ATNF News

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First image with the ATCA EW 352/367 configurations

Naomi McClure-Griffiths and the Southern Galactic Plane Survey team

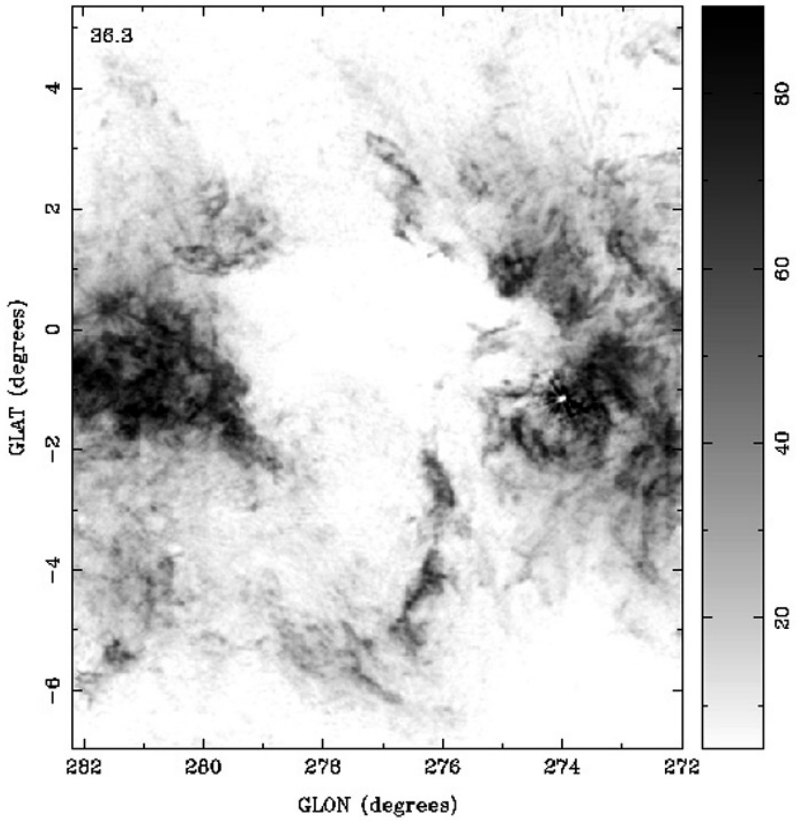

Figure 1: HI image at v=36.3 km/s of Galactic chimney GSH 277+00+36. This image was created from a 1065 pointing mosaic, mainly observed with the EW 352/367 arrays. The greyscale is linear from 5 to 90 K as shown in the wedge on the right.

The pairing of the newly commissioned EW 352 and EW 367 ATCA configurations offer almost complete coverage of all baselines from 31 to 367 m. Users of the ATCA's old 375 m configuration have long been plagued by the even multiples of the fundamental 15.3 m baseline increment, which resulted in more than a few images with a nasty grating lobe near strong sources. To overcome this problem observers needed an additional four arrays, the 750 m arrays, to fill in the inner u-v plane. The new EW 352 and EW 367 arrays provide, for the first time, an almost completely sampled inner u-v plane with only two arrays. The result is a synthesised beam with minimal sidelobes and excellent new images.

In the 2000 September and 2001 January terms we used the new arrays for 21 cm continuum and HI spectral line observations of the Galactic chimney, GSH 277+00+36. Figure 1 is the HI image of the shell at v=36.3 km/s created from these observations. GSH 277+00+36 is a very large chimney approximately 6.5 kpc from the sun in the direction of the Sagittarius-Carina spiral arm (McClure-Griffiths et al. 2000). The chimney is believed to have been formed by hundreds of stellar winds and supernovae which pushed a shock wave through the Galactic HI to create a 600 pc diameter void with dense walls of

Continued on page 15

Editorial

Greetings. Welcome to another packed issue of the ATNF News. Again we have a varied set of contributions this month and hope you enjoy reading through them here or on the web at *http://www.atnf.csiro.au/news/newsletter*. The next issue of the ATNF News will be October 2002, please send any contributions you might have for the upcoming issue to *newsletter@atnf.csiro.au*.

Steven Tingay, Jo Houldsworth and Jessica Chapman
ATNF Newsletter Team
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News items

Vale Professor Robert Hanbury-Brown

Professor Robert Hanbury-Brown, one of the major figures in the development of radio astronomy following the second world war, passed away on 16 January 2002, at the age of 85 years.

Professor Hanbury-Brown worked during the second world war as part of the British and American efforts to develop radar technology, first at the Air Ministry research station at Bawdsey Manor (1935 – 1942) and then seconded to the United States Naval Research Laboratory (1942 – 1947). Following this long period of government work, Hanbury-Brown obtained a fellowship at Manchester University under Sir Bernard Lovell and was integral in the effort to build the Jodrell Bank radio telescope.

After leaving Jodrell Bank, Hanbury-Brown took the chair of astronomy at Sydney University in 1963, working enthusiastically to build a large mirror intensity interferometer of his own design, to measure the angular sizes of stars. Hanbury-Brown's interferometer was built near Narrabri and made ground-breaking measurements until the mid 1970's.

Professor Hanbury-Brown was elected as a Fellow of the Royal Society in 1960, was appointed a Companion of the Order of Australia in 1986, and served as President of the International Astronomical Union for six years. He returned to Britain to live in 1986 and is survived by his wife and family.

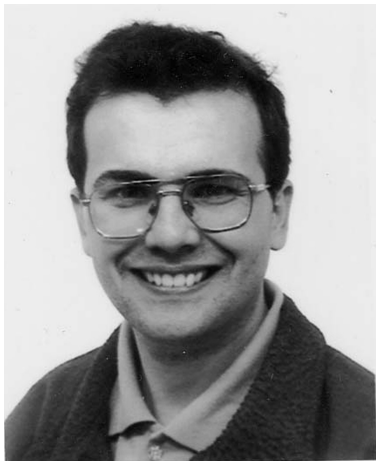
Steven Tingay
(Steven.Tingay@csiro.au)

Three Bolton Fellows appointed to ATNF

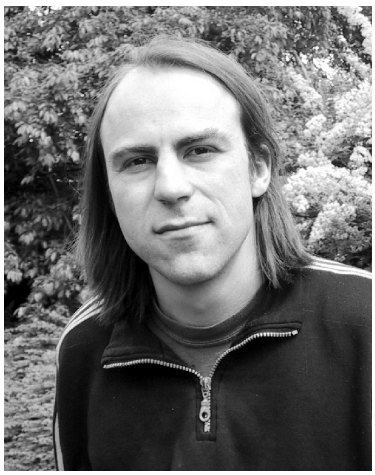
2002 is a bumper year for post-doctoral appointments at the ATNF. We are appointing three new Bolton Fellows and a post-doctoral fellow in observational pulsar astronomy shared with the University of Sydney (not yet finalised). These appointments have been made possible by our inaugural Bolton Fellows, Erwin de Blok and Steven Tingay, and our Joint AAO-ATNF post-doctoral fellow, Lucyna Kedziora-Chudczer, reaching the end of their three-year terms this year, thereby releasing 2.5 positions. The shared position is provided by the CSIRO Post-Doctoral Program as part of a new CSIRO initiative to bring more post-doctoral fellows into CSIRO.

The three new Bolton Fellows are:

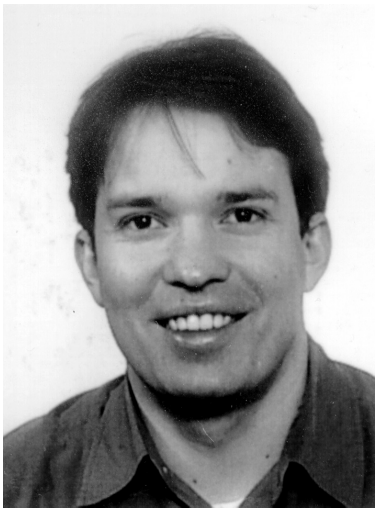
George Hobbs - George is completing a PhD at the University of Manchester, Jodrell Bank Observatory, in pulsar astronomy under the supervision of Andrew Lyne. A major part of his thesis project has been working on aspects of the Parkes Multibeam Pulsar Survey, specifically timing observations of the more northerly discoveries at Jodrell Bank and Parkes. As part of this George has visited Parkes several times for multibeam observing sessions. Prior to commencing his PhD, George completed a MSc with First Class Honours in Physics at the University of Manchester and was the recipient of several University prizes during his undergraduate and graduate career. He is an accomplished musician, having been principal cellist in several orchestras in the Manchester area, and is a keen hiker and cyclist. George will be based at Epping - he and his wife expect to arrive on 13 September. He plans to continue working in the field of pulsar astrophysics, among other things following up on the many discoveries of the Multibeam Pulsar Survey.



Juergen Ott - Juergen is completing a PhD at the University of Bonn under the co-supervision of Uli Klien and Eli Brinks, with a thesis entitled "A Multi-wavelength Study of the Interstellar Medium in Nearby Dwarf Galaxies". As suggested by this title, he has experience in a wide range of observing facilities including the Effelsberg 100-m telescope, the 30-m IRAM telescope, the VLA and OVRO, optical telescopes in Spain and Mexico. He has visited Australia, using the ATCA in 2001. He also has experience in X-ray astronomy, having analysed ROSAT and Chandra data to investigate superwinds in NGC 3077 and M 82. He plans to use the 3-mm facilities of the ATCA and Mopra to investigate the physical conditions in molecular complexes and star-forming regions in the LMC and more distant starburst galaxies and AGNs and will continue his X-ray studies, using Chandra and XMM-Newton data to investigate the composition of interstellar matter in gas-rich galaxies. Juergen also has an interest in music, having been a long-time member of a brass band and several rock groups. He will be based at Epping and plans to arrive on or about 1 October.



Chris Phillips - Chris is well-known to many of us, having completed a PhD at the University of Tasmania under the co-supervision of Ray Norris, studying methanol maser sources using VLBI, mid-IR and mm-wave imaging techniques. During his university career, Chris received a number of awards and prizes, including the University Medal when he graduated with First Class Honours in Physics.



Since completing his PhD in 1998, Chris has been working at the Joint Institute for VLBI in Europe (JIVE) in Dwingeloo, The Netherlands. His main role there was as correlator support scientist, assisting with the commissioning of the EVN MkIV VLBI correlator. With his Bolton Fellowship, Chris has joint responsibilities in the Astrophysics Group and the Electronic Development Group, and will spend approximately 50% of his time in each area. On the astrophysics side, he will continue his investigations into the use of methanol masers as tracers of young massive stars. He also plans to use the mm facilities of the ATCA to study SiO masers, investigating the dynamics of the inner Galaxy. In the Electronics Group he will work on the development of instruments and techniques for radio astronomy applications, especially in the VLBI area. Chris and his wife expect to arrive in Sydney around September 1, and he will be based at Epping.

Dick Manchester
Chair, Senior Staff Rewards and Appointments Committee
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ATNF graduate student program

It is a pleasure to welcome Natasa Vranesevic and Roberto Ricci into the ATNF co-supervision program. Natasa's project is "Galactic Distribution and Evolution of Pulsars". Her supervisors are Don Melrose (University of Sydney) and Dick Manchester (ATNF). Roberto's project is "The High Frequency ATCA Radio Sky Survey". His supervisors are Gianfranco De Zotti (Padua) and Ron Ekers (ATNF).

It is a special pleasure to congratulate David Legge (University of Tasmania) and Sebastian Juraszek (University of Sydney) for having successfully obtained their PhDs. David's thesis is entitled "Accurate Astrometry of Southern Pulsars". Sebastian's is "A Study of Galaxies behind the Milky Way".

Lister Staveley-Smith
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Australia Telescope Users Committee report

The first meeting of the Australia Telescope Users Committee for 2002 was held on 11 – 12 April 2002. There were nine members in attendance and the meeting was chaired by Dr Anne Green. The committee thanked the following departing members: Drs Balasubrahmanyan, Walker, Corbett and Sood, Ms Getts and Mr Mitchell. Dr Green announced she will step down as Committee Chair.

In the Open session on the first day the meeting received status reports from each facility and the AIPS++ project. An additional report, on the Long Baseline Array (VLBI) facility, was given by Tasso Tzioumis. Lister Staveley-Smith reported on the graduate student program.

There was a brief presentation by Vincent McIntyre on the impending changes to the computing environment, when ATNF joins the CSIRO-wide NEXUS authentication domain. The major visible change will be unix account login names. A less obvious change is the final delivery point for electronic mail, which is being moved to Microsoft Exchange servers. Most unix mail clients are able to access them transparently.

During the business session, ATUC gave its support to the draft Strategic Plan outlined by Ray Norris, particularly the criteria for accepting external research and development contracts.

The committee again discussed the match between engineering advances and scientific outcomes from the SKA demonstrator program and undertook to organise a session at the ASA meeting to discuss "SKA Demonstrator Science".

ATUC congratulated the organisers of the very successful Open Day held at Marsfield in late November. Congratulations were also extended to the radio frequency interference (RFI) mitigation group, which is making good progress on reducing RFI at Parkes.

The committee made some recommendations to encourage use of the LBA facility, including some observing support from ATNF at the Ceduna telescope. ATUC also suggested that a full listing of the RPFITS files in the ATCA archive be made available on the web, to streamline the process of requesting archival data.

Vince McIntyre
ATUC Secretary
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ATNF visitors program

It's a pleasure to have the following distinguished visitors at the ATNF: Thijs van der Hulst (Kapteyn) who is with us until 17 July and Russ Taylor (Calgary) until 6 August. Rogier Windhorst (Arizona State) arrives on 26 June and stays until 24 July. All will be giving presentations at the forthcoming annual meeting of the Astronomical Society of Australia. Future confirmed visitors include Bill Imbriale (JPL), John Dickey (Minnesota) and Don Melrose (Sydney) who will each visit the ATNF for approximately six months during the coming year.

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URSI Young Scientist Awards

In April the National Committee for Radio Science (NCRS) announced that Australia is to be represented at the forthcoming General Assembly of the International Union of Radio Science (URSI) by four scientists, as part of the URSI Young Scientists Programme. All four successfully competed in an international field to obtain their Young Scientist Awards, which cover registration, accommodation, and living expense support to attend the General Assembly in Maastricht, the Netherlands, between 18 – 24 August 2002.

The four young scientists are: Mr Aaron P Chippendale (ATNF, Marsfield), Mr Clayton R Locke (University of Western Australia), Ms Melanie Johnston-Hollitt (Adelaide University and recently co-supervised through the ATNF graduate student program), and Dr Steven J Tingay (ATNF, Narrabri). Mr Chippendale, Ms Johnston-Hollitt, and Dr Tingay will attend Commission J at the URSI General Assembly and Mr Locke will attend Commission A.

The Young Scientist Awards were made on the basis of the candidates past research output, academic qualifications, and the paper they would present at the Assembly if successful.

Steven Tingay
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The SEARFE Project – students exploring Australia's radio-frequency environment

The SEARFE Project is a high-school education and Square Kilometre Array outreach project being coordinated by CSIRO ATNF, the School of Physics in the University of Sydney and the Faculty of Engineering in the University of Technology Sydney. Students will have the chance to monitor and analyse the radio spectrum in their local areas and compare their results to other groups of students elsewhere in the country.

The aims of the Project include:

- Providing teachers with material relevant to radio-frequency wave propagation and astronomy units in the senior physics, senior science and engineering studies high-school syllabi;
- Helping students reach a better understanding of the use and value of the radio spectrum for telecommunications;
- Giving students hands-on experience in using radio-science equipment, making measurements and interpreting data;
- Enabling valuable interaction between city and country schools, and giving students experience in use of the Internet to collaborate on a project;
- Helping students gain an appreciation of radio-quietness as a significant natural resource;
- Giving students the satisfaction of contributing to the Square Kilometre Array telescope site search.

At least ten high-schools will be involved in the project in 2002 and 2003 and the experiment is also planned to be run in two University outreach activity centres. There is a waiting list of schools that would like to participate, once we have funds and equipment to enable them to do so.

Each school involved in SEARFE will be supplied with:

- An AOR AR3000A 0.1-2036 MHz radio-frequency scanning receiver;
- An IBM laptop computer for data acquisition and display;
- Java software for spectrum acquisition and display;
- 25 – 1300 MHz discone antenna and all necessary cabling;
- Student Resource and Instruction Kit including operating instructions, experimental notes and background information.

Students will be able to:

- Discover radio-frequencies used in their area and identify the source of some of the signals;
- Monitor variations in signals and learn about radio-frequency propagation;
- Learn about the equipment they are using; for example, through exploring differences with different antennas and different antenna positions;
- Use an Internet-based database and Internet conferencing system to communicate with students in other areas and learn about the differences in use of the radio-frequency spectrum between city and country areas;
- Make a valuable contribution to the knowledge base upon which Australia's bid to host the international SKA telescope will depend.

Over time the SEARFE project will build up a database of radio-frequency usage around Australia. This will be useful for radio astronomy in general, as well as being specifically useful for the SKA site studies.

The SEARFE Project will be launched on 21 June 2002 and we plan to have equipment into the schools involved in July. The Education Research and Development unit of Abbotsleigh School, Wahroonga, is formally assessing educational benefits of the project.

Members of the SEARFE team working on the software and documentation. From left to right: Oliver Mather, Michelle Storey, Betty Jacobs, George "Nyima" Warr and Julienne Harnett.

The SEARFE website is at *http://www.searfe.atnf.csiro.au*. Project documentation will be available on this site and students will be logging questions, comments and results. We welcome feedback on the Project, and if you would like your local area to become involved, please contact Michelle Storey at *michelle.storey@csiro.au*.

People who have contributed to the SEARFE Project so far include:
Duncan Campbell-Wilson (Uni Sydney), Anne Green (Uni Sydney), Peter Hall (ATNF), Julienne Harnett (Uni Technology Sydney), Betty Jacobs (Uni Technology Sydney), Paul Krautil (Pymble Ladies College), Oliver Mather (UNSW/Uni Newcastle), Vince McIntyre (ATNF), Janet Pemberton (Abbotsleigh School), Helen Sim (ATNF), Michelle Storey (CSIRO Publishing/ATNF), George "Nyima" Warr (ATNF), Andrew Wright (ATNF).

Catriona Rafael (left) and Eileen Lee (right) from Abbotsleigh School using the SEARFE equipment

Supporters and sponsors of the SEARFE Project include:

CSIRO ATNF
School of Physics, University of Sydney
Science Foundation for Physics, University of Sydney
Faculty of Engineering, University of Technology Sydney
School of Physics, University of NSW
IBM Australia
BAE Systems Australia
Perth Observatory
Australian Geographic

Michelle Storey, George "Nyima" Warr and Peter Hall
(Michelle.Storey@csiro.au)

The third CSS/GPS workshop, Kerastari, Greece

During 28 – 31 May 2002 a workshop on the topics of compact steep spectrum (CSS) and GHz peaked spectrum (GPS) sources was held in the small Greek village of Kerastari. This workshop was the third in a series on these topics and was supported in part by the ATNF. Over 40 people working in this field attended the workshop, with strong representation from several Australian institutions.

The workshop participants outside the Kerastari village hall, where the workshop was held.

Over the three days of the meeting, invited and contributed talks were given on a diverse range of CSS/GPS topics, including: evolutionary schemes by which the CSS and GPS sources may evolve into large scale FR-I and FR-II type radio galaxies; the different physical mechanisms that may be responsible for the distinctive radio spectra of CSS and GPS sources; the definition and observation of new samples of CSS and GPS sources; the polarimetric and variability properties of CSS and GPS sources; the extension of work at optical wavelengths; and observations in new wavelength regimes such as X-rays. High quality presentations and lively discussions were a feature of the meeting.

Also of note was the location. Kerastari, in the Peloponese, was the childhood home of Dr Tasso Tzioumis of the ATNF, chair of the local organising committee and the driving force behind the meeting. The workshop will be remembered by the participants for the high quality of the science presented, the memorable location, and not least the hospitality and enthusiasm of the villagers of Kerastari. More information on the meeting can be found at *http://www.atnf.csiro.au/people/atzioumi/gps_css/*. The proceedings of the workshop will be published in the Publications of the Astronomical Society of Australia (PASA).

Tasso Tzioumis, showing how it is done.

Steven Tingay
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Symposia and workshops – June 2002 to October 2002

The annual scientific meeting of the Astronomical Society of Australia will be held at Mollymook on the NSW south coast from Monday 1 July to Wednesday 3 July. For more information see *http://www.mso.anu.edu.au/ASA2002*.

This meeting will be preceded by the Harley Wood Winter School, 27 – 30 June, to be held in Batemans Bay. For more information on the HWWS see *http://msowww.anu.edu.au/~hwws2002*.

The IAU 8th Asian-Pacific Regional Meeting will be held in Tokyo between the 2 – 5 July. For more information see *http://www.astro.isas.ac.jp/conference/aprm2002/*.

IAU Symposium 213 Bioastronomy 2002: Life Among the Stars, will be held at Hamilton Island between the 8 – 12 July. For more information see *http://bioastronomy.uws.edu.au*.

A meeting on radio pulsars is being held on the Greek island of Crete between the 26 – 29 of August, to honour the work of Andrew Lyne, CSIROs Dick Manchester, and Joe Taylor. More information can be found at *http://astronomy.swin.edu.au/pulsarconference/*.

Steven Tingay
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Astrofest report

The last astrofest was held at the Marsfield Lecture Theatre on 5 June (see *http://www.atnf.csiro.au/research/astrofest/astrofest-05-June-2002.html*). Short presentations were made by ATNF and visiting astronomers on the subjects of radio galaxies, galaxy interactions, high-energy neutrinos and pulsars. Special thanks to non-ATNF speakers Dr Giovanna Temporin (Innsbruck), Simon Johnston (Sydney) and Dr Fernando Camilo (Columbia). It was also a pleasure to hear the ATNF Director Ron Ekers talk about the science he had been thinking about during his sabbatical in Berkeley, and his plans for future Lunar Cerenkov detectors. Most of the 15 minute talks were on pulsars, as the astrofest also coincided with the 60th birthday of Dick Manchester! Needless to say, there were a few festivities which continued at a local Thai restaurant in the evening. The next astrofest will be a Bolton Symposium, currently scheduled for 11 December 2002.

Dick Manchester celebrating his birthday at the ATNF astrofest.

Lister Staveley-Smith
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Articles

The USNO/ATNF VLBI astrometry and imaging of southern ICRF sources (UVAISIS): A progress report

Introduction

Since the 1980s VLBI observations at two frequencies, 8.4 (X-band) and 2.3 GHz (S-band) have been used to locate the positions of compact radio sources with unprecedented accuracy. The basic observable is the group delay with the use of two frequencies allowing calibration of the frequency-dependent propagation delay in the ionosphere. Observations of selected strong compact extragalactic radio sources, using this now mature technique, have been used to define and maintain a radio reference frame with sub-milli-arcsecond (mas) precision. This International Celestial Reference Frame (ICRF) was adopted by the XXIII IAU General Assembly in 1997 to replace the traditional optical fundamental reference system, the FK5 reference frame. The ICRF defines the axes of the International Celestial Reference System (ICRS) with a precision of approximately 20 micro arcseconds. The Hipparcos catalog is the realization of this frame at optical wavelengths.

Johnston et al. (1988) set out to establish a global reference frame of 400 sources in 1986. The first catalog produced (Ma et al. 1990) had 182 sources with a positional accuracy of 1 mas and all located north of -30 degrees. Subsequent observing campaigns increased the density of sources in the northern hemisphere and added sources in the southern hemisphere (Russell et al. 1994; Reynolds et al. 1994; Johnston et al 1995).

Goals

The UVAISIS project seeks to strengthen the southern hemisphere VLBI astrometric position reference frame. It consists of two distinct but related programs. The first will increase the reference source density and the accuracy of existing sources with additional astrometric VLBI observations. Additionally, it will provide more reference sources for phase referencing VLBI observations.

The second program involves VLBI imaging at 8.4 GHz (X-band) of a complete sample of compact, flat-spectrum sources south of -20 degrees declination, primarily in order to determine the contribution of the intrinsic source structure on measured source positions. The observations will also look for systematic errors in source positions and provide a tie between the northern and southern hemisphere frames through the overlapping sources whose positions have already been measured in the north.

Astrometry

Whereas, in principle, two fixed points can define the reference frame (principal plane, pole and zero point), in practice numerous fixed points are needed to define the reference frame globally as the definition of the axes of the system improves with the number of points used to define them. Also, more reference points are necessary to allow access to the reference system anywhere on the celestial sphere. Compared to the northern hemisphere, the southern hemisphere reference frame is defined by far fewer Class 1 sources i.e. sources with positional weighted rms accuracies of less than one mas.

To increase the accuracy of existing southern source positions we have now made four, 24 hour bandwidth synthesis VLBI observations. A 24 hour experiment duration is necessary to separate the parameters for nutation and polar motion, which have diurnal signatures. The telescopes involved were Parkes and Hobart (Australia), Fortaleza (Brazil), Hartebeesthoek (South Africa), Kashima (Japan) and Kokee Park (USA). The data is being recorded in the standard MkIIIA 2.3/8.4 GHz bandwidth synthesis

mode and is being correlated at the USNO correlator in Washington DC.

To increase the density of southern reference sources we have made short observations of 81 candidate sources during our imaging observations (see below). Suitable candidate sources will be included in upcoming astrometric observations. Further selection and observations of candidate sources is ongoing.

Imaging

Extragalactic radio sources, such as those that define the ICRF, display a variety of structure down to mas scales. Furthermore they are all variable on scales of years to weeks and indeed, in some cases, minutes. This departure from the point source approximation introduces error in the computable variables (delay and rate). The effect of source structure on position can be as large as tens of mas (e.g. Fey and Charlot, 1997). Also, as the structure of these sources varies with time, it is important to image their structure at several epochs in order to define a time-dependent source model. Multi-epoch observations, using the VLBA, to image northern hemisphere sources at 8.4 GHz have been progressing successfully for a few years.

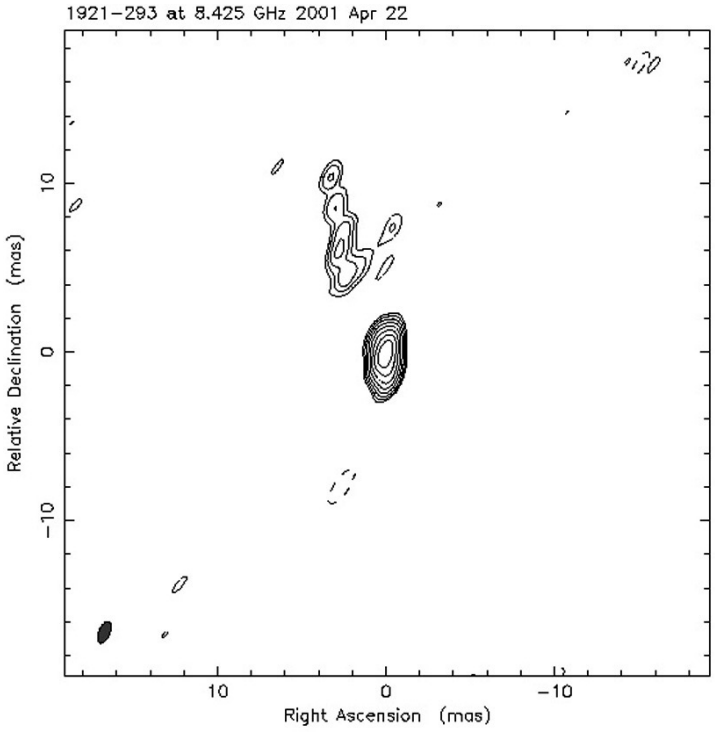
We have now completed one epoch of observations of 184 southern ICRF radio sources at 8.4 GHz. These observations, made in full polarimetric mode (two telescopes, Hobart and Kokee Park record only one polarization), have been distributed over nine, 24 hour observations. The telescopes involved are Parkes, ATCA, Mopra, Hobart, Ceduna (Australia), Hartbeesthoek (South Africa) and Kokee Park (USA).

The data are recorded in the S2 format. Modifications to the LBA correlator, located at Marsfield, now allow routine handling of up to seven antennas in full polarization mode. All the observed data have now been successfully correlated. Calibration is being done using standard techniques and using the National Radio Astronomy Observatory (NRAO) AIPS package while imaging is being done using the Caltech Difmap package. Images obtained so far look good though some sources may need additional time, mostly to get better uv-coverage.

Apart from yielding source structure information for astrometric purposes, these are often the first VLBI images of the flat-spectrum, extragalactic sources that constitute the sample. Thus we expect this project to provide valuable new information on the physics of these objects.

Conclusion

Both the astrometric and imaging components of the UVAYSIS program are progressing well. New sources are being selected and added to increase the density of the southern astrometric reference frame. The first set of observations for imaging all the existing southern reference sources are complete and calibration and imaging of the data is in progress. Information from these images is being used to optimise the next round of observations. We expect to be able to observe all sources at least twice and perhaps three times over the five year life of the project.



An image from the imaging program, PKS 1921-293.

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Roopesh Ojha, on behalf of the USNO/ ATNF VLBI Astrometry and Imaging team (Roopesh.Ojha@csiro.au)

The flowering of Fleurs: an interesting interlude in Australian radio astronomy

Introduction

Fleurs is situated about 40 km west-south-west of central Sydney near Badgery's Creek, and occupies an expanse of flat land between South Creek and Kemps Creek adjacent to a disused WWII air strip. Between 1954 and 1963, Fleurs was the leading field station of the CSIRO's Division of Radiophysics, and was home to three innovative cross-type radio telescopes, the Mills Cross, Shain Cross and the Chris Cross (Figure 1), all of which played important roles in furthering international radio astronomy (Robertson, 1992). This article discusses these radio telescopes, and the research that was carried out at the Fleurs field station.

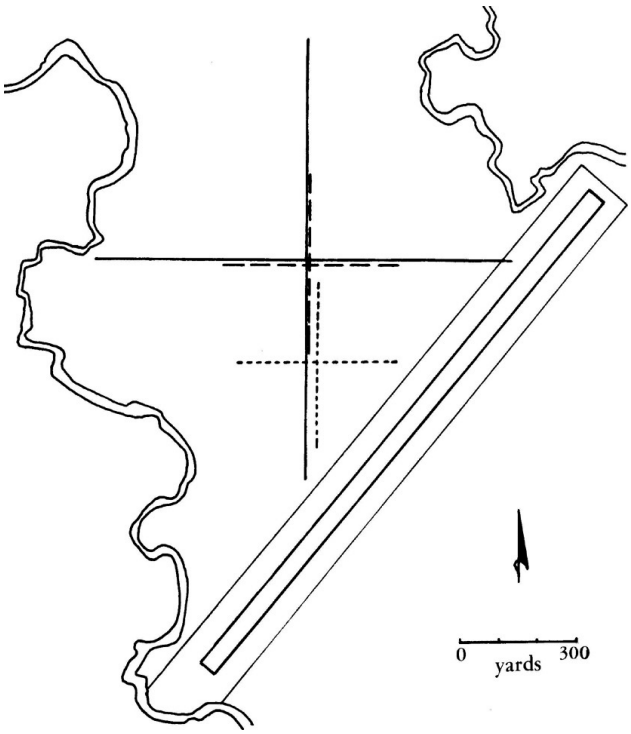

Figure 1: The Fleurs field station, showing the old air strip between Kemps Creek (on the east) and South Creek. The Mills Cross is indicated by dashes, the much larger Shain Cross by solid lines, and the Chris Cross by dots

The Mills Cross

The field station was founded in 1954 in order to erect an innovative new type of radio telescope first tested at the Potts Hill field station in 1953. The Mills Cross was the brain-child of Bernie Mills, and boasted narrow N-S and E-W arrays of dipoles about 450 m long arranged in a cross configuration (Figure 2). Mills et al. (1958: 67) describe how each array "… consists of two rows of 250 half-wave dipole elements backed by a plane wire mesh reflector; the individual dipoles are aligned in an E-W direction." The cross operated at a frequency of 85.5 MHz, giving a 49 arcminute beam – which in those days was regarded as remarkable. Although the cross was effectively a transit instrument in that neither arm was steerable, by altering the phasing of the dipoles in the N-S arm it was possible to observe different declination strips across the celestial sphere.

Between 1954 and 1957, Bernie Mills, Eric Hill and Bruce Slee used the Mills Cross to carry out a detailed survey of the sky and recorded more than 2,000 sources of discrete radio emission, publishing their results in a series of research papers in the *Australian Journal of Physics* (the so-called MSH Catalogue). Although a number of these sources were associated with galactic objects, the majority were extragalactic, producing one of the most notable outcomes of this survey: when the numbers of sources plotted against their flux densities (the co-called log N – log S curve) were compared with those derived during the Cambridge C2 survey they were found to differ markedly. Because of the profound cosmological implications of these statistics a heated controversy erupted (see Mills, 1984 for a summary), and it took some years before problems associated with the Cambridge survey were recognised and the Sydney results were fully accepted.

The late 1950s were a time of considerable upheaval at Radiophysics as different senior staff members vied for the right to construct large new radio telescopes, and Mills was one of those who suffered when the Parkes Radio Telescope and Culgoora Radioheliograph

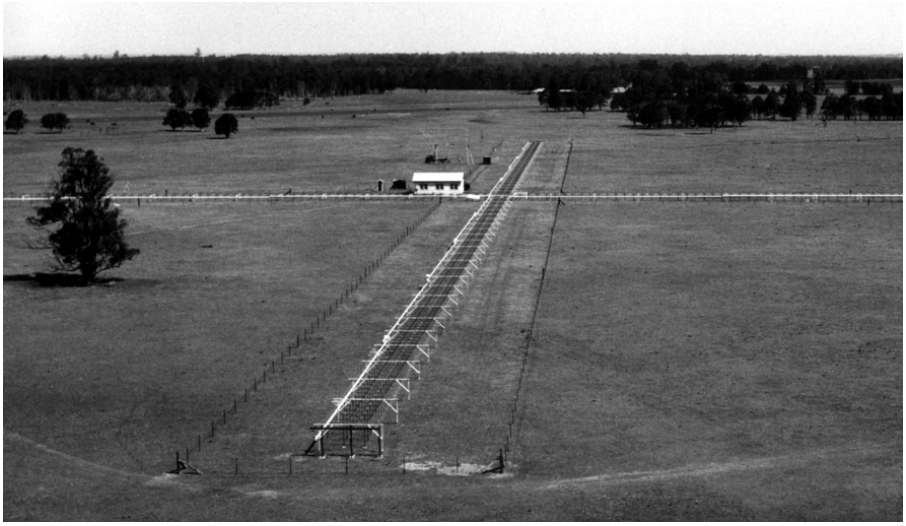

Figure 2: View looking south showing the N-S arm and most of the E-W arm of the Mills Cross, with the receiver hut at the centre of the array (ATNF Historic Photographic Archive: 3476-3).

were given priority. As a result, in 1960 he moved to a new Chair at the University of Sydney, which provided him with the opportunity to build a new and very much larger cross-type telescope, and in just a few short years the Molonglo Synthesis Telescope, near Canberra, became a reality.

But this staffing change at Fleurs and the fact that the all-sky survey had been completed did not quite spell the end of the Mills Cross, for in 1961 – 1962 Bruce Slee and visiting Cambridge radio astronomer, Peter Sheuer, used the E-W arm of this radio telescope in conjunction with barley-sugar arrays erected temporarily at a number of sites around Sydney to carry out an interferometric sky survey of the MSH sources. Their aim was to determine the sizes of these sources, but unfortunately the observational data returned to England with Sheuer at the end of his term in Sydney and few results of this investigation were ever published.

The Shain Cross

Two years after the Mills Cross was operational, the larger low frequency Shain Cross was completed (Shain, 1958). This new cross was built alongside the Mills Cross, operated at a frequency of 19.7 MHz, and had a beam width of 1.4 degrees. Although it had N-S and E-W arms of 1105 m and 1036 m respectively, the construction of this particular cross was much simpler than its Mills predecessor in that it comprised a series of dipoles strung between what look like telegraph poles (Figure 3), with the ground itself serving as a reflector.

Yet this apparent simplicity was deceptive for the Shain Cross worked perfectly, and Alex Shain (after whom it was named) was able to carry out a survey of the galactic plane (where some HII regions were seen in absorption) and monitor decametric burst emission from Jupiter.

Several years after Shain's untimely death in 1960 at the age of just 38, Bruce Slee and Charlie Higgins used a small 19.7 MHz array at Fleurs in conjunction with temporary 19.7 MHz antennas erected at a number of distant sites (with spacings up to 200 km) in order to investigate Jovian bursts. Through this interferometry, they were able to place an upper limit of 10 arcseconds on the size of the emission region, and investigate the radio scattering in the outer solar corona.

Figure 3: The 'power poles' mark part of the N-S arm of the Shain Cross, and behind it are first the Mills Cross and then the Chris Cross (ATNF Historic Photographic Archive: 5192-9).

Figure 4: The centre of the Chris Cross array showing the southern part of the N-S arm, and one of the E-W arm dishes (ATNF Historic Photographic Archive: 9097-12).

The Chris Cross

Fleurs gained its third large radio telescope in 1957 when a major new solar array, the Chris Cross, was completed. The brain-child of Dr W N Christiansen, this comprised 378-m N-S and E-W arms each containing 32 parabolic dishes 5.8 m in diameter (Figure 4). These dishes were constructed of wire mesh suitable for operation at 1420 MHz, and were equatorially-mounted in order to be able to track the Sun. The Chris Cross was the first radio telescope to generate daily two-dimensional high-resolution radio pictures of the Sun. In addition, the array has been used to investigate major solar bursts and solar microwave transients (see Christiansen and Mullaly, 1963).

A major development occurred at Fleurs in 1959 when an 18-m prefabricated American parabola was installed at the eastern end of the Chris Cross. By using this new antenna in combination with the dishes of the E-W arm of the Chris Cross the Division's scientists were able to access a compound interferometer that could be used at night for non-solar radio astronomy (see Labrum et al., 1963). Operating at 1420 MHz, and with a 1.5 arc-minute fan beam, this new array was used for a high-resolution survey of selected southern sources.

Emergence of the Fleurs Synthesis Telescope

In 1963 the 18-m antenna was transferred to Parkes to be used in conjunction with the 64-m radio telescope, and by this time the research programs carried out with Mills and Shain Crosses had come to an end and Fleurs was no longer required as a field station. It had served its purpose, and the Division's focus shifted to Parkes and later to Culgoora.

Yet this did not spell the end for Fleurs. Instead, the field station and the three cross-type radio telescopes were handed over to School of Electrical Engineering at the University of Sydney, led by Professor Christiansen (who in 1960 had also left Radiophysics). Christiansen and his team (which included other ex-Radiophysics staff) then developed the Chris Cross by installing six 13.7-m stand-alone antennas at and beyond the ends of the N-S and E-W solar arrays. The resulting Fleurs Synthesis Telescope (Figure 5) had a resolving power of 20 arc seconds, and during the 1970s and 80s was used to study individual radio sources, but particularly large radio galaxies, supernova remnants and emission nebulae (e.g. see Bunton et al., 1985).

In addition to this major development, another staff member from the School of Electrical Engineering refurbished the E-W arm of the Shain Cross, and he and a graduate student used it in conjunction with two small arrays spaced in the N-S direction to carry out a sky survey at 29.9 MHz (see Finlay and Jones, 1972). This provided the first decametric flux densities for many southern sources.

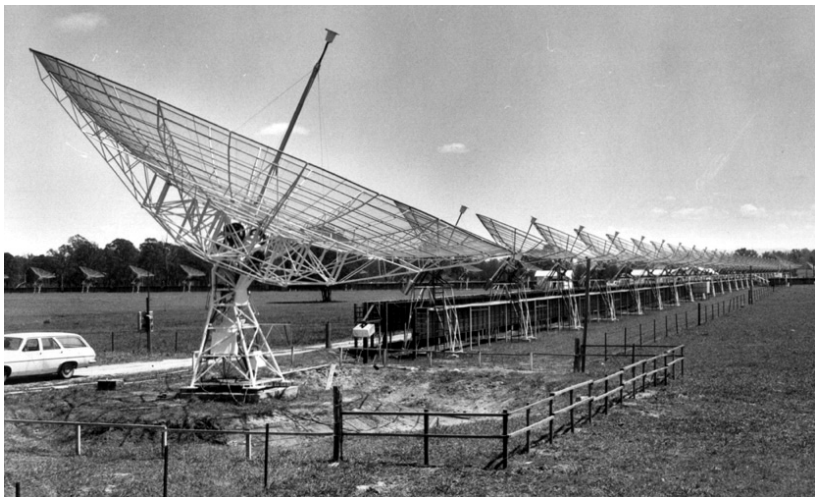

Figure 5: View of part of the Fleurs Synthesis Telescope, showing one of the 13.7m antennas and a section of the E-W arm of the Chris Cross (ATNF Historic Photographic Archive: 9097-11).

Concluding remarks

During the ten-year interval, 1954 – 1963, Fleurs was one of the world's leading radio astronomy field stations, and it played an important role in furthering solar and non-solar radio astronomy. Taffy Bowen (1984: 97) would go so far as to claim that the three Fleurs cross-type radio telescopes "… were among the great successes of the 1950's and were responsible for a large part of the Division's research output over that period." They consolidated the international standing of Christiansen and Mills, helped to build the emerging reputations of people like Shain, Sheridan and Slee, and served as stepping stones to the Division's next major advances in instrumentation: the 64-m Parkes Radio Telescope and the Culgoora Radioheliograph. Through these radio telescopes Australia was able to maintain its place at the forefront of international radio astronomy.

After the Division of Radiophysics relinquished Fleurs, the field station was taken over and developed further by the School of Engineering at the University of Sydney, and for more than a decade this site continued to make a valuable contribution to international astronomy.

After the Fleurs Synthesis Telescope was closed in 1988, the site passed to the Engineering Faculty at the University of Western Sydney and for some years was used as a teaching facility. During this period the Mills and Shain Crosses rapidly deteriorated and the Chris Cross dishes and larger antennas of the Fleurs Synthesis Telescope continued to rust. Today, all that remains of the three historic radio telescopes of the 1950s are the twelve centrally-located Chris Cross aerials, which in 1991 were cleaned and painted. The site also features a small reconstructed section of the Mills Cross N-S arm, plus the rusting remains of the six 13.7-m Fleurs Synthesis Telescope dishes.

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First image with the EW 352/367 configurations

Continued from page 1

piled-up HI, called an HI shell. As seen in Figure 1, the top and bottom of the shell are open. We believe that as the shell size exceeded the scale height of the HI disk, the top and bottom became dynamically unstable causing the shell to break and vent to the halo via the narrow vertical channels seen in the image. GSH 277+00+46 is one of only a handful of chimneys in the Milky Way and the only chimney known to have broken out of both sides of any galactic disk.

The approximately 100 square degree field observed with EW 352/367 contained 960 pointings. These data were combined with an additional 105 pointings from the Southern Galactic Plane Survey (SGPS). The 960 new pointings were observed in eight 60 second snapshots, four with the EW 352 and four with the EW 367. The deconvolved ATCA image was combined with an image from the Parkes multibeam for sensitivity to angular scales ranging from 3 arcminutes to 10 degrees. The improved resolution of new ATCA mosaic will allow us to explore the small scale structure of the shell and chimney walls. We hope the data will ultimately help us to understand the physics of chimney formation.

Naomi McClure-Griffiths and the SGPS team.
(Naomi.McClure-Griffiths@csiro.au)

Square Kilometre Array program

The last few months have been enormously productive for the SKA group in that many previously loose concepts have been consolidated into comprehensive reports for the international Engineering and Management Team (EMT). Two concept outlines, giving "end-to-end" telescope descriptions, have been submitted under the auspices of the Australian SKA Consortium Committee. These documents, dealing with the Luneburg lens and the cylindrical reflector "strawmen" proposals, will be available shortly via the web (www.skatelescope.org). They, and other concept descriptions, will be discussed at the Groningen SKA meeting in August. A first-round review will be made and recommendations formulated for continuing, and possibly joint international, development projects.

While the bulk of the activity has been directed to the concept descriptions, virtually all of the thinking involved will be applied to the design of SKA demonstrators, including the CSIRO New Technology Demonstrator to be constructed in the MNRF2001 program. Armed with new insights into key areas of antenna, RF, signal transmission and signal processing engineering - as well as more thoughts on matching science and engineering - we will shortly produce a much more detailed demonstrator outline.

In technical developments, we have taken delivery of a 64-element Vivaldi slot phased array antenna; this will be tested and used in conjunction with the prototype 0.9-m Luneburg lens. This work is a collaboration between ASTRON (Netherlands), CTIP and ATNF. The design of a first-round low-noise amplifier MMIC has also been finalised. This is a GaAs device covering the range <1.5 GHz – 5 GHz and will be available for testing late this year. With much expertise now established, continuing devlopment in this area includes a wideband SiGe device.

In other work, the SEARFE outreach project is progressing well and is described elsewhere in this issue. A number of SKA briefings have been held for Commonwealth Government departments and states' agencies. These meetings have concerned technology and other spin-off possibilities, together with the requirements for site testing and SKA hosting. With the retirement of Bruce Thomas, new arrangements for managing the CSIRO site project are being implemented and, in closing this report, I would like to record my thanks to Bruce for his invaluable contribution to the SKA community over the past few years. We all wish him a happy retirement.

Peter Hall
SKA Program Leader
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Australia Telescope Compact Array report

Staff

It has been a busy time farewelling old and welcoming new staff members. After being with the ATNF for four years, Scott Cunningham and Vivian Wheaton have left to spend time travelling and exploring new opportunities. Martin Oestreich, who has spent nine years in the ATNF electronics groups in Marsfield and Narrabri, has left to take on a new role at the AAT at Siding Springs. Alison Ryan has finished up after completing her apprenticeship at the ATCA in January. Right up to her final hours, Alison was down in the cable pits and ditches working hard to finish her fibre optic work. After 16 years with the ATNF, Trina Gordon has left to take on other work in the Narrabri region. We wish Trina the best with her new path. Jacqui Wieringa has gone on maternity leave until 2003.

Fresh from the South Pole, we welcome back Ben Reddall, who has taken over Martin Oestreich's role as Electronics Group Leader. While Jacqui Wieringa is on leave, we are pleased to have Judy Stump keeping the library up to its usual standard. We also welcome Debbie Rowe-McDonald and Eric Darcey. Debbie has joined us as a cleaner and Lodge assistant, while Eric will work on the antenna drives and other power control systems.

We currently have three vacancies in the electronics group, which we expect to fill imminently. A systems scientist position is also currently being advertised.

Operations

Array usage

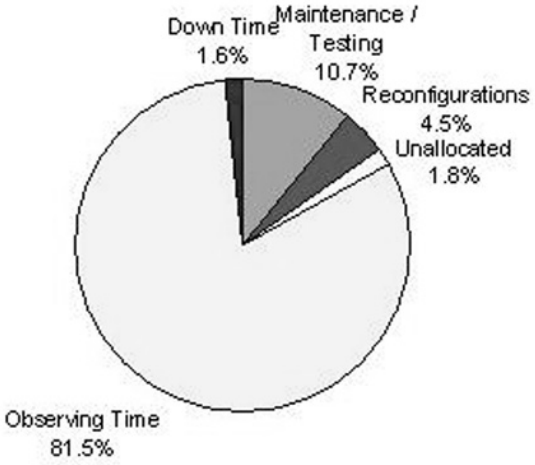

Figure 1: ATCA 2002JANT Usage

Figure 1 gives the usage of the compact array for the 2002 January term.

The weather was kind to us this term. The Antenna Control Computers remain our main source of equipment failure. Also during the term, one antenna was down for three days with problems in the drive electronics.

Millimetre observing

Millimetre observing during January (summer!) term was restricted to four 12-mm proposals (one of which experienced rain) and various tests. More serious millimetre observing began in late May, with 3-mm observations of the Galactic Centre. There has been a healthy request for millimetre observing during May term, with 78% and 22% of time scheduled to centimetre (3-20cm) and millimetre (3, 12 mm) observing proposals, respectively. The arrays scheduled during the May term consist of 6A, EW352, EW214, 1.5B, 750B, H75 and 6C. This is the first time that EW214 and H75 will been scheduled, and the first astronomical use of the north spur. As mentioned in the previous newsletter, we will be trialing a form of flexible scheduling in May term which allows millimetre observers to swap their allocated slot with a partnering centimetre observer. This trial will continue into mid-October, when we will revert back to standard fixed scheduling for the summer months.

Observers questionnaires

The observers questionnaire is now on-line. All ATCA users are encouraged to complete this. To help keep statistics on the extra requirements at millimetre wavelengths, there is an additional millimetre questionnaire. Users of the millimetre systems are strongly encouraged to complete an on-line questionnaire. The questionnaires are linked from *http://www.narrabri.atnf.csiro.au/feedback*

Building work

We are about to start a parcel of work on the buildings at the ATCA. This will include revamping the reception area in the Control Building, refitting the men's bathroom at the Lodge, and extending the Receiver Lab building to make space for the new staff arrivals. There are

numerous other smaller jobs. We will attempt to minimise any disruptions to observing and Lodge perations.

ATCA upgrade

Antenna control computers

We reached a milestone in March 2002, when interferometric fringes were produced when controlling the antennas with the new antenna control computers (ACCs). Work on debugging and integrating them with the on-line system continues. We plan to use the new ACCs for astronomical observations in mid-July, and aim to switch across to using the new ACCs permanently in early August.

Antenna structure

A photogrammetric survey of antenna 2 has proven to be a treasure trove of information. Unlike holography from a geostationary satellite, the photogrammetry can be done with the antennas at any elevation. It also decouples the deformation of the main subreflector from flexing of the quadrapod structure and lateral and rotational sags of the subreflector. The main purpose of the survey is to understand beamshapes and changes in antenna efficiency at 3-mm wavelength, as a function of elevation. An important question is whether enhanced control of the subreflector can allow us to compensate for the various distortions, and so improve beamshape and regain some lost efficiency.

Receivers

Recently, a mechanism to measure the system temperature (by periodically flipping a room temperature paddle in front of the 3-mm horn) has been implemented in the on-line system. This provides a nominal above-atmosphere value of the system temperature for calibration purposes.

Signal distribution

Good, steady, progress continues with the new signal distribution system. Fibre connections have been completed to all station posts, and the fibre patch panel in the screened room is finished. Ethernet connections are now available to all antennas. The array now runs completely on the new fibre-based local oscillator (LO) distribution system. With the exception of antenna 3, the IF returns on all antennas are now on the new single-mode fibre. Work on antenna 3 will be completed in the near future. The new LO system uses two LO signals to each antenna – one at 160 MHz and another in the 13 GHz range. Integrating the 13 GHz round trip phase measurement system into the on-line software needs to be completed.

Mopra

During January term, usage at Mopra was restricted to LBA and VSOP observations. During the May term, millimetre observations at Mopra will be jointly run by the ATNF and UNSW, with each allocated six weeks of observing time. Lucyna Kedziora-Chudczer (for UNSW) will act as a "friend of the telescope" during the observing period. Additionally AAO has agreed to provide some engineering support at Mopra during the term. These arrangements should provide good support and more timely attention to any system problems. The ATNF-supported observations have been allocated through the normal time assignment process. Mopra will also continue to be used for LBA and some VSOP observations during the June term.

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Parkes Observatory report

Staff

After advertisement of the Parkes Deputy Officer-in-Charge position, Lewis Ball has accepted an indefinite appointment. In addition to duties at Parkes, Lewis will have a major role in strategic Human Resources for the ATNF as a whole.

Karin Unger has joined the casual staff who keep the Visitors Centre ticking over.

Urumqi receiver shipped

Mr Sun Zheng-Wen and Mr Wang Wei Xia, engineers from the Urumqi Astronomical Observatory in China, have returned home with a new cryogenic L-band (18-cm) receiver built at the ATNF. Sun and Wang have spent almost a year living and working at Parkes building the receiver, with the tireless assistance of Martin McColl. Jon Crocker has also played a major role in the process, completing the metal fabrication and machining at the very high standard required. Many other also contributed to this very successful project, particularly Graeme "Herbie" Gay of Marsfield who made key contributions in the design of the receiver and with logistics.

The new receiver is the first cryogenic receiver to be installed on the 25-metre Urumqi telecope, and replaces the existing room-temperature L-band receiver.

Martin will travel to Urumqi later this month to assist in the installation of the new receiver, which arrived safely (we hope!) in China in mid-June. Dick Manchester, whose close scientific ties with Chinese astronomers were instrumental in setting up the contract, will also travel to Urumqi to help set up the observing system which will be used primarily for studying pulsars.

Sun and Wong became part of the Observatory "family" over their extended visit and leave behind many friends and happy memories. We eagerly await news of their repatriation when Martin returns!

Eclipsing millisecond pulsar discovered

The combination of observations with the Parkes Telescope and with the Hubble Space Telescope has revealed a millisecond pulsar J1740-5340 which is periodically obscured by a red companion star.

Nichi D'Amico and Andrea Possenti from the Astronomical Observatory of Bologna targeted 96 'globular clusters' - tightly packed balls of stars on the edge of our Galaxy that are known breeding grounds for millisecond pulsars. J1740-5340 was found in a globular cluster called NGC 6397. The pulsar is hidden by its companion star for about half of each 1.35 day orbit.

Francesco Ferraro and collaborators from the Astronomical Observatory of Bologna hunted through archival data from the Hubble Space Telescope and the European Southern Observatory and identified an unusually red star at the pulsar position. The shape and brightness of the star fluctuate in step with the pulsar's orbit because of the distortion of the star by the gravitational effects of the pulsar.

The pulsar is apparently dragging material from its red companion, and this discovery of the first such system may shed new light on models for the evolution of millisecond pulsars.

For more information , look at the News from Parkes links on *http://www.parkes.atnf.csiro.au/visitor_info/visitor_info.html*.

Parkes Multibeam Pulsar Survey completed!

The long-running Parkes Multibeam Pulsar Survey, a major survey of the Galactic plane using the 20-cm Multibeam receiver and dedicated pulsar filterbanks, was completed on 14 March 2002. Michael Kramer (Jodrell Bank), Paulo Freire (Arecibo) and Dion Lewis (U.Tas./ATNF) were the observers for the final pointing, representing a team of a dozen or so pulsar observers for whom the Parkes quarters have become a second home.

Observing for this survey, a collaboration between Jodrell Bank, ATNF and the University of Bologna, commenced in 1997 and has been one of the Observatory's principal research activities in the intervening 5 years.

The success of the survey has exceeded all expectations, with more than 600 new pulsars already found and another 100 or so expected to be revealed when the data are reprocessed. The survey will then have roughly doubled the number of pulsars known, with around two thirds of all known pulsars having been discovered with the Parkes telescope.

The Parkes Multbeam Pulsar Survey has its own Web page at *http://www.atnf.csiro.au/research/pulsar/pmsurv/*.

Pulsar workshop

Lewis Ball and Simon Johnston hosted a two-day Pulsar Science workshop at Turner's Vineyard, Orange, in March. Many of the most exciting recent developments in observational and theoretical pulsar research were presented. The meeting was funded by a grant under the International Researcher Exchange (IREX) scheme to fund collaborative pulsar research between Australia and Germany, and was attended by around 30 pulsar astronomers, including all but one of those on the grant. A number of attendees took the opportunity to visit the Observatory after the meeting.

Operations news

Operations continue to run smoothly with no major problems. Lost observing time remains dominated by high winds, accounting for 4.5% of total time for the year to date. Time lost to equipment faults is currently 1.2% over this period.

We experienced a minor Easter Miracle when beam 8B of the 21cm Multibeam receiver was found to have returned to life. The first stage LNA of beam 8B had died during routine cryogenic maintenance in November 2001. After similar maintenance in June 2002 beam 8B is still alive and well, but failures of the LNAs in two other channels in the outer beams have now occurred (10A is currently unusable and 12B is about 10K higher than normal). This establishes a trend of failures resulting from the thermal cycling associated with essential six-monthly maintenance, and options for future removal and refurbishment of the receiver are now being actively considered.

The pulsar filterbank is exhibiting unexpected noise levels around 1 – 3 Hz in 512 channel mode. This has had a negative impact on deep searches for slow pulsars. The cause appears to be related to power supply problems - investigations are continuing.

Operational developments

A contract for the use of the Parkes telescope by NASA for tracking spacecraft associated with a traffic jam on Mars in late 2003 and early 2004 is expected to be signed in the next few weeks. The contract will involve an upgrade of the telescope surface, with around 1000 square metres of the galvanised wire mesh to be replaced by perforated aluminium panels. The panels will be fitted around May 2003, taking the diameter of the perforated surface from 44 metres to 54 metres. A considerably upgraded X-band (8 GHz) receiver will also be built as part of the contract. While the details of the schedule are yet to be decided, it is likely that the telescope will be involved in tracking for around 10 hours per day between September 2003 and March 2004

New zenith drive gears and pinions have been manufactured in Brisbane and Perth and are about to be shipped to the Observatory. A major shutdown of around six weeks is planned in September 2002 to allow the installation of the new gears and the refurbishment of the teeth on the zenith racks.

The new pulsar Wide Band Correlator was installed in the tower on 25 March. Commissioning work revealed some hardware and firmware problems that have so far resisted the herculean efforts of Warwick Wilson, Evan Davis and other members of the electronics group. The next attempt to install the WBC is expected to occur at the end of the September shutdown.

The new 10/50 cm pulsar receiver is taking on impressive proportions. A test of the logistics of the installation of this substantial package will take place towards the end of 2002, with the receiver expected to be usable around the end of the January 2003 observing term.

Outreach

The number of public visitors to the Visitor Centre continues to climb, delighting (and exhausting) the staff whose role is at the pointy end of satisfying public interest. Numbers for the first three months of 2002

indicate a further increase of around 30% over the same period in 2001, pointing towards an astonishing total over 150,000 visitors for 2002 if the trend continues. New point of sale software has been installed to help cope with the sales of products and tickets to the AV shows and is working very smoothly.

Media interets in the Dish also continues unabated. The Parkes role in the Apollo 11 mission featured in a recent episode of ABC TV's *Dimensions in Time* program, and the imminent release of the movie *The Dish* in Japan is prompting a number of requests from film crews for visits to the telescope and interviews with both current staff and old timers.

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Officer-in-Charge
and Lewis Ball
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Time assignment information

ATCA information

The interim 3- and 12-mm systems on three antennas continue to be offered. Given that these systems are still immature, proposals for these must include an ATNF staff member, who is expected to be conversant with the millimetre systems. The millimetre bands remain divided into two sub-bands (16.1 – 18.9 and 20.1 – 22.5 GHz at 12 mm, and 84.9 – 87.3 and 88.5 – 91.3 GHz at 3 mm) with a physical swap of hardware in the antenna vertex room needed to switch between the sub-bands.

Array	Years and Terms									
	2002	2003			2004			2005		
	3	1	2	3	1	2	3	1	2	3
6.0A	●	●		●		●		●		●
6.0B		●			●				●	
6.0C	●						●			
6.0D			●					●		
1.5A	●				●				●	
1.5B		●				●				●
1.5C			●				●			
1.5D				●				●		
750A	●				●				●	
750B				●				●		
750C			●				●			
750D		●				●				●
EW367	●		●							
EW352		●		●						
EW214			●							
H214				●						
H168	●									
H75										
NS214										
122B										

Table 1. Proposed array configurations for the next few years.

In 2002SEPT the new configuration H168 (using the north spur) is being offered for the first time. This is in addition to the 6.0A, 1.5A, 750A and the new EW367 configurations. The term will also start with the 6C array. Observers are invited to propose projects using any of these configurations. Proposals are solicited to use the interim 12-mm and 3-mm systems available on three of the ATCA telescopes. For this term the millimetre systems are provided on a shared risk basis, and proposals must include an ATNF staff collaborator. The staff member is expected to understand the use and capabilities of the mm systems. To help optimize Fourier coverage with three antennas, antennas will be "shuffled" in the EW367 configuration.

Table 1 gives the proposed array configurations being offered over the coming years. The details of this are different to a proposal presented at the last ATUC meeting, although the principles behind them remain unchanged. The change from the ATUC meeting is the result of an error in meshing

the previously advertised configurations with future configurations. As millimetre usage is going to change the array usage patterns, we have yet to determine compact configurations beyond 2003.

Apart from VLBI and VSOP use, there is unlikely to be any scheduled Mopra time in the September term. The next call for proposals for Mopra will be in February 2003.

Availability of Tidbinbilla 70-m telescope for spectroscopy

As part of the Host Country agreement with NASA, a fraction of time on the Tidbinbilla 70-m antenna is allocated to the Australian astronomical community. In the past this time has been used mainly for VLBI observations but not all of it has been utilised, either because it did not coincide with the availability of other LBA antennas or because the period of the allocation was too short to provide useful (u,v) coverage. It is this time together with surplus time allocated to NASA spectroscopy projects that is being made available for domestic spectroscopy use in a service observing mode. The amount of time available for spectroscopy is likely to be about 100 hours per year in 4 to 6 hour allocations. Proposals are likely to be accepted for the 2003 JANT term.

Tidbinbilla is equipped with a ATNF Multibeam correlator block capable of two polarisation products of up to 2048 channels each with 32 or 64 MHz bandwidth, or up to four polarisation products with a total of 8192 channels (e.g. 2 x 4096 chans) and bandwidths ranging from 62 kHz to 16 MHz. The 70-m antenna is equipped with 1, 3, 13 and 18-cm bands. The 1-cm band covers frequencies from 18.5 to 26 GHz and is the most sensitive antenna in the southern hemisphere in this band (~1.7 Jy/K at 22 GHz).

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ATNF publications list

Publications lists for papers which include ATNF data are available on the web at: *http://www.atnf.csiro.au/research/publications*. Please email any corrections or additions to Christine van der Leeuw *(Christine.vanderleeuw@csiro.au)*.

This list includes published refereed articles and conference papers, including ATNF data, compiled since the February 2002 newsletter. Papers which include one or more ATNF staff are indicated by an asterisk.

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