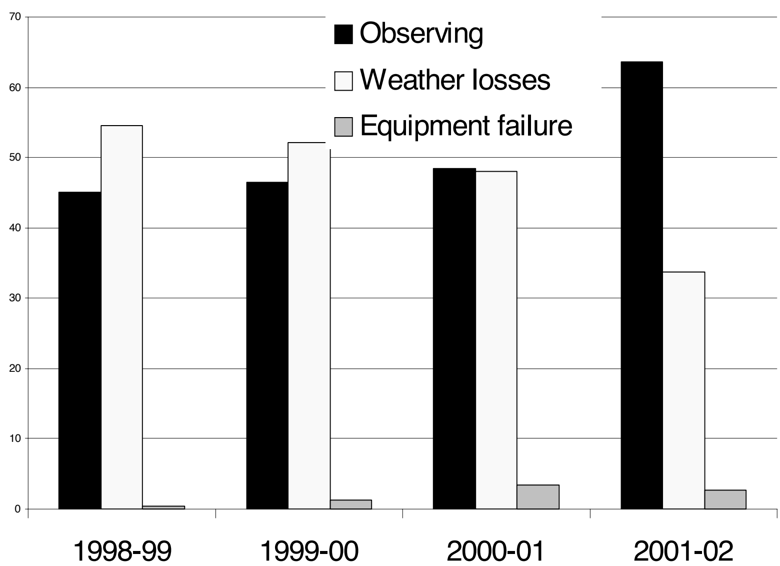


Figure 3.5 The use of observing time at the UKST



A total of 49 exposures were made for the two H-alpha surveys (Galactic Plane and Magellanic Clouds) while 41 exposures were taken to complete the southern I survey to B-grade and fill in gaps in the POSS II northern I survey. A small number of outstanding high-priority fields remain in the H-alpha and southern I surveys, but the POSS II commitment is now finished. The remaining plates and films taken during the year were in support of some 12 non-survey programs.

6dF observations during the year amounted to 326 fields, of which 207 were for the 6dF Galaxy Survey. A total of 610.1 hours of 6dF exposures were made. The non-survey observations were made in support for the Bessell/Beers contract 6dF program (radial velocities of high latitude stars) being carried out during unscheduled bright time. When these are excluded, the fraction of observing time devoted to the 6dF Galaxy Survey approximates to 75%, the target recommended by the TACs.

Participants of the 6dF Galaxy Survey Workshop, May 2002

During May and June 2002, 6dF was operated with only one field plate while the other was undergoing fibre repairs. The system was therefore operated in 'Autofib' mode (with reconfiguration time being lost) but a relatively high level of performance was still maintained. Operations with two field plates recommenced at the end of the reporting year.

For Galaxy Survey observations, the year-averaged target of four fields per clear night is being attained. During clear winter nights, Schmidt Telescope observers are now being able to observe six fields when short-exposure non-survey fields are included, demonstraing that the 6dF robot has fully achieved its performance goals. Upgrades to the 6dF spectrograph are expected to take place during September 2002, after which operations with gratings will be standard.

Key result area: research

Key outcome: good science

Strategies

Most research using data from AAO telescopes is undertaken by external users. The time assignment committees, which are peer review panels independent of the AAO, are the most important factor in the achievement of the desired research outcome: their strategy is to ensure that only projects likely to result in good science are awarded time.

The AAO also has an effect on the achievement of this outcome. The first AAO strategy for achieving good science mirrors the first strategy for telescope operations: it is for the research astronomers to keep thoroughly in touch with developments in the astronomy community.

A second strategy is to publish research results and to publicise more broadly the work and achievements of the Observatory. Research astronomers spend about half of their time on research, are encouraged to publish, and have the financial costs of publication met by the Observatory.

Finally, the AAO seeks to keep its research outcomes at the forefront by inviting distinguished visiting scientists to work at the Observatory for extended periods.

Organisational statistics

There were 12 research astronomers on the staff of the AAO at 30 June 2002. Eight of them, while spending about half of their time on Observatory duties such as supporting visiting astronomers, spend the rest of their time on research. The other four are research astronomers but have significant responsibilities not directly related to their own research. These include the Director, the Astronomer in Charge and a shared position with Macquarie University. The full time equivalent research effort is about five people. In addition, there are three emeritus astronomers.

The total number of AAT observing programs for the past five years is shown in Figure 3.6. The decreasing number over the last three years reflects the promotion of survey-style and longer-term programs at the AAT. Figure 3.7 shows the distribution of AAT observing programs by location of the Principal Investigator (P.I.). In Figure 3.8, the number of nights allocated at the AAT are distributed by the location of all the investigators in proportion. In both figures we see that users from the U.K. continue to make

Figure 3.6 Total number of scheduled AAT observing programs

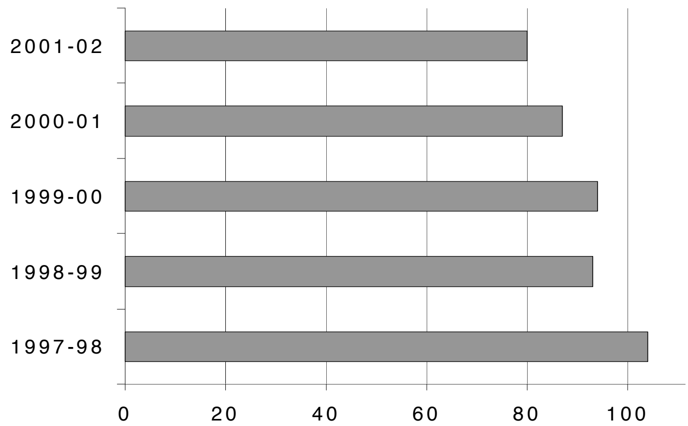


Figure 3.7 Number of scheduled AAT observing programs by location of Principal Investigator (P.I.)

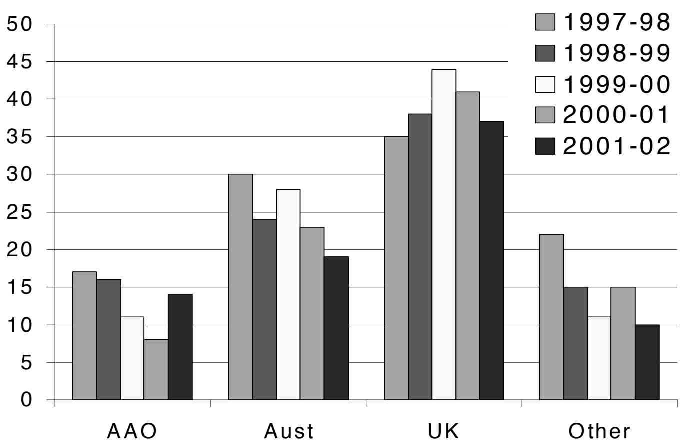


Figure 3.8 Percentage use of the AAT by location of all investigators

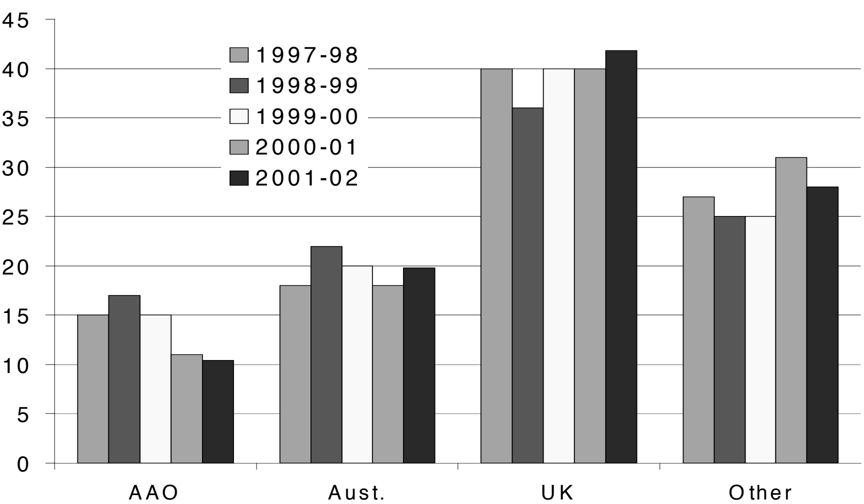
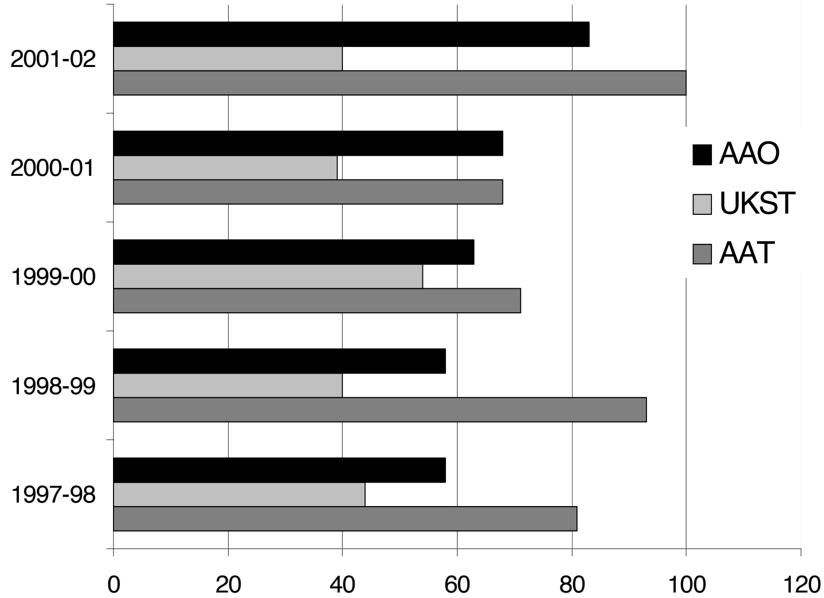


Figure 3.9 Total number of publications using AAT and UKST data, and AAO publications



active use of the telescope. The strong increase in AAO P.I.s shows that staff are taking more of a leading role in programs, while the proportion of programs with AAO involvement stays fairly constant.

Figure 3.9 shows the total numbers of research papers published in refereed journals using data from the AAT and the UKST. Also shown are the total number of AAO papers, published by AAO staff, students and visitors. When conference papers are included, the corresponding totals are 114 AAT data papers, 52 UKST data papers and 123 AAO papers. This year sees a sharp increase in publications, with AAT data papers and AAO papers both reaching an all-time high. The first results from the 2dF redshift surveys are largely responsible for this peak. AAO staff consistently produce a large number of high quality publications, demonstrating the strong links between AAO astronomers and the international community, as well as the strong AAO involvement in the redshift surveys.

The distribution of publications in refereed journals by location of the Principal Investigator (P.I.) is shown in Figures 3.10 and 3.11 for papers using AAT data and UKST data respectively. Papers making use of UKST survey data only are not included. There is an increase in many areas, and the UK publications from the AAT and UKST are almost double that of the previous

Figure 3.10 Research papers published using AAT data, by location of First Author

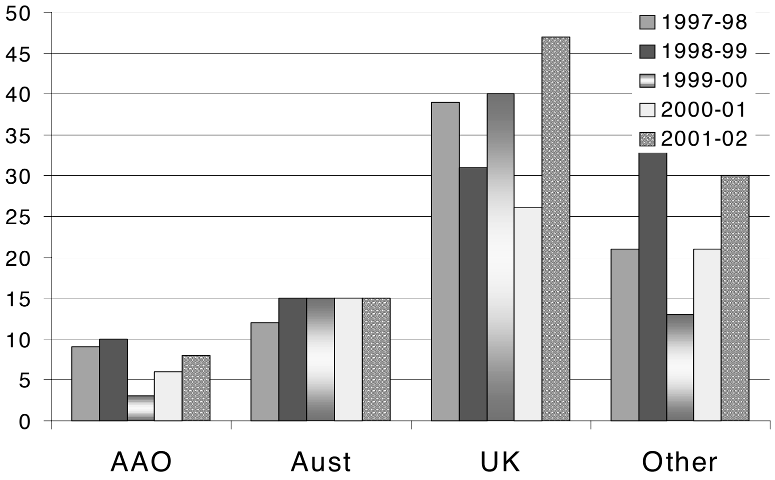


Figure 3.11 Research papers published using UK Schmidt data, by location of First Author.

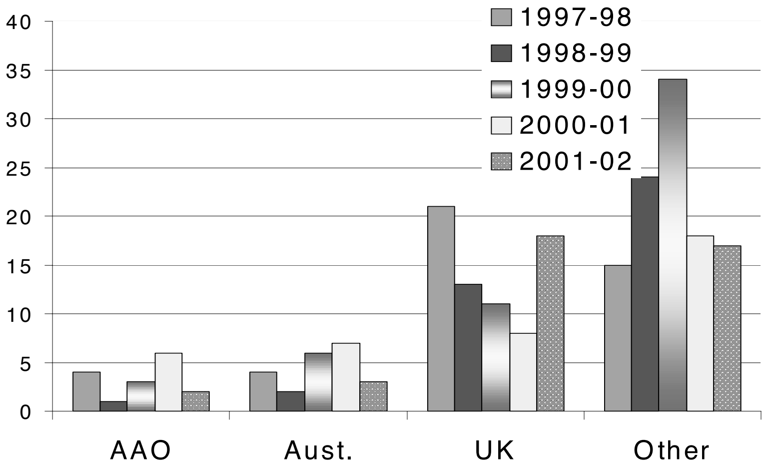


Figure 3.12 AAO publications by AAO staff, students and visitors

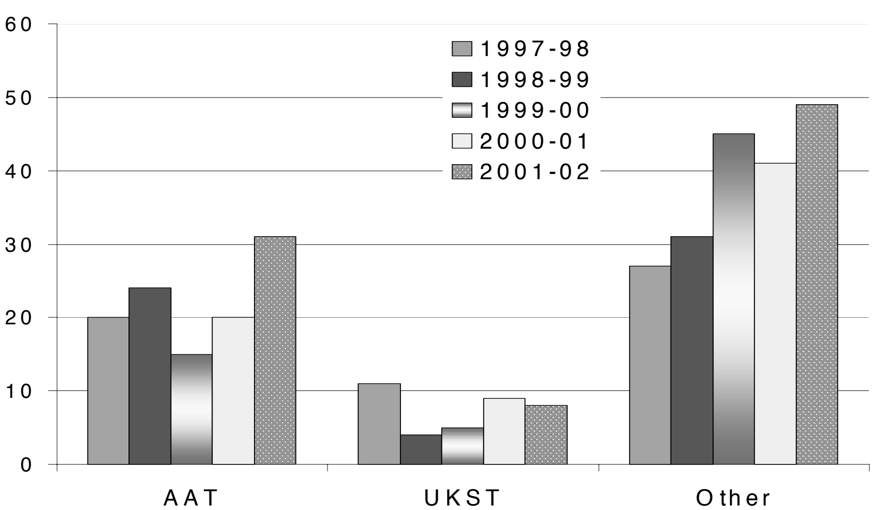
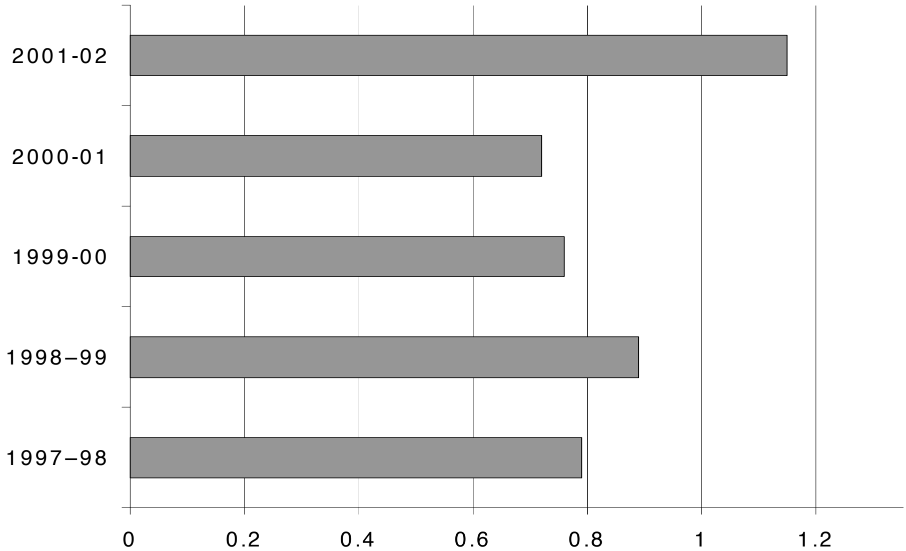


Figure 3.13 Publications per AAT observing program



year. Figure 3.12 gives the number of AAO publications produced by staff, students and visitors, sorted by papers including AAT data, UKST data, and other papers. Note that the total AAO papers does not equal the sum of the three columns in Figure 3.12 because a few papers contain both AAT and UKST data. As mentioned, publication numbers has peaked. The trend to papers without AAT and UKST data continues, but the number of AAT papers with AAO authors is also well up.

Figure 3.13 shows how well AAT observing programs are converted into scientific papers. To allow for the delay between observations and publications, the statistic given here is the number of publications in a given year divided by the number of proposals in the *previous* year. Typically between 0.7 and 0.9, this years sees a huge 1.15 papers per program. In fact, this figure compensates for the relatively low figures of the past two years, and reflects the longer time needed to complete and publish results from major surveys such as the redshift surveys.

Key result area: instrumentation

Key outcome: for AAO instrumentation an integrated suite of instruments and telescope controls that best meet, in a timely fashion, the needs of the astronomical community, with the instruments working as well as they need, without being over-engineered. For external projects, satisfied customers

Strategies

A key strategy in achieving the instrumentation objective is always to remain very much aware of developments in astronomy and instrumentation and of the needs of the astronomy community. The AAOUC's terms of reference include advising the Director on a development program which best meets the needs of the astronomy community bearing in mind AAO staff and financial constraints.

A further two strategies are vital to the implementation of the instrumentation development plan. The first is quality project management. Significant improvements in this area have been made in recent years, with the filling of two specialist project manager positions. This has resulted in improved monitoring and tracking for current projects, and improved procedures for the initiation, design review and tracking of future projects. This

Dazle's 1.2 metre diameter precision crossed-roller bearing under test at the AAO.

is supported by the provision of project management and risk assessment training for scientific and engineering staff to assist in their roles.

The second key implementation strategy is involvement at all stages, and at both sites, of all of the Observatory's highly innovative and world class astronomers, engineers, software specialists and technicians. This includes conception, design, construction and commissioning of instruments.

Table 3.3 Use of AAT instruments for the last three years

Percentage of nights allocated

Instrument	1999-00	2000-01	2001-02
2dF	37.4	35.2	34.1
UCL coude echelle spectrographs (UCLES & UHRF)	23.9	24.7	21.3
Taurus II & Taurus tunable filter (TTF)	18.6	12.0	11.1
Infrared imager/ spectrograph (IRIS2)[1]			10.2
RGO spectrograph	5.8	9.8	9.4
Wide field imager (WFI)[1]		6.2	6.1
Low dispersion survey spectrograph (LDSS)[2]	7.7	3.5	
SPIRAL integral field spectrograph[1]		2.2	4.2
Infrared imager/ spectrograph (IRIS)[2]	3.4	0.9	
Instruments supplied by users	3.2	5.5	3.6[3]

[1] WFI and SPIRAL were first used in 2000-01. IRIS2 was first used this year.
[2] IRIS (which includes UNSWIRF observations) and LDSS were both decommissioned this year.
[3] The Semel Polarimeter, an attachment to UCLES.

Organisational statistics: AAO instrumentation

The AAO spends about 15 percent of its budget each year on new instruments and associated software and detectors. Table 3.3 summarises the use made of instruments on the AAT over the last few years. It does not include time used for aluminising the primary mirror.

The Two-degree Field (2dF) facility has continued to be both highly in demand and highly allocated. With the completion of the two major redshift survey programs in July 2001, we have seen a shift to many smaller and varied programs. Demand for the high-resolution UCLES and UHRF spectrographs also remains high, with 43% of the time devoted to the ongoing search for extrasolar planets. In addition, a number of projects were carried out using the visiting Semel Polarimeter, which attaches to UCLES, to study variations in nearby stars.

This year saw the first of a series of planned decomissioning of instruments to increase operational efficiency and make way for new, advanced instrumentation. Taurus was upgraded to make use of the high efficiency VPH gratings, enabling the replacement of LDSS, and IRIS has been replaced by IRIS2, which was first used in October 2001. IRIS2 provides a wide range of observing modes in the infrared, with a far larger and more efficient detector than that in the aging IRIS. It offers a far larger range of spectral options, and the ability to observe several hundred objects at once. During its first commissioning run, IRIS2 was used to help identify the source of one of the mysterious Gamma-Ray Bursts.

Table 3.4 Percentage use of AAT detectors for the last three years

	1999-00	2000-01	2001-02
MITLL2A CCD[3]	29.1	31.4	10.2
MITLL3 CCD[3]	19.7	0.9	0
EEV CCD[1]		6.7	38.0
Tek2 CCD	13.7	17.8	1.4
Thomson CCD	0	0.9	0
2dF CCD	38.1	35.2	34.1
WFI CCD[1]		6.2	6.1
Infrared IRIS[2]	3.4	0.9	
Infrared IRIS2[1]			10.2

[1]WFI and EEV were first used in 2000-01, and IRIS2 was first used this year.

[2]IRIS was decommissioned this year.

[3]MITLL3 was out of commission after February 2001, and MITLL2A after February 2002 due to major faults. They have both since been repaired.

Detector use in recent years is shown in Table 3.4. Charge coupled devices (CCDs) remain the astronomical detector of choice. 2dF, WFI, IRIS and IRIS2 have a fixed detector. Users have a choice of CCDs on other instruments. However, major faults experienced by both MITLL2A and MITLL3 limited this choice, especially in 2002, and this is reflected in the high usage of the blue-sensitive EEV (77% of possible nights). The older small-format CCDs (Tek2 and Thomson) have very little use, even during the period when there were no other red-efficient detector available.

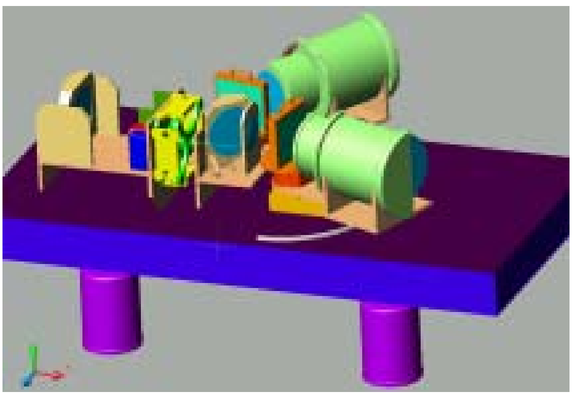
There is an increasing emphasis at the AAO on instrumentation design and construction. During 2001-2002, this was reflected in the commissioning of IRIS2 at the AAT and the delivery of OzPoz, the first major instrument designed for a non-AAO telescope, as well as the acceptance of the concept design for AAOmega, the next major instrument planned for the AAT.

Internal Projects

AAOmega

AAOmega is designed to be the successor to 2dF at the AAT, able to take spectra of hundreds of targets simultaneously via optical fibres. AAOmega will make use of the existing optics and mechanical infrastructure of 2dF, but improvements will include improved fibre positioning, improved stability by mounting the spectrograph on the AAT mount rather than on the top end, and the construction of a Dual Beam Schmidt Spectrograph (DBSS) allowing simultaneous red and blue observ-ations with modern large-format detectors. This will allow observations to go much fainter and to more detail.

Mechanical design for the DBSS for AAOmega



In addition, it is planned to enable the current SPIRAL Integral Field Unit to feed the AAOmega DBSS. This system provides 2-dimensional information of objects which are large on the sky, like nearby galaxies. AAOmega has passed the design review stage, and work will begin in ernest in 2002-03.

AAO Infrastructure Upgrade Project

The AAO2 controllers project aims to provide new electronic and software to control the AAT suite of detectors. The first controller has been completed to operate the IRIS2 detector, providing much higher data transmission rates than would have been possible with the old controllers. Six more controllers will be constructed for the optical detectors, to be delivered by end 2003.

A concept study is currently underway for a major upgrade to the AAT telescope control system and the instrument control and integration system.

Upgrades to existing instruments

6dF, a multi-object spectrograph on the UKST, has been in operation for over a year now, and is used for the bulk of observing time. Currently the spectrograph is being upgraded to use VPH gratings, which will provide greater observing efficiency and flexibility.

The acquisition and guidance unit at the Cassegrain focus of the AAT is used with the RGO spectrograph, Taurus/TTF and IRIS2. The unit has been largely rebuilt, with the robot and detector replaced.

Dome Airconditioning

A large project has been improved to implement airconditioning in the AAT dome. The conditions within the dome will be set to match the expected night time conditions, using custom prediction from the Meteorological Bureau. By minimising the difference in temperature between the air inside and outside the dome, the sky will appear much sharper and collection of light will be maximised.

Left: Trade assistant Nathan helping to fit the air-conditioning cooling tower onto its support frame photo by Chris McCowage

External Projects

During 2001-02 the AAO was also involved in three projects to design/build instrumentation for overseas observatories.

OzPoz

Right: Peter Gillingham working on OzPoz, now installed on UT2, at Paranal in Chile

In May 1999, the Observatory entered into an agreement with the European Southern Observatory (ESO) to build a positioner (OzPoz) for the Very Large Telescope in Chile. This was a natural extension of the work the AAO had done on the robots for the multi-object spectrographs, 2dF and 6dF, and provided an opportunity for the AAO to enhance its instrumentation building skills. OzPoz was shipped to Chile in February 2002 and the commissioning phase on the VLT is close to completion.

Echidna

Echidna is a multifibre feed being developed by the AAO for the FMOS spectrograph on theJapanese Subaru Telescope. Its design is quite different from that of 2dF and OzPoz, using spines to position optical fibres much closer together. Echidna has completed its preliminary design review, following a highly successful prototyping and testing phase, and the project is now in the final design stage.

Dazle

The Dark Ages High Redshift (Z) Lyman Explorer (DAZLE) is a project in the preliminary design phase. The idea is to make use of narrow-band filter technology used in TTF to detect highly redshifted light from very distant galaxies. DAZLE is to make use of the CIRPASS camera designed by IoA, on the ESO VLT.

Performance indicators

The instrumentation program is shaped by the advice given to the Director by the AAO Users' Committee. The committee consists of experienced representatives of the user communities who are responsible for ensuring that the agreed program does indeed meet the needs of the astronomical community. The best way to judge this after the event is to survey telescope users as to their satisfaction with the suite of instruments and the way the instruments, software and detectors perform. As mentioned above, this information is compiled from the user feedback survey responses (see Table 3.1). The level of user satisfaction with instrumentation and related software has increased to 4.0 this year, meeting the performance indicators as outlined in the corporate plan.

AAO OzPoz Commissioning team members in the control room with staff from the European Southern Observatory, Paranal, Chile

Key result area: AAO resources

Key outcome: AAO funds to be used optimally and to have stimulated, productive, creative and focused staff working in a safe environment

Strategies

Perhaps the best strategy for achieving this objective is the involvement of all staff in corporate planning and other reviews. Their involvement means that many different perspectives can be taken into account, leading to a more rounded approach. It also means that everyone understands the final outcome of such a process and feels more commitment to, and ownership of, the results than would otherwise be the case.

The Observatory is committed to equal employment opportunity and occupational health and safety best practices as a way of meeting its objective of stimulated, productive, creative and focused staff working in an environment in which they feel secure. Training in these concepts and practices is a well-established part of AAO life.

Organisational statistics (People)

Staff numbers

The AAO employs research scientists, technical staff, software engineers, electronics engineers, optical and mechanical engineers, administrative and library staff. There are 18.75 full time equivalents (FTE) on fixed term contracts, one of them part-time, and 50.9 FTE on indefinite appointments, three of them part-time. Staff members are located at both the Epping Laboratory and at Siding Spring Observatory. Table 3.5 shows staff numbers by tenure.

Table 3.5 Staff numbers by tenure

At 30 June 2002 the staff positions were:

	Full time	Part time
Director	1	
Research astronomers (fixed term)	6	1(.75 FTE)
Instrument scientists (fixed term)	3	
Other fixed term	8	
Instrument scientists	3	
Other indefinite	46	3 (1.9 FTE)

Performance indicators (people)

Equal employment opportunity (EEO)

The *Equal Employment Opportunity (Commonwealth Authorities) Act 1987* requires the Board to develop an EEO program for each of the four designated groups identified within the Act. The Board reports annually to the Minister for Education, Science and Training.

Only a fifth of the Observatory's staff is female. In earlier years, most of the women were employed in the administrative or research areas. In the past two or three years, more women have been recruited to the technical areas. As well, there have been several recent recruits from non-English speaking backgrounds. This is an encouraging outcome to a campaign over several years to ensure that the Observatory's recruitment processes did truly offer equal opportunity to all.

Brendan Jones and Mick Kanonsczuk welding steelwork supporting the safety grill which covers the return air penetration

Occupational health and safety

The Anglo-Australian Telescope Board's safety policy and its agreement on health and safety with the Community and Public Sector Union are set out in Appendix B.

Comcare is a statutory authority established to administer the *Commonwealth Employees' Rehabilitation and Compensation Act 1988.* The premium the Board has to pay is a function of staff numbers and claims history. Both the premium and compensation claims are well below levels of five or six years ago, though there was an increase in claims in 1999-2000 and a contingent rise in premium the following year. There have been no notifications of dangerous occurrences for the last four years.

Table 3.6 Worker's compensation and dangerous occurrences

	1997-98	1998-99	1999-00	2000-01	2001-02
Comcare premium	$27 543	$28 770	$19 200	$23 751	$16 926
No of claims	0	0	3	0	1
Payments made	0	0	$635	0	$75
Dangerous occurences	0	0	0	0	0

Organisational statistics (Financial)

The financial statements in Appendix A outline the AAO's financial position.

Performance indicators (Financial)

The Australian National Audit Office (ANAO) has audited the financial statements of the AATB and has found them to be acceptable.

Key result area: external communications

Key outcomes: a lively awareness of astronomy in general, and the AAO's role in particular, by all stakeholders

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

World Wide Web and digital images

The AAO's main method of external communication, the World Wide Web, continues to attract a large audience, with a consistent hit rate of over a million a month. These figures do not include the Cambridge (UK) mirror of the AAO site. Most of the Internet visitors are attracted by the images pages, which now support a total of about 220 photographs.

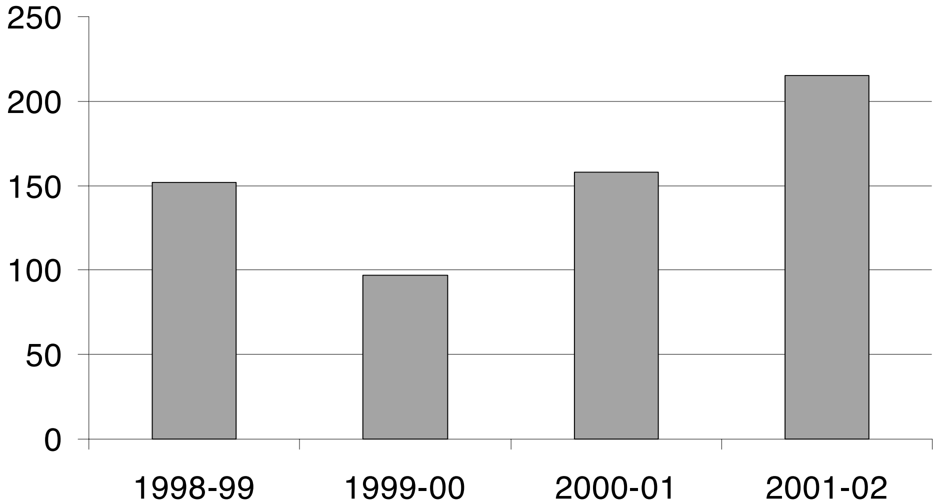
The science web page has been revamped with the aim of attracting students towards collaborative work at the AAO either through vacation positions or thesis study. A "Recent Results" page is included which summarises the current AAO science stories and publications and is updated three times a year.

A wealth of more technical information is also available and is constantly being updated and developed. A newsletter is published three times a year on the web, and as a hardcopy, to over 1000 subscribers and institutions. Abstracts from AAO publications are also sent to interested institutions.

Publicity

Stories in the media are important in forming the AAO's public image and in reaching many of the AAO's stakeholder groups. In the past year the AAO has issued eight media releases, distributing them directly to the Australian media, and world-wide through the American Astronomical Society's media-

Figure 3:14 Media Interviews



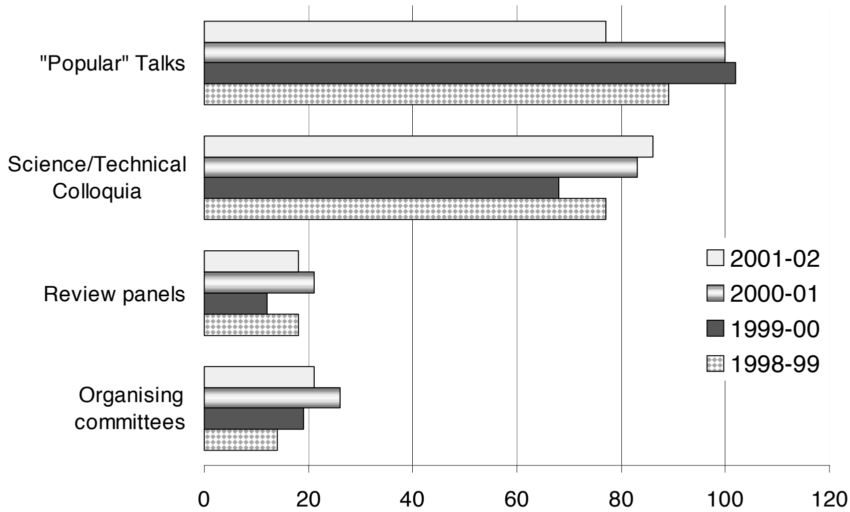
release distribution list. The subject matter was dominated by findings from the 2dF survey (four releases) and the discovery of extra-solar planets (two releases). One of the latter generated a front-page story in the Sydney Morning Herald. The galaxy redshift survey also featured on UK TV; in the BBC series *Space* and *Extreme Universe*.

As well as following up stories originating from the AAO, journalists approach AAO staff to comment on stories arising from elsewhere: this too helps to develop the organisation's public image. For instance, Brian Boyle appeared on the current affairs television program "Sixty Minutes" this year to discuss asteroid impacts and governmental approaches to the issue.

Below: Will Saunders, Quentin Parker and Fred Watson, organisers of the 6dF Galaxy Survey Workshop

During the year, staff gave over 216 radio and television interviews, an almost 50% increase over last year, as shown in Figure 3.14. In particular, Fred Watson holds up to three slots a week on ABC radio, and also continues to be involved in "Science in the Pub", a science communication program. Fred also appeared on two episodes of the BBC "Sky at Night" program. The topic of the story, called "Southern Eyes", was 6dF on the UKST.

Figure 3.15 External Communications



Staff once more gave a substantial number of popular talks (77), and wrote 8 popular articles. AAO images were used as a moving backdrop at the world premier performance of "Star Chants" at this year's Adelaide Festival.

Conferences and symposia

The AAO plays a full role in organising and participating in conferences. These conferences provide the opportunity for staff to present results from the Observatory's telescopes and recent technical developments, and are essential in maintaining strong links with the international astronomical community.

Figures 3.14 and 3.15 show the outreach activities of the AAO staff. In particular, the number of media interviews continues to rise. Overall, AAO staff maintain a high level of involvement, reflecting an awareness of the importance of outreach.

A. Financial statements

FINANCIAL STATEMENTS

As provided for in the Anglo-Australian Telescope Agreement, the accounts, records and financial transactions of the Board are audited by the Australian Auditor-General. The form of the Board's financial statements for the year ended 30 June 2002 is in accord with orders made by the Finance Minister under *the Commonwealth Authorities and Companies Act 1997*.

The Board submitted detailed estimates of receipts and expenditure for approval by each Government in respect of the financial accounting period for 1 July 2001 to 30 June 2002. All estimates were expressed in Australian dollars.

Statement by the Directors

In our opinion, the attached financial statements for the year ended 30 June 2002 give a true and fair view of the matters required by the Finance Minister's orders made under *the Commonwealth Authorities and Companies Act 1997*.

M J Barlow
Chair of the Board

7 November 2002

R D Ekers
Deputy Chair of the Board

7 November 2002

Australian National
Audit Office

INDEPENDENT AUDIT REPORT

To the Minister for Education, Science and Training

Scope

I have audited the financial statements of the Anglo-Australian Telescope Board for the year ended 30 June 2002. The financial statements comprise:

- Statement by Directors;
- Statements of Financial Performance, Financial Position and Cash Flows;
- Schedules of Commitments and Contingencies; and
- Notes to and forming part of the Financial Statements.

The members of the Board are responsible for the preparation and presentation of the financial statements and the information they contain. I have conducted an independent audit of the financial statements in order to express an opinion on them to you.

The audit has been conducted in accordance with Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards, to provide reasonable assurance as to whether the financial statements are free of material misstatement. Audit procedures included examination, on a test basis, of evidence supporting the amounts and other disclosures in the financial statements, and the evaluation of accounting policies and significant accounting estimates. These procedures have been undertaken to form an opinion as to whether, in all material respects, the financial statements are presented fairly in accordance with Australian Accounting Standards, other mandatory professional reporting requirements and statutory requirements in Australia so as to present a view of the Anglo-Australian Telescope Board which is consistent with my understanding of its financial position, the results of its operations and its cash flows.

The audit opinion expressed in this report has been formed on the above basis.

PO Box A456 Sydney South NSW 1235
130 Elizabeth Street
SYDNEY NSW
Phone (02) 9367 7100 Fax (02) 9367 7102

Audit Opinion

In accordance with subsection 19(1) of the *Anglo-Australian Telescope Agreement Act 1970*, I now report that the financial statements are in agreement with the accounts and records of the Anglo-Australian Telescope Board, and in my opinion:

(i) the financial statements are based on proper accounts and records;

(ii) the financial statements show fairly, in accordance with applicable Accounting Standards and other mandatory professional reporting requirements, the financial position of the Anglo-Australian Telescope Board as at 30 June 2002 and the results of its operations and its cash flows for the year then ended;

(iii) the receipt, expenditure and investment of moneys, and the acquisition and disposal of assets, by the Board during the year have been in accordance with the *Anglo-Australian Telescope Agreement Act 1970*; and

(iv) the financial statements have been prepared in accordance with the Finance Minister's Orders made under the *Commonwealth Authorities and Companies Act 1997*.

Australian National Audit Office

P Hinchey

ANGLO-AUSTRALIAN TELESCOPE BOARD

STATEMENT OF FINANCIAL PERFORMANCE
for the year ended 30 June 2002

	Notes	2002 $'000	2001 $'000
Revenues from ordinary activities			
Revenues from Australian government	*4A*	**3,807**	3,725
United Kingdom government contribution	*4B*	**3,550**	3,450
Sales of goods and services	*4C*	**1,467**	1,724
Interest	*4D*	**42**	51
Net foreign exchange gains	*4E*	**-**	3
Other	*4H*	**354**	310
Total revenues from ordinary activities		**9,220**	9,263
Expenses from ordinary activities			
Employees	*5A*	**5,307**	5,055
Suppliers	*5B*	**2,349**	2,570
Depreciation	*5C*	**4,009**	2,488
Write-down of assets	*5D*	**401**	594
Total expenses from ordinary activities		**12,066**	10,707
Net operating (deficit) from ordinary activities		**(2,846)**	(1,444)
Net credit to asset revaluation reserve	*10*	**1,750**	3,678
Total revenues, expenses and valuation adjustments attributable to the Commonwealth and recognised directly in equity.		**1,750**	3,678
Total changes in equity other than those resulting from transactions with owners as owners		**(1,096)**	2,234

ANGLO-AUSTRALIAN TELESCOPE BOARD

STATEMENT OF FINANCIAL POSITION
as at 30 June 2002

	Notes	2002 $'000	2001 $'000
ASSETS			
Financial assets			
Cash	*6A*	**1,032**	421
Receivables	*6B*	**624**	111
Total financial assets		**1,656**	532
Non-financial assets			
Land and buildings	*7A*	**22,282**	23,192
Infrastructure, plant and equipment	*7B*	**24,374**	24,783
Other	*7D*	**82**	111
Total non-financial assets		**46,738**	48,086
Total assets		**48,394**	48,618
LIABILITIES			
Provisions			
Employees	*8A*	**1,653**	1,536
Total Provisions		**1,653**	1,536
Payables			
Suppliers	*9A*	**100**	52
Other	*9B*	**966**	259
Total Payables		**1,066**	311
Total liabilities		**2,719**	1,847
NET ASSETS		**45,675**	46,771
EQUITY			
Reserves	*10*	**34,596**	32,846
Accumulated surplus	*10*	**11,079**	13,925
Total equity		**45,675**	46,771
Current liabilities		**1,837**	1,051
Non-current liabilities		**882**	796
Current assets		**1,738**	643
Non-current assets		**46,656**	47,975

ANGLO-AUSTRALIAN TELESCOPE BOARD

STATEMENT OF CASH FLOWS
as at 30 June 2002

	Notes	2002 $'000	2001 $'000
OPERATING ACTIVITIES			
Cash received			
Sales of goods and services			
Government		**-**	-
Non-Government		**1,710**	1,600
Appropriations		**3,807**	3,725
Contributions from UK Government		**3,550**	2,587
Interest		**40**	49
GST recovered from ATO		**292**	267
Other		**354**	310
Total cash received		**9,753**	8,538
Cash used			
Employees		**(5,190)**	(4,828)
Suppliers		**(2,611)**	(2,822)
Total cash used		**(7,801)**	(7,650)
Net cash from operating activities	*10*	**1,952**	888
INVESTING ACTIVITIES			
Cash received			
Proceeds from sales of plant and equipment		**-**	23
Total cash received			23
Cash used			
Purchase of land and buildings		**30**	(16)
Purchase of plant and equipment		**(1,311)**	(1,689)
Total cash used)		**(1,341)**	(1,705)
Net cash(used by) investing activities		**(1,341)**	(1,682)
Net increase (decrease) in cash held		**611**	(794)
Cash at the beginning of reporting period		**421**	1,215
Cash at the end of reporting period	*6A*	**1,032**	421

ANGLO-AUSTRALIAN TELESCOPE BOARD

SCHEDULE OF COMMITMENTS
as at 30 June 2002

	2002 $'000	2001 $'000
BY TYPE		
Capital Commitments	**-**	-
Other Commitments		
Operating Leases	**101**	88
Total Other Commitments	**101**	88
Commitments Receivable	**-**	-
Net commitments	**101**	88
BY MATURITY		
All net commitments		
One year or less	**70**	67
From one to two years	**31**	21
Net Commitments	**101**	88

Financial leases exist in relation to motor vehicles. The leases are non-cancellable and for fixed terms of two or three years.

SCHEDULE OF CONTINGENCIES
as at 30 June 2002

	2002 $'000	2001 $'000
CONTINGENT LOSSES & GAINS	**-**	**-**

Note 1. Summary of Significant Accounting Policies

1.1 Basis of Accounting

The financial statements are required by section 19(1) of *The Anglo-Australian Telescope Board Act 1970* and are a general purpose financial report.

The statements have been prepared in accordance with:

- Finance Minister's Orders (being the Commonwealth Authorities and Companies (Financial Statements 2001-2002) Orders)
- Australian Accounting Standards and Accounting Interpretations issued by Australian Accounting Standard Board;
- other authoritative pronouncements of the Board; and
- Consensus Views of the Urgent Issues Group.

The statements have been prepared having regard to:

- The Explanatory Notes to Schedule 1 issued by the Department of Finance and Administration; and
- Finance briefs issued by the Department of Finance and Administration.

The Statements of Financial Performance and Financial Position have been prepared on an accrual basis and are in accordance with historical cost convention, except for certain assets, which, as noted, are at valuation. Except where stated, no allowance is made for the effect of changing prices on the results or on the financial position.

Assets and liabilities are recognised in the Statement of Financial Position when and only when it is probable that future economic benefits will flow and the amounts of the assets or liabilities can be reliably measured. Assets and liabilities arising under agreements equally proportionately unperformed are however not recognised unless required by an Accounting Standard. Liabilities and assets that are unrecognised are reported in the Schedule of Commitments and the Schedule of Contingencies, The Board has no remote contingencies.

Revenues and expenses are recognised in the Statement of Financial Performance when and only when the flow or consumption or loss of economic benefits has occurred and can be reliably measured.

1.2 Changes in Accounting Policy

The accounting policies used in the preparation of these financial statements are consistent with those used in 2000-2001.

1.3 Revenue

Australian government appropriations are recognised at the time the Board receives the revenue.

Grants are received from the Australian Research Council (ARC) and the Particle Physics and Astronomy Research Council (PPARC) of the United Kingdom (UK) for the specific purpose of employing astronomers at the Observatory. Grants are recognised as revenue on receipt.

Resources Received Free of Charge

Services received free of charge are recognised as revenues when and only when a fair value can be reliably determined and the services would have been purchased if they had not been donated.

Contributions of assets at no cost of acquisition or for nominal consideration are recognised at their fair value when the asset qualifies for recognition.

The following resources are received free of charge*:*

(i) Use of Land
At Siding Spring Observatory, the 3.9 metre Anglo-Australian Telescope (AAT) building and the 1.2 metre UK Schmidt Telescope (UKST) building are on land owned by the Australian National University (ANU). At Epping, New South Wales, the Board's buildings are on the site of the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The Board has entered into a permissive occupancy agreement with CSIRO covering its establishment at Epping. The value of this land is disclosed in Note 7A. The Board has also entered into a permissive occupancy agreement with the ANU for its establishment at Siding Spring, for which a "peppercorn rental" of one dollar is charged.

(ii) Use of the UK Schmidt Telescope
The UK Schmidt Telescope is owned by PPARC and operated by the Anglo Australian Observatory (AAO).

1.4 Liability for Employee Entitlements

(a) Leave

The liability for employee entitlements includes provision for annual leave and long service leave. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken in future years by employees of the Board is estimated to be less than the annual entitlement for sick leave.

The liability for annual leave reflects the value of total annual leave entitlements of all employees at 30 June 2002 and is recognised at its nominal amount.

The non-current portion of the liability for long service leave is recognised and measured at the present value of the estimated future cash flows to be made in respect of all employees at 30 June 2002. In determining the present value of the liability, the Board has taken into account attrition rates and pay increases through promotion and inflation.

(b) Superannuation

Employees contribute to the Commonwealth Superannuation Scheme (CSS), the Public Sector Superannuation Scheme (PSS), the Anglo-Australian Telescope Board Staff Superannuation Scheme and to AGEST. Employer contributions amounting to $587,532 (2000-2001 $587,532) have been expensed in these financial statements.

No liability for superannuation benefits is recognised as at 30 June as the employer contributions fully extinguish the accruing liability for PSS and CSS that is assumed by the Commonwealth. The AATB and AGEST schemes are accumulation schemes and the AAT Board has no accruing liability.

Employer Superannuation Productivity Benefit contributions totalled $102,439 (2000-2001 $102,439)

1.5 Leases

A distinction is made between finance leases, which effectively transfer from the lessors to the lessee substantially all the risk and benefits incidental to ownership of leased assets, and operating leases, under which the lessor effectively retains all such risks and benefits. Operating lease payments are charged to expense on a basis, which is representative of the pattern of benefits derived from the leased assets. The Board has no finance leases.

1.6 Insurance

The AAO has insured for risks through the Government insurable risk management fund, called Comcover. Workers' compensation is insured through Comcare Australia.

1.7 Financial Instruments

Accounting policies in relation to financial instruments are disclosed in note 17.

1.8 Acquisition of Assets

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes fair value of assets transferred in exchange and liabilities undertaken.

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost in the Statement of Financial Position, except for purchases costing less than $3000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total). The $3000 threshold was selected because it facilitates efficient asset management and recording without materially affecting asset values recognised.

Revaluations

Land, buildings, infrastructure, plant and equipment are revalued progressively in accordance with the deprival method of valuation in successive three-year cycles, so that no asset has a value greater than three years old.

The revaluation cycle is as follows:

- land and buildings were revalued as at 1 July 2000.
- the telescopes and instrumentation were revalued as at 1 July 2001
- personal computers were revalued as at 1 July 1999
- other computing facilities were revalued as at 1 July 1999
- plant and equipment were revalued as at 1 July 2001

Assets in each class acquired after the commencement of the progressive revaluation cycle are not captured by the progressive revaluation then in progress.

In accordance with the deprival methodology, land is valued at its current market buying price. Property other than land, plant and equipment is measured at its depreciated replacement cost. Any assets that would not be replaced or are surplus to requirement are valued at their realisable value; at 30 June 2002 there were no assets in this situation.

The valuations of personal computers, other computing facilities and land and buildings are independent. The valuations of the telescopes, instrumentation and plant and equipment were developed within the Board based on historic prices and indices of inflation since the equipment was acquired.

Recoverable Amount Test

Schedule 1 requires the application of the recoverable amount test to the Board's non-current assets in accordance with AAS *10 Recoverable Amount of Non-Current Assets*. The carrying amounts of non-current assets have been reviewed to determine whether they are in excess of their recoverable amounts. In assessing recoverable amounts, the relevant cash flows have not been discounted to their present value.

Depreciation and Amortisation

Depreciable property, plant and equipment assets are written off to their estimated residual values over their estimated useful lives to the Board using, in all cases, the straight line method of depreciation.

Depreciation rates (useful lives) and methods are reviewed at each balance date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate. Residual values are re-estimated for a change in prices only when assets are revalued.

Depreciation rates applying to each class of depreciable assets are as follows:

	2002	2001
Buildings	**50 years**	50 years
Telescope and Ancillary Equipment	**50 years**	50 years
Telescope Instrumentation	**20 years**	20 years
Personal Computers	**3 years**	3 years
Other Computers	**5 years**	5 years
Other Plant and Equipment	**20 years**	20 years

The aggregate amount of depreciation allocated for each class of asset during the reporting period is disclosed in Note 5C.

1.9 Taxation

The Board is exempt from all forms of taxation except for the goods and services tax.

1.10 Capital Use Charge

The Anglo-Australian Telescope Board is not subject to the Commonwealth Government's capital use charge.

1.11 Foreign Currency Transactions

The contributions from the United Kingdom are converted to Australian dollars at the selling rate quoted by the Bank of England at the time each contribution is made. All other foreign currency transactions are converted at the ruling exchange rate at the time of the transaction. Foreign currency receivables and payables are translated at the exchange rate as at balance date. Associated currency gains or losses are brought to account in the Statement of Financial Performance.

1.12 Cash

Cash means notes and coins held and any deposits held at call with a bank or financial institution.

1.13 Agreements

Under an agreement between the Board and the PPARC, the Board is responsible for the management, care and maintenance, operation and development of the UK Schmidt Telescope. PPARC, the owner of the UK Schmidt Telescope, has entered into a lease with the ANU in respect of use of land for the UK Schmidt Telescope. The revenues, expenses and asset values in respect of the UK Schmidt Telescope form part of the financial statements.

1.14 External Projects

The Anglo-Australian Telescope Board has, in recent years, been invited to build telescope instrumentation for other Australian and international telescope bodies. Sometimes these non-profit contracts are on a time and materials basis, other times on a fixed price basis. The projects are costed to result in break-even results on completion. In the event of a surplus or over-run arising, it is the policy of the Board to absorb these.

1.15 Accrual Budgeting Framework

The Anglo-Australian Telescope Board is not part of the Commonwealth Government's accrual budgeting framework.

1.16 Comparative Figures

Where appropriate, comparative figures have been restated to conform to changes in the presentation of the financial statements.

1.17 Rounding

Amounts have been rounded to the nearest $1 000 except in relation to the following:

- remuneration of directors;
- remuneration of executive officers (other than directors); and
- remuneration of auditors.

Note 2. Financial Reporting by Segments

The Board operates solely in Australia and in one industry by operating and maintaining research facilities in Australia.

Note 3. Economic Dependency

The Anglo-Australian Telescope Board was established by the Anglo-Australian Telescope Board Agreement Act 1970. The Board is dependent upon Australian government revenue and contributions from the United Kingdom government for its continued existence and ability to carry out its normal activities.

NOTES TO AND FORMING PART OF THE FINANCIAL STATEMENTS
for the year ended 30 June 2002

Note 4. Operating revenues	**2002 $'000**	2001 $'000
4A Australian Government revenues		
Australian government revenue	**3,807**	3,725
Total	**3,807**	3,725
4B United Kingdom Government contribution		
The Board received the following contribution during the year from the United Kingdom government	**3,550**	3,450
4C Sale of goods and services		
Goods	**1,425**	1,398
Services	**42**	326
Total	**1,467**	1,724
Goods & services were sold to:		
Government	**-**	-
Non-Government	**1,467**	1,724
Cost of sales of goods	**1,202**	1,415
4D Interest		
Deposits	**42**	51
4E Net foreign exchange gains/(losses)		
Non-speculative	**-**	3
4G Contributions Revenue		
Donations and Bequests	**70**	-
4H Other revenues		
Rent	**12**	7
Fellowships	**94**	69
Other Revenue	**248**	234
Total	**354**	310

Note 5. Operating Expenses

5A Employee Expenses	2002 $'000	2001 $'000
Remuneration (for services provided)		
External project staff	**871**	735
All other staff	**4,436**	4,320
Total	**5,307**	5,055

The Board contributes to the Anglo-Australian Telescope Board Staff Superannuation Scheme, The Australian Government Employees Superannuation Trust (AGEST), the Commonwealth Superannuation (CSS) and the Public Sector (PSS) superannuation schemes that provide retirement, death and disability benefits to employees. Contributions to the schemes are at rates calculated to cover existing and emerging obligations. Current contributions are 11.76% of salary (AATB Superannuation Scheme), 9% of Salary (AGEST) 29.8% of salary (CSS) and 11.7% of salary (PSS). An additional amount of between 2 and 3% is contributed for employer productivity benefits.

5B Suppliers' Expenses

Supply of goods and services	**1,937**	1980
Motor vehicle lease costs	**82**	77
External projects	**330**	513
Total	**2,349**	2,570

5C Depreciation

Property, plant and equipment	**4,009**	2,488

The aggregate amounts of depreciation expensed during the reporting period for each class of depreciable asset are:

Buildings	**939**	829
Telescope	**701**	627
Instruments	**2,141**	602
Plant and equipment	**228**	430
Total allocated	**4,009**	2,488

During the year programming inconsistencies in the calculation of depreciation by the FA System were rectified. An additional depreciation charge of $1,381,000 was booked in this regard.

5D Write-down of assets

Plant and equipment - write off on disposal	**401**	594
Total	**401**	594

Note 6 Financial assets

6A Cash	2002	2001
	$'000	$'000
Cash at bank and on hand	**1,032**	421
Balance of cash as at 30 June as shown in the Statement of Cash Flows	**1,032**	421

6B Receivables	2002	2001
Goods and services	**-**	49
Other debtors	**570**	43
GST Receivable	**54**	19
Total receivables	**624**	111
Receivables (gross) are aged as follows:		
Not Overdue	**74**	97
Overdue by:		
-Less than 30 days	**507**	4
-30-60 days	**42**	1
-more than 60 days	**1**	9
Total	**624**	111

Note 7: Non-Financial assets

7A Land and buildings	2002	2001
Land - at 30 June 2001 valuation	**15**	15
Land (the use of which is free of charge) at 30 June 2001 valuation	**2,350**	2,350
	2,365	2,365
Buildings - at cost	**29**	-
Buildings - at 30 June 2001 valuation	**41,778**	41,778
Less accumulated depreciation	**(23,799)**	(22,951)
	18,008	18,827
Buildings (the use of which is free of charge) At 30 June 2001 valuation	**4,549**	4,549
Less accumulated depreciation	**(2,640)**	(2,549)
	1,909	2,000
Total land and buildings	**22,282**	23,192

	2002 **$'000**	2001 $'000
7B Plant and equipment		
Telescope and ancillary equipment at 1998 valuation	**-**	31,213
Telescope & ancillary equipment at 1/7/2001 valuation	**35,137**	-
Less accumulated depreciation	**(19,801)**	(16,939)
	15,336	14,274
Telescope and ancillary equipment at cost	**25**	31
Less accumulated depreciation	**(1)**	(1)
	24	30
Telescope instrumentation at 1998 valuation	**-**	11,255
Telescope instrumentation at 1/7/2001 valuation	**13,251**	-
Less accumulated depreciation	**(7,145)**	(3.927)
	6,106	7,328
Telescope instrumentation at cost	**946**	1,314
Less accumulated depreciation	**(3)**	(33)
	943	1,281
Other plant and equipment at 1999 valuation	**-**	3,046
Other plant and equipment at 1/7/2001 valuation	**3,587**	-
Less accumulated depreciation	**(1,941)**	(1,806)
	1,646	1,240
Other plant and equipment at cost	**339**	666
Less accumulated depreciation	**(20)**	(37)
	319	629
Total plant and equipment	**24,374**	24,783
Total property, plant and equipment	**46,656**	47,975

.

7C. Analysis of Property, Plant and Equipment

TABLE A
Reconciliation of opening and closing balances of property, plant and equipment

Item	Land $'000	Buildings $'000	Total land and buildings $'000	Plant and equipment $'000	Total $'000
Gross value as at 1 July 2001	2,365	46,327	48,692	47,526	96,218
• Additions-purchase of assets	-	29	29	1,311	1,340
• Revaluations: write-ups (write downs)		-	-	5,306	5,306
• Write-offs	-	-	-	(858)	(858)
Gross value as at 30 June 2002	**2,365**	**46,356**	**48,721**	**53,285**	**102,006**
Accumulated depreciation as at 1 July 2001	-	25,500	25,500	22,743	48,243
• Depreciation charge for year	-	939	939	3,070	4,009
• Revaluation: write-ups (write downs)	-	-	-	3,556	3,556
• Write-offs				(458)	(458)
Accumulated depreciation as at 30 June 2002	**-**	**26,439**	**26,439**	**28,911**	**55,350**
Net book value as at 30 June 2002	**2,365**	**19,917**	**22,282**	**24,374**	**46,656**
Net book value as at 1 July 2001	2,365	20,827	23,192	24,783	47,975

TABLE B

Assets at valuation

Item	Land $'000	Buildings $'000	Telescope $'000	Instruments $'000	Plant & equipment $'000	Total $'000
As at 30 June 2002						
Gross value	**2,365**	**46,327**	**35,137**	**13,251**	**3,587**	**100,667**
Accumulated depreciation	**-**	**26,439**	**19,801**	**7,145**	**1,941**	**55,326**
Net book value	**2,365**	**19,888**	**15,336**	**6,106**	**1,646**	**45,341**
As at 30 June 2001 Gross value	2,365	46,327	31,213	11,255	3,046	94,206
Accumulated depreciation	-	25,500	16,939	3,927	1,806	48,172
Net book value	2,365	20,827	14,274	7,328	1,240	46,034

	2002 $'000	2001 $'000
7D Other non-financial assets		
Prepayments for goods and services - includes insurance premiums, rentals in advance and subscriptions	**82**	111

Note 8. Provisions

8A Employees

	2002 $'000	2001 $'000
Salaries and wages	**134**	127
Leave	**1,520**	1,409
Aggregate employee entitlement liability	**1,654**	1,536

Note 9. Payables

9A Payables

	2002 $'000	2001 $'000
Trade creditors	**100**	52

9B Other Liabilities

	2002 $'000	2001 $'000
PNS (note 16C)	**-**	50
Non Trade creditors	**48**	96
Institute of Astronomy (note 16D)	**192**	-
ECHIDNA (note 16B)	**726**	113
Total	**966**	259

Note 10. Equity

	Asset Revaluation Reserve $'000	**Accumulated Result $'000**	**Total Equity $'000**
Balance at 1 July 2001	**32,846**	**13,925**	**46,771**
Operating result	**-**	**(2,846)**	**(2,846)**
Net Revaluation Increase	**1,750**	**-**	**1,750**
Balance at 30 June 2002	**34,596**	**11,079**	**45,675**
Balance at 1 July 2000	29,168	15,369	44,537
Operating result	-	(1,444)	(1,444)
Net Revaluation Increase	3,678	-	3,678
Balance at 30 June 2001	32,846	13,925	46,771

Note 11. Cash Flow Reconciliation

Reconciliation of operating deficit to net cash provided by operating activities:

	2002 $'000	2001 $'000
Operating surplus/(deficit)	**(2,846)**	(1,444)
Depreciation and amortisation	**4,009**	2,488
Property plant & equipment written off	**401**	611
Changes in assets and liabilities:		
Increase/(decrease) in liabilities to employees	**117**	97
Decrease/(increase) in receivables	**(513)**	224
(Increase)/decrease in other current assets	**29**	(45)
Increase/(decrease) in creditors	**48**	(40)
Increase/(decrease) in other current liabilities	**707**	(1,003)
Net cash provided by operating activities	**1,952**	888

Note 12. Related Party Disclosures and Remuneration of Directors

Members of the Board during the year were:

Dr I F Corbett (to 30/9/2001), Mr G Brooks from 1/10/2001, Professor M Barlow, Professor M Birkinshaw, Professor R D Ekers, Professor K Freeman, Professor V Sara (to 15/8/2001), Professor L Cram (from 16/8/2001).

The Directors do not receive remuneration.

Professor K Freeman is also an employee of the ANU Research School of Astronomy and Astrophysics (RSAA). RSAA provides site services to the AAO at Siding Spring. Professor R D Ekers is the Director of the Australian Telescope National Facility, a Division of CSIRO; CSIRO provides site services to the AAO at Epping.

Note 13. Remuneration of Officers

The number of Officers who receive or were due to receive total remuneration of $100,000 or more

	2002 Number	2001 Number
$110 001 - $120 000	**1**	1
$120 001 - $130 000	**1**	-
$130 001 - $140 000	**1**	1
$140 001 - $150 000	**1**	1
$160 001 - $170 000	**1**	1
Aggregate amount of total remuneration of officers shown above	**$670,124**	$577,593

	2002	2001
Note 14. Remuneration of Auditors		
	$	$
Remuneration to the Auditor-General for auditing the financial statements for the reporting period	**25,000**	25,000

No other services were provided by the Auditor-General during the reporting period.

Note 15. Average Staffing Levels

The average staffing levels for the AAO during the year were:	**70**	74

Note 16. External Projects

A) In May 1999, the Observatory entered into an agreement with the European Southern Observatory (ESO) to build a positioner for the Very Large Telescope in Chile. This was a natural extension of the work the AAO had done on its own instruments and provided an opportunity for the AAO to enhance its instrumentation building skills. The instrument was delivered to Chile in February 2002.

ESO has made a series of staged payments in advance. The position at 30 June 2002 was as follows:

	2002 $000	2001 $000
Instalments received from ESO	**100**	835
Suppliers expenses	**(142)**	(383)
Employee expenses	**(388)**	520
On-cost credited to Other Revenue	**-**	146
Net deficit carried forward from prior year	**(49)**	165
Project loss absorbed by AAO	**194**	-
Instalments receivable	**(285)**	(49)

B) The Japanese Telescope Subaru contracted the AAO to design and evaluate a prototype positioner, the Echidna. The contract began just before the end of the 1998-99 year and will be completed in. The position at 30 June 2002 was as follows:

Instalment received	**1,476**	479
Suppliers' expenses	**(150)**	(78)
Employee expenses	**(364)**	(176)
On Cost credited to Other Revenue	**(236)**	(113)
Instalments unexpended- included in Other Liabilities	**726**	112

C) The Observatory was part of a consortium involved in the development of a planetary nebulae spectrograph. Overall management of the project was the responsibility of one of the consortium members. However, as most of the design and manufacturing work was being done in Australia, the Observatory managed the financial aspects of the project. The collaborators lodged their contributions with the Observatory and the Observatory was using those funds to pay for the work packages as they are completed. The Observatory was not itself involved in any of the manufacturing. The project is now ended. The financial position at 30 June 2002 was as follows:

	2002 $000	2001 $000
Instalment unexpended prior year	**50**	150
Suppliers' expenses	**(50)**	(100)
Instalments unexpended - included in other liabilities	**NIL**	50

D) Institute of Astronomy

Instalment Received	**360**	-
Suppliers Expenses	**(10)**	-
Employee Expenses	**(119)**	-
On cost credited to other revenue	**(39)**	-
Instalment unexpended - included in Other Liabilities	**192**	-

Note 17. Financial Instruments.

a) Terms, conditions and accounting policies.

Financial Instruments	Notes	Accounting Policies and Methods (including recognition criteria and measurement basis.)	Nature of Underlying Instrument (including significant terms and conditions affecting the amount, timing and certainty of cash flows.)
Financial Assets		Financial assets are recognised when control over future economic benefits is established and the amount of the benefit can be reliably measured.	
Cash at Bank	6A	Cash at Bank is recognised at the nominal amount. Interest is credited to revenue as it accrues.	Temporarily surplus funds on deposit with RBA have interest credited monthly.
Receivables	6B	These receivables are recognised at the nominal amount due less any provision for bad and doubtful debts. Provisions are made when collection of the debt is judged to be less rather than more likely.	Credit terms are net 30 days.
Financial Liabilities		Financial liabilities are recognised when a present obligation to another party is entered into and the amount of the liability can be reliably measured.	
Trade Creditors	9A	Creditors and accruals are recognised at their nominal amounts, being amounts at which the liabilities will be settled. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced)	Settlement is usually made net 30 days.
Other Liabilities	9B	Amounts owing to Subaru and the PNS consortium, representing unspent contributions, are recognised at their nominal amounts.	Funds will be expended in the year ending 30 June 2002.

b) Interest rate risk

Financial Instrument	Note	Floating Interest Rate **2002** **$'000**	Floating Interest Rate 2001 $'000	Non Interest Bearing **2002** **$'000**	Non Interest Bearing 2001 $'000	**Total** **2002** **$'000**	Total 2001 $'000
Financial Assets (Recognised)							
Cash at Bank	6A	**998**	387	**-**	-	**998**	387
Cash on Hand	6A	**-**	-	**34**	34	**34**	34
Receivables for Goods and Services	6B	**-**	-	**624**	111	**624**	111
Total Financial Assets (Recognised)		**998**	387	**658**	145	**1,656**	532
Total Assets						**48,394**	48,618
Financial Liabilities (Recognised)							
Trade Creditors	8B	**-**	-	**100**	52	**100**	52
Other Liabilities	8C	**-**	-	**966**	259	**966**	259
Total Financial Liabilities (Recognised)		**-**	-	**1,066**	311	**1,066**	311
Total Liabilities						**2,719**	1,847

The weighted average effective interest rate for Cash at Bank is 3.4% (2000-2001 4.7%)

c) Net fair value of assets and liabilities

	Note	**Total Carrying Amount 2002 $'000**	**Aggregate Net Fair Value 2002 $'000**	Total Carrying Amount 2001 $'000	Aggregate Net Fair Value 2001 $'000
Financial Assets					
Cash at Bank	6A	**998**	**998**	387	387
Cash on Hand	6A	**34**	**34**	34	34
Receivables for Goods and Services	6B	**624**	**624**	111	111
Total Financial Assets		**1,656**	**1,656**	532	532
Financial Liabilities (Recognised)					
Trade Creditors	8B	**100**	**100**	52	52
Other Liabilities	8C	**966**	**966**	259	259
Total Financial Liabilities (Recognised)		**1,066**	**1,066**	311	311

Financial Assets

The net fair value of cash assets is their carrying value as shown.

Financial Liabilities

The net fair values of trade creditors and other liabilities, all of which are short term in nature, are their carrying values as shown.

d) Credit risk exposures

The economic entity's maximum exposure to credit risk at reporting date in relation to each class of recognised financial assets is the carrying amount of those assets as indicated in the Statement of Assets and Liabilities.

The economic entity has no significant exposures to any concentration of credit risk.

Research papers

The following list includes research papers published from AAT and UKST data, 1 July 2001–30 June 2002, together with papers published by AAO staff from data obtained entirely from other telescopes. It does not include AAO contributions to the IAU circulars, which are used to make urgent announcements, nor does it include all of the papers that have made use of UKST sky survey plates and atlases.
A list of some of the popular articles published by AAO staff members follows..
'A' or 'S' following each entry indicates whether the paper was based on AAT data or UKST data. 'O' indicates publications by AAO staff members using data obtained from other telescopes. Abbreviations for journals are listed at the end of this appendix.

AFONSO J (ICL), MOBASHER B (STSI), CHAN B (SYDNEY), CRAM L (SYDNEY)
Discovery of an extremely red galaxy at z=0.65 with dusty star formation and nuclear activity. Astrophys Jnl Letters, 559:101, 2001 (A)

ALONSO-HERRERO A (HERTFORDSHIRE), RYDER S D (AAO), KNAPEN J H (ING)
Nuclear star formation in the hotspot galaxy NGC 2903. ASP Conf. series vol.249: The central kiloparsec of starbursts and AGN: the La Palma connection, p.557, 2002 (O)

ANDRIEVSKY S M (BRAZIL), BERSIER D (HSCA), KOVTYUKH V V (ODESSA), ET AL
Using Cepheids to determine the galactic abundance gradient. II. Towards the galactic center. Astronomy & Astrophysics, 384:140, 2002 (A)

AOKI W (TOKYO), NORRIS J E (RSAA), RYAN S G (OPEN U), ET AL
The chemical composition of carbon-rich, very metal poor stars: a new class of mildly carbon rich objects without excess of neutron-capture elements. Astrophys. J., 567:1166, 2002 (A)

AOKI W (TOKYO), RYAN S G (OPEN U), NORRIS J E (RSAA), ET AL
Neutron capture elements in s-process-rich, very metal-poor stars. Astrophys. J., 561:346, 2001 (A)

ARGAST D (BASEL), SAMLAND M (BASEL), THIELEMANN F K (BASEL), GERHARD O E (BASEL)
Implications of O and Mg abundances in metal-poor halo stars for stellar iron yields. Astronomy & Astrophysics, 388:842, 2002 (A)

ARNABOLDI M (NAPLES), AGUERRI J A L (BASEL), NAPOLITANO N R (NAPLES), ET AL
Intracluster planetary nebulae in Virgo: photometric selection, spectroscopic validation, and cluster depth. Astronom Jnl, 123:760, 2002 (A)

ASHTON C E (CARDIFF), LEWIS G F (AAO)
Gravitational microlensing of planets: the influence of planetary phase and caustic orientation. Mon Not R astr Soc, 325:305, 2001 (O)

BABUL A (VICTORIA), BALOGH M L (DURHAM), LEWIS G F (AAO), POOLE G B (VICTORIA)
Physical implications of the X-ray properties of galaxy groups and clusters. Mon Not R astr Soc, 330:329, 2002 (O)

BAKER J C (CALIFORNIA), HUNSTEAD R W (SYDNEY), ATHREYA R M (PARIS), ET AL
Associated absorption in radio quasars. I. C IV absorption and the growth of radio sources. Astrophys. J., 568:592, 2002 (A)

BALDRY I K (JHU), GLAZEBROOK K (JHU), BAUGH C M (DURHAM), BLAND-HAWTHORN J (AAO), BRIDGES T J (AAO), CANNON R D (AAO), ET AL
The 2dF Galaxy Redshift Survey: constraints on cosmic star formation history from the cosmic spectrum. Astrophys. J., 569:582, 2002 (A)

BARMBY P (HSCA), PERRETT K M (QUEENS), BRIDGES T J (AAO)
The ‘remarkable’ M31 globular cluster 037-B327 revisited. Mon Not R astr Soc, 329:461, 2002 (O)

BARNES J R (PORTO), CAMERON A C (ST ANDREWS)
Starspot patterns on the M dwarfs HK Aqr and RE 1816+541. Mon Not R astr Soc, 326:950, 2001 (A)

BECKER R H (CALIFORNIA), WHITE R L (NOAO),GREGG M D (CALIFORNIA), ET AL
The FIRST Bright Quasar Survey. III. the south Galactic cap. Astrophys Jnl Suppl, 135:227, 2001 (S)

BEDDING T R (SYDNEY), KJELDSEN H (AARHUS), BALDRY I K (AAO), BOUCHY F (GENEVA), ET AL
Solar-like oscillations in Beta Hydri: evidence for short-lived high-amplitude oscillations. ASP Conf. series vol. 259, p.464, 2002 (A)

BENN C R (ING), VIGOTTI M (BOLOGNA), PEDANI M (LA PALMA), ET AL
High-redshift QSOs in the FIRST survey. Mon Not R astr Soc, 329:221, 2002 (S)

BIGNALL H E (ADELAIDE), JAUNCEY D L (ATNF), KEDZIORA-CHUDCZER L L (ATNF, AAO), ET AL
New results from an ATCA study of intraday variable radio sources. Publ Astron Soc Australia, 19:29, 2002 (O)

BLAKE L A J, RYAN S G (OPEN U), NORRIS J E (RSAA), BEERS T C
Neutron-capture elements in the Sr-rich, Ba-normal metal-poor giant CS22897-008. Nucl. Phys A, 688:502c, 2001 (A)

BLAND-HAWTHORN J (AAO), MALONEY P R (COLORADO)
H alpha distance constraints for high velocity clouds in the Galactic halo. ASP Conf. series vol.254: Extragalactic gas at low redshift, p.267, 2002 (O)

BLAND-HAWTHORN J (AAO), PUTMAN M E (ATNF)
The galactic halo UV field, Magellanic Stream, and high-velocity clouds. ASP Conf. series v.240: Gas & Galaxy Evolution, p.369, 2001 (O)

BLAND-HAWTHORN J (AAO), VAN BREUGEL W (LLNL), GILLINGHAM P R (AAO), BALDRY I K (AAO), JONES D H (ESO)
A tunable Lyot filter at prime focus: a method for tracing supercluster scales at z approx. 1. Astrophys. J., 563:611, 2001 (O)

BOATTINI A (ROME), D’ABRAMO G (ROME), FORTI G (ARCETRI), GAL R (JHU)
The Arcetri NEO Precovery Program. Astronomy & Astrophysics, 375:293, 2001 (S)

BOYCE P J (BRISTOL), PHILLIPPS S (BRISTOL), JONES J B (NOTTINGHAM), ET AL
The nature of the dwarf population in Abell 868. Mon Not R astr Soc, 328:277, 2001 (A)

BOYLE B J (AAO), CROOM S M (AAO), HOYLE F (DURHAM), OUTRAM P J (DURHAM), SHANKS T (DURHAM), ET AL
The 2dF QSO Redshift Survey. ASP Conf.series vol.232: The New Era of Wide Field Astronomy, p.65, 2001 (A,S)

BOYLE B J (AAO), CROOM S M (AAO), SMITH R J (LIVERPOOL), SHANKS T (DURHAM), ET AL
The 2dF QSO Redshift Survey. In: Deep Fields - ESO Workshop, p.282, 2001 (A,S)

BRANCH D (OKLAHOMA), BENETTI S (PADOVA), KASEN D (CALIFORNIA), BARON E (OKLAHOMA), JEFFERY D J (SOCORRO), HATANO K (TOKYO), STATHAKIS R A (AAO), ET AL
Direct analysis of spectra of type Ib supernovae. Astrophys. J., 566:1005, 2002 (O)

BRIDGES T J (AAO)
2dF on the AAT: current status and recent science results. ASP Conf.series vol.232: The New Era of Wide Field Astronomy, p.29, 2001 (A)

BROTHERTON M S (NOAO), GRABELSKY M (RICE), CANALIZO G (LLNL), VAN BREUGEL W (LLNL), FILIPPENKO A V (CALIFORNIA), CROOM S (AAO), BOYLE B (AAO), SHANKS T (DURHAM)
Hubble Space Telescope imaging of the poststarburst quasar UN J1025-0040: evidence for recent star formation. Publ Astron Soc Pacific, 114:593, 2002 (O)

BROWN M J I (NOAO), BOYLE B J (AAO), WEBSTER R L (MELBOURNE)
The clustering of AGNs and galaxies at intermediate redshift. Astronom Jnl, 122:26, 2001 (S)

BURTON M G (UNSW)
Molecular hydrogen in the Lagoon: H2 line emission from Messier 8. Publ Astron Soc Australia, 19:260, 2002 (A)

BUTLER R P (CIW, AAO), TINNEY C G (SSO), MARCY G W (CALIFORNIA), ET AL
Two new planets from the Anglo-Australian Planet Search. Astrophys. J., 555:410, 2001 (A)

BUXTON M (RSAA), VENNES S (ANU)
Atmospheric modelling of the companion star in GRO J1655-40. Publ Astron Soc Australia, 18:91, 2000 (A)

CAMERON A C (ST ANDREWS), DONATI J F (OMP)
Doin' the twist: secular changes in the surface differential rotation on AB Doradus. Mon Not R astr Soc, 329:L23, 2002 (A)

CAMERON A C (ST ANDREWS), DONATI J F (OMP), SEMEL M (PARIS)
Stellar differential rotation from direct star-spot tracking. Mon Not R astr Soc, 330:699, 2002 (A)

CANNON R (AAO), HAMBLY N (EDINBURGH), ZACHARIAS N (USNO)
Accurate large-scale astrometry for faint stars. ASP Conf. series vol.232: The new era of wide field astronomy, p.311, 2001 (S)

CANNON R (AAO), MORGAN D (EDINBURGH), HATZIDIMITRIOU D (CRETE), CROKE B (ANU)
A spectroscopic survey of carbon stars in the Magellanic Clouds. ASP Conf. series vol.232: The new era of wide field astronomy, p.224, 2001 (A,S)

CARETTA C A (BRAZIL), MAIA M A G (BRAZIL), KAWASAKI W (TOKYO), WILLMER C N A (BRAZIL)
The Aquarius superclusters. I. Identification of clusters and superclusters. Astronom Jnl, 123:1200, 2002 (S)

CARRIER F (GENEVA), BOUCHY F (GENEVA), KIENZLE F (GENEVA), BEDDING T R (SYDNEY), KJELDSEN H (AARHUS), BUTLER R P (CIW), BALDRY I K (AAO), O'TOOLE S J (SYDNEY), TINNEY C G (AAO), MARCY G W (CALIFORNIA)
Solar-like oscillations in beta Hydri: confirmation of a stellar origin for the excess power. Astronomy & Astrophysics, 378:142, 2001 (O)

CARTER D (LIVERPOOL), MOBASHER B (STSI), BRIDGES T J (AAO), ET AL
A photometric and spectroscopic study of dwarf and giant galaxies in the Coma cluster. V. Dependence of the spectroscopic properties on location in the cluster. Astrophys. J., 567:772, 2002 (O)

CECIL G (NORTH CAROLINA), BLAND-HAWTHORN J (AAO), VEILLEUX S (MARYLAND), FILIPPENKO A V (CALIFORNIA)
Jet- and wind-driven ionized outflows in the superbubble and star-forming disk of NGC 3079. Astrophys. J., 555:338, 2001 (O)

CHAPMAN S C (CALTECH), LEWIS G F (AAO), SCOTT D (BRITISH COLUMBIA), ET AL
Understanding the nature of the optically faint radio sources and their connection to the submillimeter population. Astrophys. J., 570:557, 2002 (O)

CHATY S (OPEN U), MIRABEL I F (SACLAY), GOLDONI P (SACLAY), ET AL
Near-infrared observations of Galactic black hole candidates. Mon Not R astr Soc, 331:1065, 2002 (A,S)

CHEN A (CAPE TOWN), O'DONOGHUE D (CAPE TOWN), STOBIE R S (SAAO), ET AL
Cataclysmic variables in the Edinburgh-Cape Blue Object Survey. Mon Not R astr Soc, 325:89, 2001 (S)

CHRISTIAN D J (CALIFORNIA), MATHIOUDAKIS M (BELFAST)
High-resolution optical observations of extreme-ultraviolet-selected active late-type stars. Astronom Jnl, 123:2796, 2002 (A)

CLARKE F J (CAMBRIDGE), TINNEY C G (AAO), COVEY K R (CARLETON)
Periodic photometric variability of the brown dwarf Kelu-1. Mon Not R astr Soc, 332:361, 2002 (A)

COLE S (DURHAM), NORBERG P (DURHAM), BAUGH C M (DURHAM), FRENK C S (DURHAM), BLAND-HAWTHORN J (AAO), BRIDGES T (AAO), CANNON R (AAO), ET AL
The 2dF Galaxy Redshift Survey: near-infrared galaxy luminosity functions. Mon Not R astr Soc, 326:255, 2001 (A)

COLLESS M (RSAA), DALTON G (OXFORD), MADDOX S (NOTTINGHAM),...BLAND-HAWTHORN J (AAO), BRIDGES T (AAO), CANNON R (AAO), ET AL
The 2dF Galaxy Redshift Survey: spectra and redshifts. Mon Not R astr Soc, 328:1039, 2001 (A)

COOKE J A (EDINBURGH), DIGBY A P (EDINBURGH), REID I N (PENNSYLVANIA)
Wide field astrometry: moving from the UKST to VISTA. ASP Conf.series vol.232: The New Era of Wide Field Astronomy, p.272, 2001 (S)

CORBETT E (AAO), NORRIS R (ATNF), HEISLER C (RSAA), DOPITA M (RSAA), ET AL
First results from the COLA project: the radio-FIR correlation, compact radio cores, and radio excess in the southern COLA galaxies. ASP Conf. series vol.249: The central kiloparsec of starbursts and AGN: the La Palma connection, p.126, 2002 (O)

CORBETT E A (AAO), NORRIS R P (ATNF), HEISLER C A (MSSSO), DOPITA M A (MSSSO), ET AL
First results from the COLA project: the radio-far-infrared correlation and compact radio cores in southern COLA galaxies. Astrophys. J., 564:650, 2002 (O)

COTE P (CALTECH), McLAUGHLIN D E (CALIFORNIA), HANES D A (QUEENS), BRIDGES T J (AAO), ET AL
Dynamics of the globular cluster system associated with M87 (NGC 4486). II. Analysis. Astrophys. J., 559:828, 2001 (O)

CRAWFORD I A (UCL)
An ultra-high-resolution study of the interstellar medium in the direction of Alpha Ophiuchi. Mon Not R astr Soc, 327:841, 2001 (A)

CRAWFORD I A (UCL)
Ultra-high-resolution observations of interstellar NaI and KI towards the Scorpius OB1 association. Mon Not R astr Soc, 328:1115, 2001 (A)

CROOM S M (AAO)
QSO-galaxy correlations: lensing or dust?. Publ Astron Soc Australia, 18:169, 2001 (O)

CROOM S M (AAO), SHANKS T (DURHAM), BOYLE B J (AAO), ET AL
The 2dF QSO Redshift Survey - II. Structure and evolution at high redshift. Mon Not R astr Soc, 325:483, 2001 (A,S)

CROOM S M (AAO), WARREN S J (ICL), GLAZEBROOK K (AAO)
A small-area faint KX redshift survey for QSOs in the ESO Imaging Survey Chandra Deep Field South. Mon Not R astr Soc, 328:150, 2001 (A,S)

CROSS N (ST ANDREWS), DRIVER S P (ST ANDREWS), COUCH W (UNSW), BAUGH C M (DURHAM), BLAND-HAWTHORN J (AAO), BRIDGES T (AAO), CANNON R (AAO), ET AL
The 2dF Galaxy Redshift Survey: the number and luminosity density of galaxies. Mon Not R astr Soc, 324:825, 2001 (A,S)

CROSS N (ST ANDREWS), DRIVER S (ST ANDREWS), LEMON D (ST ANDREWS)
The INT-WFS + 2dFGRS: the local space and luminosity density. ASP Conf.series vol.232: The New Era of Wide Field Astronomy, p.181, 2001 (A)

CRUDDACE R (NRL), VOGES W (MPE), BOHRINGER H (MPE), ET AL
The ROSAT All-Sky Survey: a catalog of clusters of galaxies in a region of 1 steradian around the south Galactic pole. Astrophys Jnl Suppl, 140:239, 2002 (S)

CZOSKE O (OMP), SOUCAIL G (OMP), KNEIB J-P (OMP), BRIDGES T (AAO), ET AL
A wide-field spectroscopic survey in the cluster lens C10024+17. ASP Conf. series vol.237: Gravitational lensing: recent progress and future goals, p.309, 2001 (O)

DAHLEM M (LEIDEN), EHLE M (MADRID), RYDER S D (AAO)
A search for intergalactic HI gas in the NGC 1808 group of galaxies. Astronomy & Astrophysics, 373:485, 2001 (O)

DE MARCO O (NEW YORK), CLAYTON G C (LOUISIANA), HERWIG F (VICTORIA), ET AL
What are the hot R Coronae Borealis stars?. Astronom Jnl, 123:3387, 2002 (A)

DE MARCO O (NEW YORK), CROWTHER P A (UCL), BARLOW M J (UCL), ET AL
SwSt 1: an O-rich planetary nebula around a C-rich central star. Mon Not R astr Soc, 328:527, 2001 (A)

DE PROPRIS R (UNSW), COUCH W J (UNSW), COLLESS M (MSSSO), DALTON G B (OXFORD),...BLAND-HAWTHORN J (AAO), BRIDGES T (AAO), CANNON R (AAO), ET AL
The 2dF Galaxy Redshift Survey: a targeted study of catalogued clusters of galaxies. Mon Not R astr Soc, 329:87, 2002 (A)

DEACON N R (EDINBURGH), HAMBLY N C (EDINBURGH)
The trigonometric parallax of DENIS-P J104814.7-395606.1. Astronomy & Astrophysics, 380:148, 2001 (S)

DEMPSEY R C (STSI), NEFF J E (CHARLESTON), LIM J (TAIPEI)
Simultaneous observations of variability at all atmospheric levels of V824 Arae (HD 155555). Astronom Jnl, 122:332, 2001 (A)

DOBBIE P D (LEICESTER), KENYON F (LEICESTER), JAMESON R F (LEICESTER), ET AL
A deep large-area search for very low-mass members of the Hyades open cluster. Mon Not R astr Soc, 329:543, 2002 Also AAT data (A,S)

DONATI J F (OMP), BABEL J (NEUCHATEL), HARRIES T J (EXETER), ET AL
The magnetic field and wind confinement of Theta 1 Orionis C. Mon Not R astr Soc, 333:55, 2002 (A)

DRINKWATER M J (MELBOURNE), GREGG M D (CALIFORNIA), HOLMAN B A (MELBOURNE), BROWN M J I (MELBOURNE)
The evolution and star formation of dwarf galaxies in the Fornax Cluster. Mon Not R astr Soc, 326:1076, 2001 (S)

DUFTON P L (BELFAST), SMARTT S J (CAMBRIDGE), HAMBLY N C (EDINBURGH)
A UKST survey of blue objects towards the Galactic centre - seven additional fields. Astronomy & Astrophysics, 373:608, 2001 (S)

EDWARDS S A (RSAA), COLLESS M (RSAA), BRIDGES T J (AAO), CARTER D (LIVERPOOL), ET AL
Substructure in the Coma cluster: giants versus dwarfs. Astrophys. J., 567:178, 2002 (A)

EFSTATHIOU G (CAMBRIDGE), MOODY S J (CAMBRIDGE)
Maximum likelihood estimates of the two- and three-dimensional power spectra of the APM Galaxy Survey. Mon Not R astr Soc, 325:1603, 2001 (A)

EFSTATHIOU G (CAMBRIDGE), MOODY S (CAMBRIDGE), PEACOCK J A (ROE), PERCIVAL W J (ROE), BAUGH C (DURHAM), BLAND-HAWTHORN J (AAO), BRIDGES T (AAO), CANNON R (AAO), ET AL (THE 2dFGRS TEAM)
Evidence for a non-zero cosmological constant and a low matter density from a combined analysis of the 2dF Galaxy Redshift Survey and cosmic microwave background anisotropies. Mon Not R astr Soc, 330:L29, 2002 (A)

ELGAROY O (CAMBRIDGE), GRAMANN M (TARTU), LAHAV O (CAMBRIDGE)
Features in the primordial power spectrum: constraints from the cosmic microwave background and the limitation of the 2dF and SDSS redshift surveys to detect them. Mon Not R astr Soc, 333:93, 2002 (A)

ELLISON S L (ESO), YAN L (CALTECH), HOOK I M (OXFORD), ET AL
The CORALS survey I: new estimates of the number density and gas content of damped Lyman alpha systems free from dust bias. Astronomy & Astrophysics, 379:393, 2001 (A)

ELLISON S L (ESO), YAN L (CALTECH), HOOK I M (OXFORD), ET AL
The CORALS survey II. Clues to galaxy clustering around QSOs from z abs - z em damped Lyman alpha systems. Astronomy & Astrophysics, 383:91, 2002 (A)

FASSIA A (ICL), MEIKLE W P S (ICL), SPYROMILIO J (ESO)
Spectroscopy of SN 1987A at 0.9-2.4 microns: days 1348-3158. Mon Not R astr Soc, 332:296, 2002 (A)

FORD A, JEFFRIES R D, JAMES D J, RYAN S G (OPEN U)
Lithium abundances in halo stars from the 6104 Angstrom line. ASP Conf. series vol.223: Cambridge Workshop on Cool Stars, Stellar Systems & the Sun, p.1339, 2001 (A)

FRANCIS P J (RSAA), DRAKE C L (RSAA), WHITING M T (MELBOURNE), DRINKWATER M J (MELBOURNE), WEBSTER R L (MELBOURNE)
The spectra of red quasars. Publ Astron Soc Australia, 18:221, 2001 (A)

FRANCIS P J (RSAA), WILSON G M(RSAA), WOODGATE B E (NASA)
On the gas surrounding high-redshift galaxy clusters. Publ Astron Soc Australia, 18:64, 2001 (A)

FREIRE P C (JODRELL), KRAMER M (JODRELL), LYNE A G (JODRELL), ET AL
Detection of ionized gas in the globular cluster 47 Tucanae. Astrophys Jnl Letters, 557:L105, 2001 (A)

FUJIYOSHI T (ADFA), SMITH C H (ADFA), WRIGHT C M (ADFA), ET AL
Infrared polarimetry of the southern massive star-forming region G333.6-02. Mon Not R astr Soc, 327:233, 2001 (A)

GANG T (NASA)
Ultra-high resolution spectroscopy of P Cygni and similar stars in the optical wavelength region. ASP Conf. series v.233: P Cygni: 400 Years of Progress, p.129, 2001 (A)

GAUSTAD J E (SWARTHMORE), McCULLOUGH P R (ILLINOIS), ROSING W (CALIFORNIA), VAN BUREN D (NEW YORK)
A robotic wide-angle H alpha survey of the southern sky. Publ Astron Soc Pacific, 113:1326, 2001 (S)

GILLINGHAM P R (AAO)
An optical design for an Antarctic 2m telescope with a near IR imager. Publ Astron Soc Australia, 19:301, 2002 (O)

GILMORE G (CAMBRIDGE), WYSE R F G (JHU)
The thick disk-halo interface. ASP Conf. series v.228: Dynamics of Star Clusters and the Milky Way, p.225, 2001 (A)

GRAHAM M F (JODRELL), SMITH R J (JODRELL), MEABURN J (JODRELL), BRYCE M (JODRELL)
The expansion of the giant filamentary shell, DEM 171, in the Magellanic Bridge. Mon Not R astr Soc, 326:539, 2001 (A,S)

HAMBLY N C (EDINBURGH), DAVENHALL A C (EDINBURGH), IRWIN M J (CAMBRIDGE), MACGILLIVRAY H T (EDINBURGH)
The SuperCOSMOS Sky Survey - III. Astrometry. Mon Not R astr Soc, 326:1315, 2001 (S)

HAMBLY N C (EDINBURGH), IRWIN M J (CAMBRIDGE), MACGILLIVRAY H T (EDINBURGH)
The SuperCOSMOS Sky Survey - II. Image detection, parametrization, classification and photometry. Mon Not R astr Soc, 326:1295, 2001 (S)

HAMBLY N C (EDINBURGH), MACGILLIVRAY H T (EDINBURGH), READ M A (EDINBURGH), TRITTON S B (EDINBURGH), ET AL
The SuperCOSMOS Sky Survey - I. Introduction and description. Mon Not R astr Soc, 326:1279, 2001 (S)

HAMBLY N C (ROE), BROWN M L (ROE), SMITH R E (ROE), READ M A (ROE), TAYLOR A N (ROE)
New science results from the superCOSMOS Sky Survey. ASP Conf.series vol.232: The New Era of Wide Field Astronomy, p.35, 2001 (S)

HANES D A (QUEENS, AAO), COTE P (RUTGERS), BRIDGES T J (AAO), ET AL
Dynamics of the globular cluster system associated with M87 (NGC 4486). I. New CFHT MOS spectroscopy and the composite database. Astrophys. J., 559:812, 2001 (O)

HAWKINS E (NOTTINGHAM), MADDOX S (NOTTINGHAM), BRANCHINI E (ROME), SAUNDERS W (ROE, AAO)
The clustering of hot and cold IRAS galaxies: the redshift-space correlation function. Mon Not R astr Soc, 325:589, 2001 (O)

HAWKINS M R S (ROE)
Variability in active galactic nuclei: confrontation of models with observations. Mon Not R astr Soc, 329:76, 2002 (S)

HELLIER C (KEELE), BEARDMORE A P (KEELE)
The accretion flow in the discless intermediate polar V2400 Ophiuchi. Mon Not R astr Soc, 331:407, 2002 (A)

HELLIER C (KEELE), WYNN G A (LEICESTER), BUCKLEY D A H (SAAO)
On the accretion mode of the intermediate polar V1025 Centauri. Mon Not R astr Soc, 333:84, 2002 (A)

HEWETT P C (CAMBRIDGE), FOLTZ C B (ARIZONA), CHAFFEE F H (HAWAII)
The Large Bright Quasar Survey. VII. The LBQS and FIRST Surveys. Astronom Jnl, 122:518, 2001 (S)

HOYLE F (DREXEL), VOGELEY M S (DREXEL), GOTT III J R (PRINCETON)
Two-dimensional topology of the Two Degree Field Galaxy Redshift Survey. Astrophys. J., 570:44, 2002 (A)

HOYLE F (DURHAM), OUTRAM P (DURHAM), SHANKS T (DURHAM), BOYLE B J (AAO), CROOM S (AAO), ET AL
Simulating the 2QZ Survey. ASP Conf.series vol.232: The New Era of Wide Field Astronomy, p.75, 2001 (O)

HOYLE F (DURHAM), OUTRAM P J (DURHAM), SHANKS T (DURHAM), CROOM S M (AAO), BOYLE B J (AAO), ET AL
The 2dF QSO Redshift Survey - IV. The QSO power spectrum from the 10k catalogue. Mon Not R astr Soc, 329:336, 2002 (A,S)

HOYLE F (DURHAM), OUTRAM P J (DURHAM), SHANKS T (DURHAM), BOYLE B J (AAO), CROOM S M (AAO), SMITH R J (LIVERPOOL)
The 2dF QSO Redshift Survey - VII. Constraining cosmology from redshift-space distortions via the 2-point correlation function parallel and perpendicular to line of sight . Mon Not R astr Soc, 332:311, 2002 (A)

IBATA R (STRASBOURG), IRWIN M (CAMBRIDGE), LEWIS G (AAO), FERGUSON A M N (KAPTEYN), TANVIR N (HERTFORDSHIRE)
A giant stream of metal-rich stars in the halo of the galaxy M31. Nature, 412:49, 2001 (O)

IBATA R A (STRASBOURG), LEWIS G F (AAO), IRWIN M J (CAMBRIDGE)
Uncovering CDM halo substructure with tidal streams. Mon Not R astr Soc, 332:915, 2002 (O)

IBATA R A (STRASBOURG), LEWIS G F (AAO), IRWIN M J (CAMBRIDGE), CAMBRESY L (CALTECH)
Sub-structure of the outer Galactic Halo from the 2 Micron All Sky Survey. Mon Not R astr Soc, 332:921, 2002 (O)

IRWIN J A (QUEENS), STIL J M (QUEENS), BRIDGES T J (AAO)
SCUBA observations of NGC 1275. Mon Not R astr Soc, 328:359, 2001 (O)

IRWIN M (CAMBRIDGE), FERGUSON A (KAPTEYN), TANVIR N (HERTFORDSHIRE), IBATA R (STRASBOURG), LEWIS G (AAO)
The Andromeda stream: a giant trail of tidal stellar debris in the halo of M31. ING Newsletter, no.5, p.3, 2001 (O)

ISAAK K G (CAMBRIDGE), PRIDDEY R S (CAMBRIDGE), McMAHON R G (CAMBRIDGE), ET AL
The SCUBA Bright Quasar Survey (SBQS): 850 micron observations of the z greater than or equal to 4 sample. Mon Not R astr Soc, 329:149, 2002 (S)

JACOB A P (SYDNEY), BEDDING T R (SYDNEY), ROBERTSON J G (SYDNEY), BARTON J R (AAO), ET AL
Multi-wavelength observations of the red giant R Doradus with the MAPPIT interferometer. IAU Symp. 205: ‘Galaxies and their Constituents at the Highest Angular Resolutions’, p.298, 2001 (A)

JAUNCEY D L (ATNF), KEDZIORA-CHUDCZER L (ATNF, AAO), LOVELL J E J (ATNF), ET AL
Intraday variability and microarcsecond structure in blazar cores. IAU Symp. 205: Galaxies and their constituents at the highest angular resolutions, p.84, 2001 (O)

JOHNSTON H M (SYDNEY), WU K (SYDNEY), FENDER R (AMSTERDAM), CULLEN J G (SYDNEY)
Secular and orbital variability of Cir X-1 observed in optical spectra. Mon Not R astr Soc, 328:1193, 2001 (A)

JONES D H (ESO), SHOPBELL P L (CALTECH), BLAND-HAWTHORN J (AAO)
Detection and measurement from narrowband tunable filter scans. Mon Not R astr Soc, 329:759, 2002 (A)

JONES H (ESO), BLAND-HAWTHORN J (AAO)
Tunable filter surveys for star formation across different lookback times. ASP Conf. series v.245: Astrophysical Ages and Time Scales, p.552, 2001 (A)

KAUFFMANN G (MPA), HAEHNELT M G (ICL)
The clustering of galaxies around quasars. Mon Not R astr Soc, 332:529, 2002 (A)

KEDZIORA-CHUDCZER L (AAO, ATNF), MACQUART J-P (SYDNEY), JAUNCEY D L (ATNF)
Extreme examples of intraday variability - search for diffractive scintillation in the smallest quasar, PKS 0405-385. IAU Symp. 205: Galaxies and their constituents at the highest angular resolutions, p.90, 2001 (O)

KEDZIORA-CHUDCZER L L (SYDNEY, ATNF, AAO), JAUNCEY D L (ATNF), WIERINGA M H (ATNF), ET AL
The ATCA intraday variability survey of extragalactic radio sources. Mon Not R astr Soc, 325:1411, 2001 (O)

KOMIYAMA Y (SUBARU), SEKIGUCHI M (TOKYO), KASHIKAWA N (TOKYO), ET AL

A photometric and spectroscopic study of dwarf and giant galaxies in the Coma cluster - I. Wide-area photometric survey: observation and data analysis. Astrophys Jnl Suppl, 138:265, 2002 (O)

KOTNIK-KARUZA D (CROATIA), FRIEDJUNG M (PARIS), SELVELLI P L (TRIESTE)
The region of Fe II emission line formation of the symbiotic nova RR Telescopii. Astronomy & Astrophysics, 381:507, 2002 (A)

LANDY S D (WILLIAMSBURG)
The pairwise velocity distribution function of galaxies in the Las Campanas Redshift survey, Two-degree Field Survey, and Sloan Digital Sky Survey. Astrophys Jnl Letters, 567:L1, 2002 (A)

LAZENDIC J S (SYDNEY), WARDLE M (SYDNEY), BURTON M G (UNSW), ET AL
Shocked molecular gas towards the supernova remnant G359.1-0.5 and the Snake. Mon Not R astr Soc, 331:537, 2002 (A)

LEE D (AAO), HAYNES R (AAO), SKEEN D J (AAO)
Properties of optical fibres at cryogenic temperatures. Mon Not R astr Soc, 326:774, 2001 (O)

LEE D (AAO), HAYNES R (AAO), REN D (DURHAM), ALLINGTON-SMITH J (DURHAM)
Characterization of lenslet arrays for astronomical spectroscopy. Publ Astron Soc Pacific, 113:1406, 2001 (O)

LEE J-K (UNSW), WALSH A J (UNSW), BURTON M G (UNSW), ASHLEY M C B (UNSW)
Discovery of molecular hydrogen line emission associated with methanol maser emission. Mon Not R astr Soc, 324:1102, 2001 (A)

LEMON D (ST ANDREWS), DRIVER S (ST ANDREWS), CROSS N (ST ANDREWS)
The Millennium Galaxy Catalogue. ASP Conf.series vol.232: The New Era of Wide Field Astronomy, p.193, 2001 (A)

LEWIS G F (AAO)
Gravitational microlensing of stars with transiting planets. Astronomy & Astrophysics, 380:292, 2001 (O)

LEWIS G F (AAO)
Gravitational microlensing of giant luminous arcs: a test for compact dark matter in clusters of galaxies. Publ Astron Soc Australia, 18:182, 2001 (O)

LEWIS G F (AAO), BLAND-HAWTHORN J (AAO)
A test for dark halos in high-velocity clouds. ASP Conf. series v.240: Gas & Galaxy Evolution, p.539, 2001 (O)

LEWIS G F (AAO), CARILLI C (NRAO), PAPADOPOULOS P (ESA), IVISON R J (ROE)
Resolved nuclear CO(1-0) emission in APM08279+5255: gravitational lensing by a naked cusp?. Mon Not R astr Soc, 330:L15, 2002 (O)

LEWIS G F (AAO), IRWIN M J (CAMBRIDGE), IBATA R A (STRASBOURG), GIBSON B K (SWINBURNE)
AAT/WFI observations of the extragalactic HI cloud HIPASS J1712-64. Publ Astron Soc Australia, 19:257, 2002 (A)

LEWIS I J (AAO), CANNON R D (AAO), TAYLOR K (AAO, CALTECH), GLAZEBROOK K (AAO, JHU), ET AL
The Anglo-Australian Observatory's 2dF facility. Mon Not R astr Soc, 333:279, 2002 (A)

LUMSDEN S L (LEEDS, AAO), HEISLER C A (MSSSO), BAILEY J A (AAO), HOUGH J H (HERTFORDSHIRE), YOUNG S (HERTFORDSHIRE)
Spectropolarimetry of a complete infrared-selected sample of Seyfert 2 galaxies. Mon Not R astr Soc, 327:459, 2001 (A)

MADGWICK D S (CAMBRIDGE), LAHAV O (CAMBRIDGE), BALDRY I K (JHU), BAUGH C M

(DURHAM), BLAND-HAWTHORN J (AAO), BRIDGES T (AAO), CANNON R (AAO), ET AL
The 2dF Galaxy Redshift Survey: galaxy luminosity functions per spectral type. Mon Not R astr Soc, 333:133, 2002 (A)

MAGEE H R M(BELFAST), DUFTON P L (BELFAST), KEENAN F P (BELFAST),ROLLESTON W R J (BELFAST), ET AL
Model atmosphere and kinematical analyses of early-type stars from the Edinburgh-Cape Survey. Mon Not R astr Soc, 324:747, 2001 (A,S)

MAGLIOCCHETTI M (TRIESTE), MADDOX S J (NOTTINGHAM)
Optical identifications of 400 radio sources at the 1mJy level. Mon Not R astr Soc, 330:241, 2002 (S)

MAGLIOCCHETTI M (TRIESTE), MADDOX S J (NOTTINGHAM), JACKSON C A (RSAA), BLAND-HAWTHORN J (AAO), BRIDGES T (AAO), CANNON R (AAO), ET AL
The 2dF Galaxy Redshift Survey: the population of nearby radio galaxies at the 1-mJy level. Mon Not R astr Soc, 333:100, 2002 (A)

MAMON G A (PARIS), PARKER Q A (ROE, AAO), PROUST D (PARIS)
FLAIR II spectroscopy of two DENIS J band galaxy samples. Publ Astron Soc Australia, 18:232, 2001 (S)

MARAGOUDAKI F (ATHENS), KONTIZAS M (ATHENS), MORGAN D H (EDINBURGH), ET AL
The recent structural evolution of the SMC. Astronomy & Astrophysics, 379:864, 2001 (S)

MARTINEZ H J (CORDOBA), ZANDIVAREZ A (CORDOBA), DOMINGUEZ M (CORDOBA), ET AL
Galaxy groups in the 2dF Galaxy Redshift Survey: effects of environment on star formation. Mon Not R astr Soc, 333:L31, 2002 (A)

MATUTE I (ROME), LA FRANCA F (ROME), POZZI F (BOLOGNA), ET AL
The evolution of type 1 active galactic nuclei in the infrared (15 micron): the view from ELAIS-S1. Mon Not R astr Soc, 332:L11, 2002 (A)

MAXTED P F L (SOUTHAMPTON), MARSH T R (SOUTHAMPTON), MORAN C K J (SOUTHAMPTON)
The mass ratio distribution of short-period double degenerate stars. Mon Not R astr Soc, 332:745, 2002 (A)

MEADOWS V (JPL), CRISP D (JPL), BARNES J (CALTECH), ORTON G (JPL), SPENCER J (LOWELL)
AAT observations of the SL9 fragment C,D,G,K,N,R,V, and W impacts with Jupiter: lightcurves and imaging. Icarus, 152:366, 2001 (A)

MEYLAN G (STSI), SARAJEDINI A (FLORIDA), JABLONKA P (PARIS), DJORGOVSKI S G (PALOMAR), BRIDGES T (AAO), RICH R M (UCLA) Mayall II = G1 in M31: giant globular cluster or core of a dwarf elliptical galaxy?. Astronom Jnl, 122:830, 2001 (O)

MOBASHER B (STSI), BRIDGES T J (AAO), CARTER D (LIVERPOOL), ET AL
A photometric and spectroscopic study of dwarf and giant galaxies in the Coma cluster. II. Spectroscopic observations. Astrophys Jnl Suppl, 137:279, 2001 (O)

MOONEY C J (BELFAST), ROLLESTON W R J (BELFAST), KEENAN F P (BELFAST), ET AL
A detailed abundance analysis of the hot post-AGB star ZNG-1 in M10. Mon Not R astr Soc, 326:1101, 2001 (A)

MORTLOCK D J (CAMBRIDGE), DRINKWATER M J (MELBOURNE)
Using the 6dF Galaxy Redshift Survey to detect gravitationally-lensed quasars. Publ Astron Soc Australia, 18:195, 2001 (S)

MORTLOCK D J(CAMBRIDGE), MADGWICK D S (CAMBRIDGE), LAHAV O (CAMBRIDGE)
The 2dF Gravitational Lens Survey. Publ Astron Soc Australia, 18:192, 2001 (A)

NARAYANAN V K (OHIO), WEINBERG D H (OHIO), BRANCHINI E (KAPTEYN), FRENK C S (DURHAM), MADDOX S (NOTTINGHAM), OLIVER S (ICL), ROWAN-ROBINSON M (ICL), SAUNDERS W (EDINBURGH, AAO)
Reconstruction analysis of the IRAS Point Ssource Catalog Redshift Survey. Astrophys Jnl Suppl, 136:1, 2001 (O)

NORBERG P (DURHAM), BAUGH C M (DURHAM), HAWKINS E (NOTTINGHAM), MADDOX S (NOTTINGHAM), ...BLAND-HAWTHORN J (AAO), BRIDGES T (AAO), CANNON R (AAO), ET AL
The 2dF Galaxy Redshift Survey: luminosity dependence of galaxy clustering. Mon Not R astr Soc, 328:64, 2001 (A)

NORBERG P (DURHAM), BAUGH C M (DURHAM),...BLAND-HAWTHORN J (AAO), BRIDGES T (AAO), CANNON R (AAO), ET AL
The 2dF Galaxy Redshift Survey: the dependence of galaxy clustering on luminosity and spectral type. Mon Not R astr Soc, 332:827, 2002 (A)

NORRIS J E (RSAA), RYAN S G (OPEN U), BEERS T C (MICHIGAN)
Extremely metal-poor stars. VIII. High-resolution, high signal-to-noise ratio analysis of five stars with (Fe/H) less than or equal to -3.5. Astrophys. J., 561:1034, 2001 (A)

NORRIS J E (RSAA), RYAN S G (OPEN U), BEERS T C (MICHIGAN), ET AL
Extremely metal-poor stars. IX. CS 22949-037 and the role of hypernovae. Astrophys Jnl Letters, 569:L107, 2002 (A)

NORRIS R P (ATNF), HOPKINS A (ATNF), SAULT R J (ATNF),...BOYLE B J (AAO), WILLIAMS R E (STSI)
Radio observations of the Hubble Deep Field South. in Deep Fields: ESO Workshop, p.135, 2001 (O)

ORCHISTON W (AAO)
From amateur astronomer to observatory director: the curious case of R.T.A. Innes. Publ Astron Soc Australia, 18:317,2001 (O)

ORCHISTON W (AAO)
Victoria’s earliest astronomical groups. Crux, 19(4):16, 2001 (O)

ORCHISTON W (AAO)
The founding of the BAA NSW branch. The Astronomers’ Bulletin vol.4 issue 5, p.8, 2001 (O)

ORCHISTON W (AAO)
The Thames observatories of John Grigg. Southern Stars, 40(3):14, 2001

ORCHISTON W (AAO)
‘Sentinel of our Southern Heavens’: The Windsor observatory of John Tebbutt. J. Antique Telescope Soc., 21:11, 2001 (O)

ORCHISTON W (AAO), PERDRIX J
A history of the British Astronomical Association in Australia: the fate of the Branches. Journal of British Astronomical Assoc., 112,2:68, 2002 (O)

ORCHISTON W (AAO, ATNF), SLEE B (ATNF)
Ingenuity and initiative in Australian radio astronomy: the Dover Heights ‘hole-in-the ground’ antenna. Jnl of Astronomical History & Heritage, 5(1), p.21, 2002 (O)

OUTRAM P J (DURHAM), HOYLE F (DURHAM), SHANKS T (DURHAM), BOYLE B J (AAO), CROOM S M (AAO), ET AL
The 2dF QSO Redshift Survey - VI. Measuring Lambda and Beta from redshift-space distortions in the power spectrum. Mon Not R astr Soc, 328:174, 2001 (A,S)

OUTRAM P J (DURHAM), SMITH R J (LIVERPOOL), SHANKS T (DURHAM), BOYLE B J (AAO), CROOM S M (AAO), LOARING N S (OXFORD), MILLER L (OXFORD)

The 2dF QSO Redshift Survey - VIII. Absorption systems in the 10k catalogue. Mon Not R astr Soc, 328:805, 2001 (A,S)

PAPPA A (LEICESTER), STEWART G C (LEICESTER), GEORGANTOPOULOS I (ATHENS), GRIFFITHS R E (PITTSBURGH), BOYLE B J (AAO), SHANKS T (DURHAM)
ASCA observations of deep ROSAT fields - V. The X-ray spectrum of hard X-ray selected QSOs. Mon Not R astr Soc, 327:499, 2001 (A)

PARK O K (RSAA), KALNAJS A (RSAA), FREEMAN K C (RSAA), KORIBALSKI B (ATNF), STAVELEY-SMITH L (ATNF), MALIN D F (AAO)
Full-coverage K and H I mosaic images of NGC 253 and M 83. ASP Conf. series v.230: Galaxy Disks and Disk Galaxies, p.109, 2001 (O)

PARKER Q A (ROE), PHILLIPPS S (BRISTOL)
The AAO/UKST H-alpha survey and the discovery of a rich vein of planetary nebulae. ASP Conf.series vol.232: The New Era of Wide Field Astronomy, p.38, 2001 (S)

PEACOCK J A (ROE), COLLESS M (ANU), BAUGH C M (DURHAM), BLAND-HAWTHORN J (AAO), & THE 2DFGRS TEAM
Measuring large-scale structure with the 2dF Galaxy Redshift Survey. in: Deep Fields - ESO Workshop, p.221, 2001 (A)

PERCIVAL W J (ROE), BAUGH C M (DURHAM), BLAND-HAWTHORN J (AAO), BRIDGES T (AAO), CANNON R (AAO), ET AL
The 2dF Galaxy Redshift Survey: the power spectrum and the matter content of the Universe. Mon Not R astr Soc, 327:1297, 2001 (A)

PERRETT K M (QUEENS), BRIDGES T J (AAO), HANES D A (QUEENS), IRWIN M J (CAMBRIDGE), BRODIE J P (LICK), CARTER D (LIVERPOOL), HUCHRA J P (HSCA), WATSON F G (AAO)
The kinematics and metallicity of the M31 globular cluster system. Astronom Jnl, 123:2490, 2002 (O)

PHILLIPPS S (BRISTOL), DRINKWATER M J (MELBOURNE), GREGG M D (CALIFORNIA), JONES J B (NOTTINGHAM)
Ultracompact dwarf galaxies in the Fornax Cluster. Astrophys. J., 560:201, 2001 (A)

PIMBBLET K A (DURHAM), SMAIL I (DURHAM), EDGE A C (DURHAM), COUCH W J (UNSW), O'HELY E (UNSW), ZABLUDOFF A I (STEWARD)
The Las Campanas/AAT rich cluster survey - I. Precision and reliability of the photometric catalogue. Mon Not R astr Soc, 327:588, 2001 (A)

PIMBBLET K A (DURHAM), SMAIL I (DURHAM), KODAMA T (DURHAM), ET AL
The Las Campanas/AAT Rich Cluster Survey - II. The environmental dependence of galaxy colours in clusters at z approx. 0.1. Mon Not R astr Soc, 331:333, 2002 (A)

POGGIANTI B M (PADOVA), BRIDGES T J (AAO), MOBASHER B (STSI), ET AL
A photometric and spectroscopic study of dwarf and giant galaxies in the Coma Cluster. III. Spectral ages and metallicities. Astrophys. J., 562:689, 2001 (O)

POGGIANTI B M (PADOVA), BRIDGES T J (AAO), CARTER D (LIVERPOOL), ET AL
Ages of S0 and elliptical galaxies in the Coma Cluster. Astrophys. J., 563:118, 2001 (O)

POURBAIX D (BRUSSELS), NIDEVER D (SAN FRANCISCO), McCARTHY C (CIW), BUTLER R P (CIW), TINNEY C G (AAO), ET AL
Constraining the difference in convective blueshift between the components of Alpha Centauri with precise radial velocities. Astronomy & Astrophysics, 386:280, 2002 (A)

PRICE P A (RSAA), BERGER E (PALOMAR), REICHART D E (PALOMAR),...BAILEY J A (AAO), BOYLE B J (AAO), CORBETT E (AAO), GUNN K (SOUTHAMPTON), RYDER S R (AAO), ET AL
GRB 011121: a massive star progenitor. Astrophys Jnl Letters, 572:L51, 2002 (A)

PRICE R J (UCL), CRAWFORD I A (UCL), BARLOW M J (UCL), HOWARTH I D (UCL)
An ultra-high-resolution study of the interstellar medium towards Orion. Mon Not R astr Soc, 328:555, 2001 (A)

PUTMAN M E (RSAA), DE HEIJ V (LEIDEN), STAVELEY-SMITH L (ATNF),...MALIN D F (AAO),...RYDER S D (AAO), ET AL
HIPASS high-velocity clouds: properties of the compact and extended populations. Astronom Jnl, 123:873, 2002 (O)

REID I N (STSI), SAHU K C (STSI), HAWLEY S L (WASHINGTON)
High-velocity white dwarfs: thick disk, not dark matter. Astrophys. J., 559:942, 2001 (S)

RICKETT B (CALIFORNIA), KEDZIORA-CHUDCZER L (ATNF, AAO), JAUNCEY D L (ATNF)
Interstellar scintillation explains the intraday variations in the linear polarisation of quasar PKS 0405-385 at cm-wavelengths. Publ Astron Soc Australia, 19:106, 2002 (O)

ROBERTSON J G (SYDNEY, AAO)
Single-object spectroscopy with integral-field units or slits: which loses more signal?. The Observatory, 121:368, 2001 (O)

ROSE J A (NORTH CAROLINA), GABA A E (NORTH CAROLINA), CHRISTIANSEN W A (NORTH CAROLINA), ET AL
Multiple merging events in the double cluster A3128/A3125. Astronom Jnl, 123:1216, 2002 (A)

ROUKEMA B F (IUCAA), MAMON G A (PARIS), BAJTLIK S (WARSAW)
The cosmological constant and quintessence from a correlation function comoving fine feature in the 2dF Quasar Redshift Survey. Astronomy & Astrophysics, 382:397, 2002 (A)

RUSSEIL D (AAO, MARSEILLE, HELSINKI), PARKER Q A (AAO, ROE)
First results from the combination of the AAO/UKST and Marseille H alpha surveys. Publ Astron Soc Australia, 18:76, 2001 (S)

RYAN S G (OPEN U)
Element abundances and Galactic chemical evolution. In: The influence of binaries on stellar population studies, D. Vanbeveren (ed), Kluwer, p.491, 2001 (A)

RYAN S G (OPEN U), AOKI W, BLAKE L A J, ET AL
s- and r-process elements in two very metal-poor stars. Mem.S.A.It, 72(2):337, 2001 (A)

RYAN S G (OPEN U), AOKI W, NORRIS J E, ET AL
Lead in the C-rich, s-process rich, metal-poor subgiant LP625-44. Nucl. Phys A, 688:209c, 2001 (A)

RYAN S G (OPEN U), GREGORY S G (OPEN U), KOLB U (OPEN U), ET AL
Rapid rotation of ultra-Li-depleted halo stars and their association with blue stragglers. Astrophys. J., 571:501, 2002 (A)

RYDER S D (AAO), KNAPEN J H (ING), TAKAMIYA M (GEMINI)
Understanding circumnuclear star formation in spiral galaxies. ASP Conf. series v.230: Galaxy Disks and Disk Galaxies, p.327, 2001 (O)

RYDER S D (AAO), KNAPEN J H (ING), ALONSO-HERRERO A (HERTFORDSHIRE), TAKAMIYA M (GEMINI)
The ages of circumnuclear starbursts from near-IR spectroscopy: bushfires or Mexican wave?. ASP Conf. series vol.249: The central kiloparsec of starbursts and AGN: the La Palma connection, p.501, 2002 (O)

RYDER S D (AAO), KORIBALSKI B (ATNF), STAVELEY-SMITH L (ATNF), KILBORN V A (MELBOURNE), MALIN D F (AAO), ET AL
HIPASS detection of an intergalactic gas cloud in the NGC 2442 group. Astrophys. J., 555:232, 2001 (O)

SACKETT P D (KAPTEYN, AAO)
Microlensing and the physics of stellar atmospheres. ASP Conference series vol.239: Microlensing 2000: a new era of microlensing astrophysics, p.213, 2002 (O)

SADLER E M (SYDNEY), JACKSON C A (MSSSO), CANNON R D (AAO), ET AL
Radio sources in the 2dF Galaxy Redshift Survey - II. Local radio luminosity functions for AGN and star-forming galaxies at 1.4 GHz. Mon Not R astr Soc, 329:227, 2002 (A)

SCHOLZ R D (POTSDAM), IBATA R (STRASBOURG), IRWIN M (CAMBRIDGE), ET AL
New nearby stars among bright APM high proper motion stars. Mon Not R astr Soc, 329:109, 2002 (S)

SCHOLZ R D (POTSDAM), SZOKOLY G P (POTSDAM), ANDERSEN M (POTSDAM), IBATA R (STRASBOURG), IRWIN M J (CAMBRIDGE)
A new wide pair of cool white dwarfs in the solar neighborhood. Astrophys. J., 565:539, 2002 (S)

SCHOLZ R-D (POTSDAM)
Search for nearby faint high proper motion stars. Deep Fields, S. Cristiani, A. Renzini, R.E. Williams (eds), p.16, 2002 (S)

SHORTRIDGE K (AAO)
Astronomical software - a review. ASP Conf. series vol. 238: ADASS X, p.343, 2001 (O)

SMITH K (ZURICH), LEWIS G F (AAO), BONNELL I A (ST ANDREWS), EMERSON J P (LONDON)
Infall variability in the Classical T Tauri system VZ Chamaeleonis. Astronomy & Astrophysics, 378:1003, 2001 (O)

SMITH R M (CARDIFF), DAVIES J I (CARDIFF), KAMBAS A (CARDIFF)
Dwarf galaxy populations in nearby clusters. ASP Conf.series vol.232: The New Era of Wide Field Astronomy, p.147, 2001 (S)

SNOW T P (COLORADO)
A search for fine structure within the 4430 Angstrom diffuse interstellar band. Astrophys. J., 567:407, 2002 (A)

SOCHTING I K (LANCASHIRE), CLOWES R G (LANCASHIRE), CAMPUSANO L E (CHILE)
Environments of quasars in the context of large scate structure. ASP Conf. series vol. 232: The New Era of Wide Field Astronomy, p.123, 2001 (S)

SOCHTING I K (PRESTON), CLOWES R G (PRESTON), CAMPUSANO L E (CHILE)
Quasar environment in the context of large-scale structure at z approx. 0.3. Mon Not R astr Soc, 331:569, 2002 (S)

SOLORZANO-INARREA C (SHEFFIELD), TADHUNTER C N (SHEFFIELD), BLAND-HAWTHORN J (AAO)
Shocks, illumination cones and intrinsic gas structures in the extreme radio galaxy 3C 265. Mon Not R astr Soc, 331:673, 2002 (O)

SOSA-BRITO R (MPE), TACCONI-GARMAN L E (MPE), LEHNERT M D (MPE)
Integral field near-infrared spectroscopy of a sample of Seyfert and LINER galaxies. I. The data. Astrophys Jnl Suppl, 136:61, 2001 (A)

STAIRS I H (JODRELL), MANCHESTER R N (ATNF), LYNE A G (JODRELL), KASPI V M (MONTREAL), ...CANNON R D (AAO), ET AL
PSR J1740-3052 - a pulsar with a massive companion. Mon Not R astr Soc, 325:979, 2001 Also contains UKST data (A,S)

TAKAMI M (HERTFORDSHIRE), CHRYSOSTOMOU A (HERTFORDSHIRE), BAILEY J (AAO), GLEDHILL T M (HERTFORDSHIRE), ET AL
He I 1.083 micron emission and absorption in DG Tauri: line excitations in the jet, hot wind, and accretion flow. Astrophys. J., 568:L53, 2002 (O)

THOROUGHGOOD T D (SHEFFIELD), DHILLON V S (SHEFFIELD), LITTLEFAIR S P (SHEFFIELD), ET AL
The mass of the white dwarf in the recurrent nova U Scorpii. Mon Not R astr Soc, 327:1323, 2001 (A)

TINNEY C G (AAO), BUTLER R P (CIW), MARCY G W (CALIFORNIA), JONES H R A (LIVERPOOL), ET AL
Two extra-solar planets from the Anglo-Australian Planet Search. Astrophys. J.,571:528, 2002 (A)

TINNEY C G (AAO), McCARTHY C (CIW), JONES H R A (LIVERPOOL), BUTLER R P (CIW), ET AL
Echelle spectroscopy of CaII HK activity in Southern Hemisphere planet search targets. Mon Not R astr Soc, 332:759, 2002 (A)

TSAREVSKY G S (ATNF), PAVLENKO E P (UKRAINE), STATHAKIS R A (AAO), ET AL
A search for new galactic microquasars. ASP Conf. series: The Physics of Cataclysmic Variables and Related Objects, 2001 (O)

TURNER J E H (DURHAM), ALLINGTON-SMITH J (DURHAM), CHAPMAN S (HERZBERG), CONTENT R (DURHAM), DONE C (DURHAM), HAYNES R (DURHAM, AAO), LEE D (DURHAM), MORRIS S (HERZBERG)
The origin of (FeII) emission in NGC 4151. Mon Not R astr Soc, 331:284, 2002 (O)

VEILLEUX S (MARYLAND), CECIL G (NORTH CAROLINA), BLAND-HAWTHORN J (AAO), SHOPBELL P L (CALTECH)
New results from a survey of galactic outflows in nearby active galactic nuclei. Rev MexAA (Serie de Conferencias), 13:222, 2002 (A)

VEILLEUX S (MARYLAND), RUPKE D S (MARYLAND)
Identification of galactic wind candidates using excitation maps: tunable-filter discovery of a shock-excited wind in the galaxy NGC 1482. Astrophys Jnl Letters, 565:L63, 2002 (A)

VENTURI T (BOLOGNA), BARDELLI S (BOLOGNA), ZAMBELLI G (BOLOGNA), ET AL
Radio properties of the Shapley Concentration - IV. The A3528 cluster complex. Mon Not R astr Soc, 324:1131, 2001 (S)

WALKER A J (WOLLONGONG), ZEALEY W J (WOLLONGONG)
Multifibre spectroscopy of the supernova remnant candidate RCW 114. Mon Not R astr Soc, 325:287, 2001 (S)

WALKER A J (WOLLONGONG), ZEALEY W J (WOLLONGONG), PARKER Q A (ROE)
Filamentary shell structures from the AAO/UKST H alpha Survey. Publ Astron Soc Australia, 18:259, 2001 (S)

WALSH A J (MPIR), LEE J K (UNSW), BURTON M G (UNSW)
The massive star-forming region G323.74-0.26. Mon Not R astr Soc, 329:475, 2002 (A)

WATSON F G (AAO)
The enduring legacy of Bernhard Schmidt. 2002 Yearbook of Astronomy (O)

WATSON F G (AAO), BOGATU G (AAO), SAUNDERS W (AAO), FARRELL T J (AAO), RUSSELL K S (AAO), HINGLEY B E (AAO), MIZIARSKI S (AAO), GILLINGHAM P R (AAO), PARKER Q A (ROE), COLLESS M M (MSSSO)
All-sky spectroscopic surveys and 6dF. ASP Conf. series vol. 232: The new era of wide-field astronomy, p.421, 2001 (S)

WILLIGER G M (NASA), CAMPUSANO L E (CHILE), CLOWES R G (LANCASHIRE)
Mg II absorbers toward a large quasar group at z between 1.20 and 1.38. ASP Conf. series vol. 232: The New Era of Wide Field Astronomy, p.114, 2001 (S)

WILLIS J P (CAMBRIDGE), HEWETT P C (CAMBRIDGE), WARREN S J (ICL)

Luminous early-type field galaxies at z approx. 0.4 - I. Observations and redshift catalogue of 581 galaxies. Mon Not R astr Soc, 325:1002, 2001 (A,S)

WOOLF V M (ARMAGH), JEFFERY C S (ARMAGH), POLLACCO D L (ING)
Radial velocity variations of the pulsating subdwarf B star PG 1605+072. Mon Not R astr Soc, 329:497, 2002 (A)

WOUDT P A (CAPE TOWN), KRAAN-KORTEWEG R C (MEXICO)
A catalogue of galaxies behind the southern Milky Way. II. The Crux and Great Attractor regions (l = 289 to 338 degrees). Astronomy & Astrophysics, 380:441, 2001 (S)

YOUNG A J (MARYLAND), WILSON A S (MARYLAND), SHOPBELL P L (CALTECH)
A Chandra X-ray study of NGC 1068 - I. Observations of extended emission. Astrophys. J., 556:6, 2001 (A)

YUSEF-ZADEH F (NORTHWESTERN), STOLOVY S R (CALTECH), BURTON M (UNSW), ET AL
High spectral and spatial resolution observations of shocked molecular hydrogen at the galactic center. Astrophys. J., 560:749, 2001 (A)

ZIEGLER B L (DURHAM), BOWER R G (DURHAM), SMAIL I (DURHAM), DAVIES R L (DURHAM), LEE D (AAO)
The early-type galaxy population in Abell 2218. Mon Not R astr Soc, 325:1571, 2001 (O)

ZURITA A (ING), BECKMAN J E (IAC), ROZAS M (UNAM), RYDER S (AAO)
The origin of the ionization of the diffuse ionized gas in spirals. II. Modelling the distribution of ionizing radiation in NGC 157. Astronomy & Astrophysics, 386:801, 2002 (O)

Popular articles by AAO staff

MALIN D F (AAO)
The Fox Fur Nebula. Sky & Telescope, v.102 no.2, p.52, 2001 (O)

ORCHISTON W (AAO)
Wellington astronomers of the 1840s. Southern Stars, 40(4):5, 2001

ORCHISTON W (AAO)
Joseph Ward: pioneer New Zealand telescope-maker. Southern Stars, v41 no.2, p.13, 2002

SIM H (AAO)
OzPoz takes on the cosmos. Sky & Space, vol.15 no.3, p.24, 2002

WATSON F (AAO)
Reflections...on a stupendous idea. Sky & Space, vol.15 no.1, p.58, 2002

WATSON F G (AAO)
Reflections... on the AAO's new baby. Sky & Space, vol.14 no.4, p.58, 2001

WATSON F G (AAO)
Reflections...on a well-earned award. Sky & Space, vol.14 no.6, p.58, 2001

WATSON F G (AAO)
Reflections...astronomy to the rescue?. Sky & Space, vol.15 no.3, p.58, 2002

Journal abbreviations

A&A	Astronomy & Astrophysics
A&AS	Astronomy & Astrophysics Supplement Series
A&SS	Astronomy and Space Science
AJ	Astronomical Journal
ApJ	Astrophysical Journal
ApJL	Astrophysical Journal Letters
ApJS	Astrophysical Journal Supplement Series
ASP Conf Ser	Astronomical Society of the Pacific, Conference Series
Aust J Astr	Australian Journal of Astronomy
IAJ	Irish Astronomical Journal
JAH^2	Journal of Astronomical History and Heritage
MNRAS	Monthly Notices of the Royal Astronomical Society
PASP	Publications of the Astronomical Society of the Pacific
Publ ASA	Publications of the Astronomical Society of Australia
SPIE Proc	Proceedings of the International Society for Optical Engineering