

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

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The editors would like to warn Aboriginal and Torres Strait Islander people that this newsletter may contain images of people who are deceased.

Italy and Australia Strengthen SKA Ties

In late April 2009, Australia and Italy formally agreed to work in close partnership on the international SKA project through the signing of a Joint Statement of Intent.

The agreement was signed by the Italian Undersecretary of State for Economic Development and Foreign Trade, Adolfo Urso, and Australia's Minister for Innovation, Industry, Science and Research, Senator Kim Carr.

Mr Urso was visiting Australia as part of an industry delegation that included representatives from the Istituto Nazionale di Astrofisica (Italian National Institute for Astrophysics), Finmeccanica, and Thales Alenia Space.

The Joint Statement of Intent commits Australia and Italy to preparing a Memorandum of Understanding (MoU) to formalise this relationship within the international program to implement the SKA.

The MoU is intended to build Australia's relationship with Italy by encouraging cooperation between government departments, universities and research institutes in the implementation of the SKA project. Further, the MoU will enable the two nations to explore other areas for cooperation including the promotion and development of commercial exchanges in specific sectors of high technology.



Senator Kim Carr (Left) and Mr Adolfo Urso at the signing of the Joint Statement of Intent between Australia and Italy, an important step in the two countries working closely together on the SKA project. Photo Credit: Chris Cassar Photography.

Senator Carr said that the signing meant the close working relationship Australia and Italy share on radio astronomy has become even closer.

"The SKA provides an important opportunity for us to improve our science and technology relationship with Italy," Senator Carr said.

"It is an immensely technically challenging project. The SKA will only be built through a concerted global effort involving scientists and businesses at the cutting-edge of their field.

"That global network of excellence is already emerging – Australia and Italy are both proud to be a part of it."

This will build on the existing strong relationship between the Italian National Institute for Astrophysics and CSIRO's Australia Telescope National Facility.

The MoU will be finalised in the coming months.

SKA Taskforce, Department of Innovation, Industry, Science and Research

\$80 million Investment in SKA Science

As part of the Australian Government's \$160 million Super Science – Space and Astronomy initiative announced in the 2009/10 Federal Budget, \$80 million has been allocated to the establishment of an Australian National Centre for SKA Science to be situated in Perth.

The Centre will be part of iVEC, the advanced computing hub for Western Australia's research community. The Government will consult with relevant parties, particularly the radio astronomy community, to ensure that this project is implemented in ways that complement CSIRO's Australian SKA Pathfinder (ASKAP) project and other Australian SKA-related activities.

The Centre will facilitate enhanced ASKAP operations and increase the astronomy community's ability to exploit the enormous volume of data from ASKAP. It will operate in conjunction with the Geraldton-based ASKAP Murchison Radio-astronomy Observatory Support Facility to support ASKAP science.

As well as making a significant contribution to SKA science and ASKAP, the Centre will be a world-class hub for high-performance computing that will support high-end research in many disciplines. The Centre will also enhance the International Centre for Radio Astronomy Research's SKA-related research agenda by expanding access to cutting-edge ICT facilities.

SKA Taskforce, Department of Innovation, Industry, Science and Research

Workshop Confirms Industry Commitment to the SKA

A research-industry SKA workshop held in Sydney on 27 May 2009 confirmed the strong commitment by Australian industry, including through its global linkages, to engage with and contribute to the SKA and its precursor activities. There was clear recognition by participants of the desirability of broadening opportunities for research and industry collaboration in the remaining development phases of ASKAP and other related projects to further Australia's bid for the SKA.

The workshop was chaired by Professor Peter Hall, Professor of Radio Astronomy Engineering at Curtin University and Deputy Director of the International Centre for Radio Astronomy Research (ICRAR). Discussion focused on potential approaches and solutions to the various technical and logistical challenges of ASKAP, other SKA-related projects in Australia and the SKA. The workshop also provided Australian research agencies with greater information on the range of relevant Australian industry expertise that could assist the implementation of CSIRO and ICRAR projects, and contribute downstream to the SKA.

The workshop was organised by the Australian Department of Innovation, Industry, Science and Research. It was initiated by the Australian SKA Coordination Committee's Industry Participation and Procurement Advisory Group and had the support of CSIRO, ICRAR and the Australian SKA Industry Consortium (including the New Zealand and Western Australian Governments). Presentations and further information on the workshop are available at www.ska.gov.au.

Manufacturing Division, Department of Innovation, Industry, Science and Research

Science News

Australian SKA Pathfinder (ASKAP) Update Compact Array Broadband Backend Successfully Installed

A new broadband backend system has been successfully installed on the CSIRO Australia Telescope Compact Array. The seven-year, \$12 million upgrade, called the Compact Array Broadband Backend (CABB) project, makes the telescope's bandwidth – the 'chunk' of radio spectrum it can handle at any one time – 16 times greater, boosting it from 128 MHz to 2 GHz.

Increasing the Compact Array's bandwidth makes the telescope four times more sensitive to faint signals, and able to detect cosmic objects travelling at a wider range of velocities.



Warwick Wilson (Project Leader for the CABB project, Left), Megan Clark (CSIRO Chief Executive, Centre) and Lewis Ball (CSIRO ATNF Acting Director, Right) with a CABB signal processing board at the Australia Telescope Compact Array. Photo Credit: Paul Mathews Photographics.

Significantly, the CABB signal processing board design is being used as a prototype for the signal processing boards for ASKAP.

The scale and complexity of CABB demonstrates CSIRO's capacity to undertake large projects such as ASKAP. The greater bandwidth and increased data flow provided by CABB also demands new ways to analyse data and calibrate telescope performance. "What we learn from working with CABB will be important for ASKAP and the SKA," said Lewis Ball, CSIRO ATNF's Acting Director.

ASKAP Antennas on Schedule

The design phase of the ASKAP antenna contract has now been fully completed by the contractor CETC54 and the first antenna is due to arrive on site in Western Australia on schedule in November 2009.

As part of the production readiness review, the ASKAP antenna design has been subject to rigorous assessment including an analysis of the expected electromagnetic scattering due to the feed package and the quadripod feed support, coupled with a full finite element analysis of the antenna operation in many different situations (for example, under varying temperature and wind conditions). The specified reflector surface accuracy of 1 mm or better is maintained under all operating conditions and, therefore, the ASKAP antennas will support radio astronomy observations up to at least 10 GHz.

The CSIRO ASKAP team is preparing a full suite of factory acceptance and site commissioning tests. Alongside these, the team has developed site and infrastructure support plans, and is working to ensure that the foundation for the first antenna is ready. Specialist antenna engineers from CETC54 will arrive at the Murchison Radio-astronomy Observatory (MRO) in late October 2009 to prepare for the arrival of the first antenna.

ASKAP Survey Science Project Evaluations Underway

The ASKAP Survey Science Project Evaluation Committee, chaired by SKA Project Scientist Joe Lazio, is in the process of selecting surveys that will utilise observing time during the first five years of the telescope's science operations. Seventeen proposals, with a combined authorship of 693 people and total telescope observing time in excess of 12 years, are currently being reviewed.

ASKAP Industry Engagement News

As ASKAP moves into the 'build' phase of the project, a number of procurement processes have commenced:

- ▶ A contract for the design work at Boolardy Homestead has been awarded to a Geraldton-based company, Eastman Poletti Sherwood Architects. Work is now progressing on the design of upgrades to the homestead and to the accommodation and catering facilities for CSIRO personnel and other visitors to the MRO.
- ▶ A request for tender for the design of the MRO infrastructure has been posted on the AusTender web site, and
- ▶ Evaluation of the many expressions of interest to develop a prototype single digital backend computing system continues and the result will be announced shortly.

In addition to these opportunities for industry to be involved with the project, the CSIRO ASKAP team is continuing its successful program of industry engagement including briefings, early-phase research and development collaborations, and tender updates. Following feedback from the research-industry SKA workshop held on 27 May 2009, these activities will be expanded to include:

- ▶ Technical discussions aimed at addressing both ASKAP and SKA challenges aligned with the PrepSKA WP2 work packages, with possible spin-out industry expert groups working on particular SKA challenges, to encourage deeper technology engagement with industry, and
- ▶ Improved technical communications to industry.

The first edition of CSIRO's new quarterly publication *ASKAP Technical Update* has now been produced to keep industry and other interested stakeholders informed on the progress of the ASKAP project. It is available online at <http://www.atnf.csiro.au/projects/askap>.

ASKAP on Display

In recent months the CSIRO ASKAP team has been busy talking with the astronomy community and industry about the progress of the project. In early June 2009, a small delegation attended the 214th American Astronomical

Society meeting in Pasadena where the ASKAP exhibition stand was very successful in attracting interest among the 1600 astronomers and other meeting participants. At the end of May 2009, ASKAP Project Scientist Ilana Feain addressed the Royal Astronomical Society of New Zealand's Annual Meeting. At CeBIT Australia 2009, the nation's largest annual technology trade fair held in Sydney in early May, a dedicated ASKAP display formed part of a larger CSIRO stand.



CSIRO ATNF's Jamie Stevens and the ASKAP booth at the American Astronomical Science meeting in Pasadena. Photo Credit: Carole Jackson, CSIRO.

Gabby Russell, CSIRO

Curtin Institute of Radio Astronomy (CIRA) Continues to Grow

Following its recent relocation into the Brodie-Hall Building in Bentley Technology Park, CIRA has welcomed several new members of staff. Dr Randall Wayth has joined the team as a Postdoctoral Fellow working in the experimental computing and transient astronomy area. CIRA has also welcomed two new PhD students: Aziz Jiwani, from India, who is working with Professor Peter Hall on SKA mid-band aperture array design; and Kevin Koay, from Malaysia, who is working with Professor Hall and Dr J-P Macquart on detection of transients at low frequencies.

Wayne Arcus will shortly join CIRA as Murchison Widefield Array (MWA) Project Manager, taking over from Professor Steven Tingay in this role. Wayne will work closely with Professor Tingay and David Emrich, MWA Commissioning Engineer, to provide vital WA-based expertise to the project.

CIRA is Curtin University of Technology's cross-disciplinary radio astronomy group and is the University's link with ICRAR and other partners.



David Emrich (MWA Commissioning Engineer, Right), Mark Waterson (MWA Receiver Engineer, Centre) and Randall Wayth (MWA On-site Software Support Engineer, Standing). Photo Credit: Steven Tingay, Curtin Institute of Radio Astronomy.

Peter Hall, Curtin Institute of Radio Astronomy

Murchison Widefield Array (MWA) Update

The MWA project continues to make significant progress at the Murchison Radio-astronomy Observatory (MRO), with site visits taking place every month so far this year. Current activity is dominated by preparations for the arrival of the MWA 32T hardware correlator, which is in the final stages of integration and end-to-end system testing on the bench at the MIT Haystack Observatory near Boston. The hardware correlator is expected to be shipped to the MRO for integration with the fielded system of antennas, beamformers and receivers.

The MWA project has also undergone a series of reviews by funding agencies in Australia and the US: Astronomy Australia Limited completed a review of the project in April 2009, and the National Science Foundation conducted a review of the MWA project in June 2009 (in conjunction with the major project meeting for the year in Seattle). These reviews will determine the release of final funding to complete the build-out of the final MWA before the end of 2010.

Steven Tingay, Curtin Institute of Radio Astronomy

SKA Molonglo Prototype (SKAMP) Update

SKAMP, which aims to test and develop new technology for the SKA by producing a completely new digital signal pathway on the existing mechanical superstructure of the Molonglo Observatory Synthesis Telescope (MOST), is now entering stage two of its three-stage development (see AuSKA Newsletter 20, July 2008, for full details).

Stage two will see the implementation of the full 100 MHz bandwidth correlator and polyphase filterbanks with up to 6,000 channels for spectral line imaging. This equipment has been designed and manufactured, and the boards are in preparation for production in August 2009. Infrastructure is nearing completion and upgrading of the main building's radio frequency interference shielding is currently underway.

The next six months will see major progress with this exciting project and the SKAMP team expects to begin wide-field surveys of the sky by the end of 2009.

SKAMP is a joint University of Sydney and CSIRO project largely funded through the Australian Government's Major National Research Facilities Program. There is strong collaboration between the SKAMP, MWA and ASKAP projects because of the underlying common correlation module, which is the heart of the signal processing system.

Science with SKAMP: Widefield Spectroscopy of the Southern Radio Sky

In preparation for stage two of SKAMP, the University of Sydney is hosting a science workshop at Molonglo Observatory to discuss and develop science plans for the project. Sessions at the workshop will cover:

- ▶ SKAMP instrumentation
- ▶ HI absorption surveys
- ▶ Radio transients
- ▶ OH megamasers
- ▶ Low-surface-brightness radio sources
- ▶ Synergies with other new facilities such as MWA, ASKAP and Skymapper
- ▶ A tour of SKAMP

Where: Molonglo Observatory, NSW

When: 16 and 17 September 2009

Registration: Now open, although spaces are limited.

Visit www.physics.usyd.edu.au/sifa/Main/ScienceWithSKAMP for more information.

Anne Green, University of Sydney for the SKAMP team

Regional News from Geraldton

Sky's the Limit for Indigenous Art

A recent visit to Australia's candidate SKA site by a group of Indigenous artists and scientists has been the inspiration for an art exhibition, *Ilgarijiri – things belonging to the sky*, at the Geraldton Regional Art Gallery.

The group spent three days together at Mullewa and Boolardy Station to celebrate and explore the connection between radio astronomy and Indigenous culture through art. Telescopes and binoculars were used to gaze at Saturn, the stars and galaxies.



While touring the Murchison Radio-astronomy Observatory site, the group visited one of the MWA tiles (an installation of 16 dipoles). Photo Credit: Megan Argo, Curtin University of Technology.

Professor Steven Tingay, Deputy Director of ICRAR, said the group made a special visit to Australia's selected site for the world's biggest radio astronomy project, the SKA.

"Australia's core site for the SKA project, the Murchison Radio-astronomy Observatory, is located on Wajarri Yamatji land," Professor Tingay said. "The Wajarri Yamatji country is an area rich in Indigenous culture but it is also one of the most interference-free places on Earth, making it an ideal location to operate the sensitive radio telescopes needed for the SKA project."

The group was made up of three astronomers from ICRAR, 12 Indigenous artists from Geraldton and Mullewa and a number of Yamaji Art Indigenous art cooperative staff members.

"The visit allowed the artists to draw inspiration from the country, the telescopes, and the sharing of stories about the night sky to produce a collection of more than 90 artworks connecting the land, culture and astronomy," said Professor Tingay.

Ilgarijiri – things belonging to the sky was officially launched at the Geraldton Regional Art Gallery on 12 June 2009 by Ian Blayney MLA, the Member for Geraldton. Over 500 people attended the opening which started with Wajarri Elder Ross Boddington delivering the Acknowledgement of Country Ceremony followed by a traditional Wajarri women's dance.



Wajarri Elder Ross Boddington (Right) delivering the Acknowledgement of Country Ceremony at the opening of Ilgarjiri – things belonging to the sky. Photo Credit: Priscilla Clayton, CSIRO.



The youngest of the Wajarri women dancers looks to the sky. Photo Credit: Priscilla Clayton, CSIRO.



From Left: Katherine Moroz (Yamaji Art), Steve Douglas (CEO, Mid West Development Commission), Charmaine Green (Yamaji Art), Priscilla Clayton (CSIRO) and Steven Tingay (Deputy Director, ICRAR) at the exhibition opening. Photo Credit: Daryl Ding.

More information on the artworks and exhibition can be found at <http://ilgarjiri.wordpress.com>.

Steven Tingay, on behalf of the Yamaji Art and ICRAR collaboration

Presentation to Engineers Australia

Professor Peter Hall (Deputy Director, ICRAR) visited Geraldton in May 2009 to deliver a presentation to the local branch of Engineers Australia. More than 30 engineers attended the presentation to learn more about the SKA and, in particular, power requirements for the project. While in Geraldton, Peter Hall visited a nearby 'green' energy provider, the Alinta Wind Farm at Walkaway, and the Geraldton Port Authority's ship loading facilities.



Peter Hall (Left) with Joseph Reilly (Engineers Australia Geraldton Branch) and Priscilla Clayton (CSIRO). Photo Credit: CSIRO.

Priscilla Clayton, CSIRO

Education and Outreach

Astronomy WA Space Camp 2009

Twenty teams from schools as far apart as Mudgee in NSW and Kalgoorlie in Western Australia recently learned about how the SKA will change the future of astronomy as part of the Astronomy WA Space Camp 2009 organised by Scitech.

Over three days, the 60 students and their teachers participated in a range of engaging astronomy activities that included meeting with radio astronomers from the University of Western Australia and Curtin University of Technology, and visiting the *Out There!* exhibition, to find out about the science behind the SKA project.

Other activities included the Astronomy WA Challenge Cup, which saw the group divide into teams and compete in challenges such as launching homemade

rockets, assembling space stations and programming robotic Mars rovers. A visit to Gingin Observatory was a special treat.

“Even after three full days, the students were as eager to get involved as at the start,” said David Dempsey, one of the Space Camp organisers.

Expressions of interest for involvement in Space Camp 2010 can be sent to Andrew Hannah at Scitech (andrew@scitech.org.au).

David Dempsey, Scitech and Gabby Russell, CSIRO

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