

This is one of a series of Newsletters to keep interested parties informed about the progress of activities in Australasia related to the SKA radio telescope project. Previous newsletters are available from ► [www.ska.gov.au](http://www.ska.gov.au)

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*ASKAP Theme Leader Dave DeBoer with prototype receiver for the Parkes testbed focal plane array (Photo Credit: Chris Walsh, Patrick Jones Photo Studio).*

## Editorial

Over the past few months a significant milestone in delivering the Australian SKA Pathfinder (ASKAP) was reached with the awarding of a contract for the design and supply of thirty-six 12 m antennas. In addition to this achievement was the release of the call for Expressions of Interest to be involved in designing and implementing an initial set of Survey Science Projects for ASKAP. The Murchison Widefield Array (MRA) project has also been making rapid progress, with 32 "tiles" now deployed at the Early Research Area in Western Australia, and New Zealand is pleased to report it has installed its first 12 m radio telescope.

Other features in this issue include news of regional events in Western Australia, outreach initiatives, a NASA award to an ASKAP project scientist, and details of the International Radio Astronomy Research Centre planned for Western Australia.

## Opportunities for Industry on \$100M Radio Telescope

On 26 September Senator Kim Carr, Minister for Innovation, Industry, Science and Research, launched a register of the opportunities available to industry to participate in building the Australian Square Kilometre Array Pathfinder (ASKAP) radio telescope in Western Australia.

The ASKAP Industry Opportunities Register outlines the technology and infrastructure requirements to 2012 in areas where industry partnerships are needed. The opportunities for industry participation will be in the vicinity of \$70 million of budgeted projects.

"The Industry Opportunities Register reflects CSIRO's commitment to working with industry to provide innovative and value-for-money solutions for ASKAP and potentially for the SKA," Professor Brian Boyle, CSIRO's Australia Telescope National Facility Director, said.

"The register is important to businesses with the capacity to contribute to the Pathfinder telescope and, in time, the SKA radio telescope," Professor Boyle said.

John Humphreys, Chair of the Australian SKA Industry Consortia (ASKAICs), said that "the information in the register will be essential for planning and understanding the ASKAP technology pathway."

To access the ASKAP Industry Opportunities Register visit: [www.atnf.csiro.au/projects/askap/industry](http://www.atnf.csiro.au/projects/askap/industry) or email: [ASKAP-contact@csiro.au](mailto:ASKAP-contact@csiro.au)

*Mary Mulcahy, CSIRO ATNF*

## Australian SKA Industry Consortium CEOs' Dinner

The leaders of a number of major companies met at Parliament House in Canberra on Tuesday 11 November 2008 at a dinner held in support of Australia's involvement in the Square Kilometre Array (SKA) project.

The Australian SKA Industry Consortium's (ASKAIC's) guest of honour was Senator the Hon Kim Carr, Minister for Innovation, Industry, Science and Research. He spoke about the Government's efforts to boost innovation capacity and further develop knowledge-intensive industries in Australia, building upon initiatives such as SKA. The Minister also outlined the Government's plans to support Australian industry participation in the SKA project, beginning with the \$110 million ASKAP project.

Later in the evening ASKAIC was briefed on progress on the ASKAP project by Professor Brian Boyle, Director of CSIRO's Australia Telescope National Facility.



Left to Right: Minister Carr and His Excellency Dr John Larkindale, New Zealand High Commissioner to Australia at the CEOs' Dinner in Canberra (Photo Credit: DIISR).

ASKAIC is a group of organisations collaborating to assist in attracting the SKA to Australia and to facilitate industry engagement in the project. ASKAIC's membership includes a number of major multinationals, as well as Australian based companies. Organisations interested in joining ASKAIC are invited to register interest (see contact details below).

As part of the collaborative industry/government/science approach to the SKA being developed in Australia, the Department of Innovation, Industry, Science and Research, CSIRO and the Western Australian Department of Industry and Resources are also members of ASKAIC.

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## CSIRO Lets Major Antenna Contract for ASKAP

CSIRO announced on 3 November that the major contract for the antennas for ASKAP was awarded to the 54<sup>th</sup> Research Institute of China Electronics Technology Group Corporation (known as CETC54). CETC54 will supply thirty-six 12 m antennas for A\$10 million, meeting a key cost target of under \$300,000 per delivered antenna.

CETC54 is a state-owned institution established in 1952. It has undertaken thousands of government and commercial projects in satellite communication, tracking, telemetry and control, and has designed and built the 50-m Miyun radio telescope for receiving data from China's Chang'E1 satellite. The institute is headquartered in Shijiazhuang, in Hebei province, about 200 km south of Beijing.

*Mary Mulcahy, CSIRO ATNF*

## Visit by Rob Millenaar, SPDO Site Engineer

Rob Millenaar, Site Engineer for the Square Kilometre Array Program Development Office (SPDO) recently visited the CSIRO's Australia Telescope as part of his role in studying all aspects and parameters of the Australian and Southern African sites that have been short-listed to host the SKA. The studies will pave the way towards a well balanced site selection in 2011/12, and implementation thereafter.

Site characteristics that come out of the studies will be fed into the current and future design processes for the SKA. A new "Site Characterisation Working Group" is guiding this work. CSIRO ATNF's Graham Allen is the Australian member of that group.

Rob commented: "I was impressed by the massive effort going on to secure this site for the next generation of Australian and international radio astronomy facilities.

"A first class radio astronomy facility, such as the Murchison Radio-astronomy Observatory (MRO), deserves a first class radio quiet site, certainly if you want to go to the highest sensitivity and widest frequency coverage. I have discussed the establishment of the Radio Quiet Zone (RQZ) with the people involved in that. It is of great importance to work with the local government and groups of people that live in the area to come to an agreement in setting up such an RQZ. I learned that this process is well underway and that there is very active Australian participation within the International Telecommunication Union to ultimately regulate the establishment of RQZs".

*Diana Londish, CSIRO ATNF*

## Science News

### Murchison Widefield Array Update

Over the last 6 months, the Murchison Widefield Array (MWA) project has been making rapid progress at the MRO, Australia's candidate site for the core of the SKA located in the Mid West of Western Australia. The MWA is a low frequency (80–300 MHz) telescope and is funded by a consortium of Australian and US universities and national research organisations (Raman Research Institute in India and the CSIRO in Australia). Goals for the MWA include Solar, Heliospheric and Ionospheric (SHI) research, detection of the Epoch of Reionisation (EoR), Galactic and Extragalactic (GEG) science, and the search for transient radio events.

Since July, the MWA project has run monthly visits to the MRO to install antennas, receivers, data recorders and an interim software correlator. At the end of November the MWA consisted of 32 "tiles" distributed over an approximate 300 m

diameter area within the Early Research Area (ERA) of the MRO. Each tile is constructed of a steel mesh ground-plane and a  $4 \times 4$  grid of low frequency dipole antennas.



*An MWA tile in the field, showing the ground-plane and the 16 dipoles (Photo Credit: Steven Tingay).*

Signals from the 16 dipoles on each tile are combined to form a directional beam on a celestial target, before being distributed to a receiver (that converts the analog radio signals into digital signals). Each receiver processes the signals from 8 tiles, therefore the 32 tile system requires 4 receivers. Currently these 4 receivers reside in a radio frequency interference (RFI) screened room, with laboratory work space provisioned in a separate building.

A data acquisition rack is also located within the screened room with server-class PCs recording the digital signals produced by the receivers.



*The MWA screened room (Right) and laboratory space (Left) at the MRO (Photo Credit: Steven Tingay).*

Following the installation of the system, test science observations were made of the Sun. At the moment the Sun is in its quietest Sun spot state in almost a century, making low frequency observations of the quiet sun very interesting (the Sun is a strong and detectable radio source, even in its quiet state).

Science and engineering test observations will be made with the current system between December and February 2009. By approximately May 2009 a full end-to-end 32 tile MWA system will be operational. The MWA project goals call for an expansion of the system to 256 tiles by the end of 2009 and up to 512 tiles by the middle of 2010.

The step from prototype to mass manufacture for the MWA is being explored in conjunction with industry partners.

*Prof. Steven Tingay, MWA Project Manager, Curtin University of Technology, WA*

### **Call for Expressions of Interest for Science Survey Projects for ASKAP**

A call for Expressions of Interest (Eoi) to be involved in designing and implementing an initial set of Survey Science Projects for ASKAP was issued on 1 November 2008. Expressions of Interest are the first of a three stage process to define large Survey Science Projects that will utilise 75% of ASKAP's observing time during the first 5 years of its science operations.

The astronomy community is already highly engaged, and at last count there are 15 Eois being prepared from groups nationally and internationally. Further details can be found at: <http://www.atnf.csiro.au/projects/askap/index.html>

*Ilana Feain CSIRO ATNF*

### **Meet the ASKAP Team – Electronics PhD Student Suzy Jackson**

Suzy Jackson is a Radio Frequency (RF) design engineer working on the ASKAP project. Her current research is on a receiver chip, measuring just 3 mm on each side, which incorporates much of the electronics in a radio telescope receiver. "One day (I hope) chips like mine will allow us to build telescopes like the SKA, with hundreds of thousands of individual elements" Suzy said.



*Suzy inspecting her receiver chips (Photo Credit: Chris Walsh, Patrick Jones Photo Studio).*

When asked why she chose a career in engineering Suzy replied:

"I really enjoyed working as a technician, but always found myself redesigning things I was supposed to fix. I figured that the best way to ensure I did more of the designing and less of the fixing was to go back to school and study engineering.

"During my degree, I signed up for a 6 month sandwich-student position in the receiver group at the CSIRO ATNF, and have been here ever since. I am currently enrolled (part-time) in a PhD in electronics at Macquarie University. I chose Macquarie because they are doing research into radio receiver chips. This research involves using the processes for making computer chips to make radio receivers instead. By adapting computer and mobile phone technology, we are able to make bigger (and cheaper) telescopes than before".

For more details go to: <http://outreach.atnf.csiro.au/about/astroinaction/suzy.html>

*Diana Londish, CSIRO ATNF*

### **News from New Zealand SKA Committee (SKANZ)**

Auckland University of Technology (AUT) has installed New Zealand's first radio telescope – a 12 m shaped Cassegrain manufactured by Patriot Antenna Systems, USA. It is located near the township of Warkworth, 70 km north of Auckland, in a relatively radio quiet and very picturesque valley. The radio telescope is equipped with a dual band, dual polarisation feed specially designed for this antenna by Patriot. The high surface quality allows it to work at high frequency (up to 32 GHz and possibly higher), and its high slew rate (5 deg Azimuth) makes it suitable for geodetic applications as well. Tuning and testing of the antenna will continue till the end of this year.



*A beautiful sight, the 12m dish at Warkworth, NZ (Photo Credit: Sergej Gulyaev).*

The radio telescope will also be used for educational purposes. From 2009 AUT will offer a new Astronomy Major as a part of the Bachelor of Mathematical Sciences in the School of Computing and Mathematical Sciences.

*Sergei Gulyaev, AUT, New Zealand*

### **NASA Award to ASKAP Scientist**

The US space agency NASA has announced that CSIRO research scientist, Dr John Bunton, is to receive a NASA Space Act Board Award for research into the development of a novel "beamformer" capable of providing a live video link from Mars.

Dr Bunton is a senior member of the CSIRO ICT Centre Wireless Technology laboratory, and Project Engineer for ASKAP. He was originally asked to provide an assessment of the NASA-developed Deep Space Array Based Network beamformer, but decided instead to suggest a totally new design that would provide a better solution.

Dr Bunton's beamformer uses novel frequency domain architecture in which the video signal data is divided into narrow channels and transported to beamformer boards. Each board sums the narrow channel data from all 400 antennas. This data can then be reconstructed back into a broadband signal.

Dr Bunton's expertise in beamformer design is also being put to good use in his role as ASKAP project Engineer and lead Scientist for the ASKAP Digital Systems team.

*Diana Londish, CSIRO ATNF*

### **International Radio Astronomy Research Centre**

The process to establish an International Radio Astronomy Research Centre in Western Australia has recommenced with continued commitment from the newly elected Western Australian Government, through the Minister for Science and Innovation, the Hon. Troy Buswell MLA.

The steering group established as part of the initial development of the centre has submitted its recommendations to Government for the structure and ongoing operations of the facility. The multi-million dollar initiative will be a collaborative joint venture with significant contributions from research organisations and industry.

The centre will add to Australia's already significant radio astronomy research capability, undertaking pure radio astronomy science and developing new ICT and engineering systems.

The \$20 million State Government funding will contribute towards:

- ▶ the employment of scientists and technicians to undertake radio astronomy research and development;
- ▶ developing new software and technologies;
- ▶ developing radio astronomy-related industry capability;
- ▶ undertaking public outreach and education programs; and
- ▶ creating national and international linkages and partnerships in radio astronomy and the SKA.

It is anticipated that the centre will be launched by mid 2009.

*Jonathon Jones, Department of Industry and Resources, WA Government*

### **Regional News** by Priscilla Clayton, CSIRO ATNF **WA Regional Stakeholders Advisory Group**

The WA Regional Stakeholders Advisory Group (WARAG) held its inaugural meeting in Geraldton on 11 August 2008. WARAG is an advisory group to the Australian SKA Coordination Committee. The group is chaired by Julie de Jong, Director, Innovative Industries, Department of Industry and Resources (DoIR) with Garry Clarke, General Manager, Radio Astronomy, DoIR providing executive officer support.



*Members of WARAG (Left to Right) Bill Mitchell (Murchison Shire Council), Steve Burgess (Department for Planning and Infrastructure), Steve Douglas (Mid West Development Commission), Garry Clarke (EO, WARAG/DoIR), Tony Brun (City of Geraldton-Greenough). Front Row: Sue Chafer (DoIR), Julie DeJong (Chair, WARAG/DoIR), Wendy McIntyre (DIISR) and Priscilla Clayton (CSIRO ATNF) (Photo Credit: Priscilla Clayton).*

Members representing key stakeholder groups include Professor Peter Quinn (Premier's Fellow, University of Western Australia), Bill Mitchell (Councillor, Murchison Shire Council) Tony Brun (CEO, City of Geraldton – Greenough), Steve Douglas (CEO, Mid West Development Commission), Steve Burgess (Manager, Department for Planning and Infrastructure), Priscilla Clayton (ASKAP Regional Manager,

CSIRO ATNF) and Wendy McIntyre (Director, SKA Taskforce, Department of Innovation, Industry, Science and Research).

At the inaugural meeting many of the local stakeholders expressed the need for an ASKAP WA Government Agencies Planning Day, which was subsequently held on 21 October (see below).

### *ASKAP WA Government Agencies Planning Day*

Members of the WARAG, together with other invited government representatives, held a planning day in Geraldton on 21 October 2008.

The focus of the Planning Day was to:

- ▶ Share and exchange information in order to identify an agreed plan and to support the ASKAP and, subsequently, Australia's bid for the SKA.
- ▶ Provide a means of identifying local and regional opportunities and synergies.

The Planning Day was attended by CEOs of Shire of Murchison, City of Geraldton-Greenough, Mid West Development Commission, Mayor, City of Geraldton-Greenough, Ian Blayney Member for Geraldton and Hon Brian Ellis (Member for the Agricultural Region), Deputy Shire President, Shire of Murchison, Managing Director, Central West TAFE, Director, Geraldton Universities Centre and Regional Managers from various WA Government Agencies including the Department for Planning and Infrastructure, Environment, Main Roads, Water Corporation and the Department of Industry and Resources. Professor Peter Quinn, Premier's Fellow for Radio Astronomy, and Dr Dave DeBoer Assistant Director, CSIRO, ATNF also attended the Planning Day.

Professor Quinn set the scene for the Planning Day by providing an overview of astronomy in WA including the potential SKA project, while Dr DeBoer presented information about the ASKAP.

Items discussed included optic fibre connectivity, supercomputing, power, project infrastructure, Boolardy Station, Shire of Murchison, City of Geraldton-Greenough, Geraldton Universities Centre, training/community needs, the International Radio Astronomy Research Centre, industry development and tourism.

The outcomes from the Planning Day will be presented to the WARAG.

### *New Murchison Shire CEO*

Ron Adams is the new Chief Executive at the Murchison Shire, home to the MRO. He was formerly Deputy CEO, Shire of Yalgoo (which is adjacent to the Shire of Murchison). Ron is a

familiar face in the Mid West having grown up in Mingenev and later Geraldton.



*New Murchison Shire CEO, Ron Adams (Photo Credit: Priscilla Clayton CSIRO ATNF).*

Former CEO Dirk Sellenger is now Chief Executive at the Shire of Chapman Valley (still in the Mid West).

### *Public Works Committee Hearing Geraldton*

The Commonwealth Parliamentary Standing Committee on Public Works (PWC) hearing for ASKAP was conducted in Geraldton on October 1, 2008 at the Geraldton Universities Centre. The task of the Committee is to make recommendations to Parliament on public works estimated to cost more than \$15 million.

Fifteen written submissions (all supportive) were provided to the PWC. Written submissions included those from the Mid West Development Commission, City Geraldton-Greenough, Shire of Murchison and several Geraldton community members.

The tabling of the Committee's conclusions and recommendations is expected before the end of 2008.

### *Mid West Science Summit 2008*

The inaugural Mid West Science Summit was held in Geraldton, Western Australia on 13 August. It was initiated by the Mid West Development Commission.

The Science Summit, the first of its kind in regional Western Australia, was officially opened by the Hon Kim Chance (WA Minister for Agriculture and Food, Forestry; Mid West and Wheatbelt; Great Southern).

The aim of the Summit was to identify future regional challenges and opportunities and determine the priority science response for the region. It is hoped the Summit will drive the development of a Mid West Science Plan to support this response.



Left to Right: Damon Angelatos (Geraldton Grammar), Michelle Storey (CSIRO ATNF), Suzie Edwards (John Willcock College) and Professor Lyn Beazley (immediate past WA Chief Scientist) (Photo Credit: Priscilla Clayton CSIRO ATNF).

Dr Michelle Storey (CSIRO ATNF) attended the summit and gave a presentation on ASKAP and the SKA. Steve Douglas (CEO, Mid West Development Commission) expressed the opinion that the MRO will offer many opportunities to the region.

It is expected the Summit and the Mid West Science Plan will also look at promoting interest in science to students, as well as strengthen Geraldton's standing as a Smart City and learning hub.

## Outreach and Education

### *Mining the Sky with the SKA – Brodie-Hall Memorial Lecture*

On 8 October the CSIRO Alumni hosted the annual Sir Laurence Brodie-Hall Memorial Address, the 24<sup>th</sup> lecture in the series. Dr Brian Boyle, Director Australia Telescope National Facility, gave the address – “Mining the Sky with the SKA” – an entertaining and insightful presentation on the SKA.

The Brodie-Hall Memorial Address is CSIRO's annual lecture instituted by the former CSIRO Western Australian State Committee in 1985 to recognise the contributions made to CSIRO and Western Australia by Sir Laurence Brodie-Hall. This year's address attracted 250 guests.

It was a fitting presentation for the occasion, as the SKA represents everything that Sir Laurence Brodie-Hall saw as important – innovation, collaboration, education and pushing the boundaries of knowledge and human endeavour.

Dr Boyle's address outlined the international project which aims to build this telescope by the end of the next decade, and described some of the transformational scientific projects that will be done with the telescope. He also described current SKA activities in Australia, including CSIRO's construction of the ASKAP telescope at the MRO over the coming 4 years.

### *Visit to Pia Wadjari Remote Community School*

Outreach staff from CSIRO ATNF and Curtin University visited Pia Wadjari Remote Community School in early October. Students from Yalgoo primary School travelled up for the day and stayed overnight. During the afternoon students participated in activities on the solar system, and made balloon rockets. Unfortunately the evening turned cloudy and so the viewing night was cancelled.

Highlights included meeting a number of teachers and educators in Geraldton; and working with a fantastic group of teachers and students from Yalgoo and Pia Wadjari remote community schools.

Mary Mulcahy CSIRO ATNF

### *AstronomyWA November Tour*

AstronomyWA treated students, teachers and community members in Northam, Geraldton and Kalgoorlie to an experience that was out of this world. Funded by ASISTM (Australian School Innovation in Science, Technology and Mathematics) the week-long regional tour included workshops for teachers and “Observing on the Oval” public



Right to Left: Murray Thomas from Shenton College and Teachers from Halls Head Primary School participating in an “Observing on the Oval” event in WA (Photo Credit: Scitech).

viewing nights delivered by CSIRO Education Officer Rob Hollow and AstronomyWA coordinator Pete Wheeler.

Eminent astronomer and science communicator Professor Fred Watson explored space tourism as a reality and the recent interest in planetary investigation in a series of public lectures. He also gave audiences an insight into his award winning book, "Why is Uranus upside down?"

*Pete Wheeler, Planetarium Manager and AstronomyWA Coordinator, Scitech*

### *The I-dome at Floriade*

The Australian SKA Project took part in this year's Floriade festival in Canberra in September as part of the CSIRO display in the "look'n'learn" marquee. The annual flower festival draws over 100,000 visitors to Canberra, and over 14,000 people visited the marquee over the 3 days that the CSIRO exhibition was there.

The display featured the I-dome, an interactive video display about the SKA project.



*Diana Londish from CSIRO ATNF in front of the I-dome display (Photo Credit: Jo Chapman, CSIRO Publishing).*

Staff from CSIRO's Australia Telescope National Facility (ATNF) were on hand to answer questions and tell visitors more about the SKA and ASKAP.

*Diana Londish, CSIRO ATNF*

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