

This is one of a series of newsletters to keep interested parties informed about the progress of SKA-related activities in Australia and New Zealand. Previous newsletters are available from [www.ska.gov.au](http://www.ska.gov.au) [www.ska.govt.nz](http://www.ska.govt.nz)

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## General News

### Trans-Tasman Antennas Successfully Linked

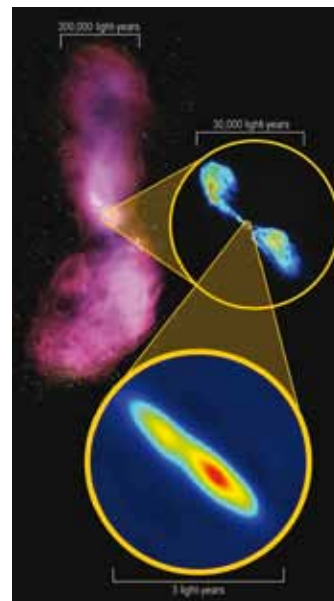
Six radio telescopes across Australia and New Zealand have joined forces to act as one giant telescope, linking up over a distance of 5,500 km for the first time. The link-up was a collaborative effort between CSIRO, the International Centre for Radio Astronomy Research at Curtin University of Technology in Western Australia, and AUT University in New Zealand.

Showing Australia and New Zealand can link telescopes in this way strengthens the two countries' joint bid to host the international SKA telescope.

"The SKA is a truly mega-sized science project with its global reach, scale and ambition, akin to the Large Hadron Collider in Europe," says CSIRO SKA Director Professor Brian Boyle.

"This successful linking of antennas shows Australia and New Zealand's commitment to next-generation astronomical research and how seriously we are taking the SKA bid."

"The linked telescope will make images ten times more detailed than those of the Hubble Space Telescope and has already been used to peer into the heart of a galaxy called Centaurus A," continues Brian.



Zooming in to the heart of galaxy Centaurus A, 14 million light-years away. This composite image shows the entire galaxy, as imaged by CSIRO radio telescopes; radio emission from a central part of the galaxy, imaged by a US radio telescope; and the innermost part of the galaxy, imaged by the new network of Australian and New Zealand radio telescopes. Image Credits: Whole galaxy: I. Feain, T. Cornwell & R. Ekers (CSIRO/ATNF); ATCA northern middle lobe pointing courtesy R. Morganti (ASTRON); Parkes data courtesy N. Junkes (MPIfR). Inner radio lobes: NRAO/AUI/NSF. Core: S. Tingay (ICRAR)/ICRAR, CSIRO and AUT.

The newcomers to the Australasian telescope team are the New Zealand dish, near Warkworth in the hills of the North Island, and the first antenna of CSIRO's Australian SKA Pathfinder (ASKAP) radio telescope, which is located inland from Geraldton in the Mid West region of Western Australia.

The Warkworth dish is operated by AUT and is the first functioning research-quality radio telescope in New Zealand.

Data from the New Zealand radio telescope were transferred from Warkworth directly to Australia using recently established 1 Gb per second connectivity via the Kiwi Advanced Research and Education Network (KAREN).

"The linking of the Warkworth antenna is a milestone for New Zealand science," says Professor Sergei Gulyaev, Director of the Institute for Radio Astronomy and Space Research at AUT.

The other telescopes used in the link-up were three CSIRO facilities in New South Wales and a University of Tasmania dish near Hobart.

One of the linked telescope's first projects has been to study the heart of a galaxy called Centaurus A. Lurking there is a black hole that shoots out jets of radio-emitting particles at close to the speed of light.

Observing the galaxy for 10 hours, the telescopes took enough data to fill a stack of DVDs in their cases as high as a nine-storey building. The International Centre for Radio Astronomy Research (ICRAR) at Curtin University of Technology provided the equipment for recording the data and also analysed the data to make an image.

The resolution of the new image is 100,000 times higher than that of a ground-breaking radio image made by CSIRO last year, which is itself the most detailed image ever made of the whole galaxy.

"Centaurus A is 14 million light-years away," says Curtin University's Professor Steven Tingay. "We're zooming in on the black hole at the heart of this galaxy, to learn more about how these systems work. Making the new image has been like photographing a pin head from 20 km away."

## Perth–Geraldton Fibre Construction Begins

The start of construction of a fibre-optic backbone linking Perth to Geraldton in Western Australia was marked by Senator Stephen Conroy, Minister for Broadband, Communications and the Digital Economy, at an official ceremony on 21 May 2010.

The 426 km link, part of the Australian Government's National Broadband Network, is an important part of the network that

will connect the Murchison Radio-astronomy Observatory (MRO) in Western Australia's Mid West region with the world (see anzSKA Newsletter 26).

The MRO is home to ASKAP and other radio telescopes currently under construction, and is also Australia and New Zealand's candidate core SKA site. A tender for the installation of fibre-optic cable between the MRO and Geraldton is currently being evaluated.

With the new Geraldton–Perth link in place the large volumes of scientific data that will be generated by ASKAP can be transmitted to Perth for peta-scale processing at the new Pawsey High Performance Computing Centre for SKA Science.

The new link is also a big step forward for the joint Australia – New Zealand bid to host the international SKA project. By 2011, Australia will have in place a cost-effective, SKA-ready fibre-optic infrastructure from the MRO to Perth and beyond.

"This is a significant advance in proving the feasibility of the project and highlighting the already significant scientific and logistical advantages of the Western Australian site," says Senator Kim Carr, Minister for Innovation, Industry, Science and Research.

## Super Science Awards Boost Australian SKA Program

Australia's SKA effort received a major boost from the Australian Research Council's new Super Science Fellowships announced on 8 April 2010 by Senator Kim Carr, Minister for Innovation, Industry, Science and Research.

Twenty-one of the 100 new awards, valued at almost \$5 million over the next five years, are for research related to developing SKA pathfinder instruments in Australia or using those instruments to undertake ground-breaking research. They are designed to give early career researchers the opportunity to work in areas of national significance.

CSIRO received funding for three fellowships that will focus on developing innovative phased array feed technology for ASKAP as well as science projects to be conducted with the new telescope. Curtin University of Technology also received funding for three fellowships which will be used to support early science from the Murchison Widefield Array, another SKA pathfinder instrument.

The University of Western Australia was awarded funding for two fellowships for a project using ASKAP and new supercomputers being built at the Pawsey High Performance Computing Centre for SKA Science in Perth to search for neutral hydrogen in the Universe to improve our understanding of the origin and continuing evolution of galaxies.



*A prototype of ASKAP's phased array feed (or 'radio camera') technology on the 12-metre antenna at the Parkes Testbed Facility, which is used for testing ASKAP's systems. Image Credit: David McClenaghan, CSIRO.*

Other ASKAP- and SKA-related fellowships went to the Anglo-Australian Observatory, the University of Sydney, the University of Tasmania, Swinburne University of Technology, the University of Melbourne and Monash University.

For more details on the awards visit the anzSKA website at [www.ska.gov.au](http://www.ska.gov.au).

## Italy–Australia Relationship Develops

The inaugural meeting of the Italy–Australia SKA Working Group was held on 29 April 2010 in Rome. The group has been established following the signing of a memorandum of understanding in July 2009, which provides for Australia and Italy to collaborate through their respective government, scientific and industry communities on activities to support the international SKA program (see anzSKA Newsletter 24).

During the group's first meeting a range of collaboration possibilities were discussed in a very fruitful exchange of information and ideas. Industry delegates explored the potential for a joint project in an area that would be of value to the international project, such as renewable energy. Various areas of scientific research and technical collaboration were also discussed and are being further explored.

Senator Kim Carr will visit Rome in June 2010 to meet Adolfo Urso, Italy's Deputy Minister for Economic Development, and other government and industry representatives. Plans are also being made for an Italian industry delegation to visit Australia later this year.

## Deputy SKA Project Scientist Appointed

Australian Dr Minh Huynh has recently been appointed Deputy International SKA Project Scientist and will be joining the SKA team later this year.

By working with Project Scientist Dr Joseph Lazio, and scientists and engineers from around the world, Minh will help develop the pioneering science case for the SKA.

"Balancing the aspirations of the astronomy community with the engineering design of the telescope will become increasingly important as the project grows, particularly during the development of cost models," says Minh of her new appointment.

Minh's time will be split between her base at ICRAR in Perth and the SKA Program Development Office at the Jodrell Bank Centre for Astrophysics in the UK.

Minh completed her studies in astronomy at the Australian National University's Research School of Astronomy and Astrophysics. She brings to the new role experience working on a number of international instruments, including CSIRO's Australia Telescope Compact Array and NASA's Spitzer Space Telescope.

In addition to her role as Deputy International SKA Project Scientist, Minh will also continue her research into galaxy evolution. Her interests include star formation and black hole activity, studied using a multi-wavelength view of the Universe, making her a valuable addition to the ICRAR research team.

## Australia, New Zealand Participate in SKA Meetings

Australia and New Zealand were well represented at the latest international SKA meetings held in Europe.

An annual meeting of the international SKA science and engineering community took place in Manchester, UK in March 2010. With the SKA in its system design phase the SKA2010 meeting focused on upcoming system and engineering decisions, and the impact these will have on the scientific observations to be conducted with the SKA (all the SKA2010 presentations can be viewed on the international SKA website at [www.skatelescope.org](http://www.skatelescope.org)). Participants also mingled at an SKA industry event convened by the UK Knowledge Transfer Network.

The SKA2010 meeting was followed by a workshop in Rome on the non-science benefits that can arise from a mega-science project such as the SKA. Hosted by the European Cooperation in Science and Technology (COST) intergovernmental European framework, the workshop was attended by civil servants, scientists and industry representatives who discussed the potential impacts of the SKA on information communications technology, energy, government-industry interactions and human capacity building. More information on the COST SKA workshop can be found at [www.cost.eu/events/ska](http://www.cost.eu/events/ska).

## ASKAP Geothermal Cooling Trial Takes Next Step

CSIRO is continuing to trial the use of efficient and cost-effective options for cooling ASKAP's electronics and reducing the telescope's overall demand on power (see anzSKA Newsletter 25). Working with Direct Energy, a Melbourne-based company, CSIRO installed a prototype direct exchange geothermal heat pump system at the site of ASKAP's first antenna in May 2010. This technology offers long-term sustainability as it uses a renewable source – the ground – as a heat sink.

Nine bore holes, each 30 metres deep, were drilled into the ground adjacent to the antenna. Copper 'loops' containing refrigerant and temperature-monitoring cables were placed in the holes and connected to a compressor and de-superheater units next to the antenna. A 'dummy' heat load emulating the operation of the antenna's electronic systems will be used to test the performance of the system over coming months.



*The Dongara Drilling team at the site of ASKAP Antenna 1 during the installation of the trial geo-exchange system. Image Credit: Graham Allen, CSIRO.*

Concern for the cost, supply security and 'greenhouse' emissions of fossil fuels over the 50-year operational lifetime of the SKA is driving the implementation of an optimised renewable energy solution for the international telescope project. Testing of this prototype system will offer valuable insight into power reduction options not only for ASKAP but for the SKA project as well.

## Regional News from Geraldton

### New Staff Join CSIRO Geraldton Office

CSIRO Regional Manager Priscilla Clayton has said "yinda barndi" ("welcome" in the Wajarri language) to two new colleagues who will be based in CSIRO's office in Geraldton. Robin Boddington, on secondment to CSIRO from Curtin

University of Technology, has taken up the role of Aboriginal Liaison Officer, while Barry Turner has started as Murchison Radio-astronomy Observatory (MRO) Site Manager.



*MRO Site Manager Barry Turner and Aboriginal Liaison Officer Robin Boddington have joined CSIRO's Geraldton Office. Image Credit: Priscilla Clayton, CSIRO.*

Robin, a Wajarri Nyarlu–Wajarri lady, is the link between the ASKAP project and the Wajarri people who are the traditional owners of the land on which the MRO is located. Robin has a busy and exciting role, which includes delivering heritage inductions for CSIRO staff, contractors and other visitors to the MRO.

One of Robin's long-term goals is to encourage the interest of Aboriginal children in science and astronomy. "Aboriginal people have always used the stars to know the right time to collect emu eggs...yalabiddy warla time," says Robin.

As MRO Site Manager Barry Turner will supervise the construction of critical site infrastructure (including buildings, roads and antenna foundations) and oversee the day-to-day operations of the site. He has worked across a variety of industries including commercial and domestic construction, mining, power generation and major water storage maintenance, and has previously spent 13 years based at CSIRO's Parkes Observatory looking after the maintenance department and site services.

"I hope to utilise my 30 years of cross-industry experience to help CSIRO deliver the best outcome we can for the MRO and maybe even the SKA in the longer term," says Barry.

## Education and Outreach

### SKA Brought to Life by Swinburne Astronomers

Filmmakers at Swinburne University's Centre for Astrophysics and Supercomputing have created an animated film

depicting the SKA for the international SKA Program Development Office based in the UK.

CAD drawings of the latest antenna designs were used to make the telescopes appear as realistic as possible.

Filmmaker Russell Scott says that one of the more challenging aspects of producing the film was maintaining neutrality in the landscape around the core SKA site, since both Australia and South Africa have been shortlisted as possible locations for the central antenna site.

“Creating a realistic, but neutral, landscape was difficult as Australia and South Africa have their own distinct ‘look’. In the end our solution was to try and blend the appearance of both countries into a new ‘Aust-Africa’ landscape,” says Russell.



A still image taken from the Swinburne Astronomy Productions animation showing dishes that will make up the SKA radio telescope. Image Credit: Swinburne Astronomy Productions/SKA Program Development Office.

“Communicating the project through film helps convey the scale and significance of the SKA to viewers, whether they are astronomers, engineers or school students,” says Outreach Officer Jo Bowler from the SKA Program Development Office.

Swinburne Astronomy Productions has previously created an animation of how the CSIRO’s ASKAP telescope will look once it is completed in 2013.

The new SKA animation can be viewed on the international SKA website at [www.skatelescope.org](http://www.skatelescope.org) and the ASKAP animation can be seen on the anzSKA website at [www.ska.gov.au](http://www.ska.gov.au).

## Spotlight on the SKA at New Zealand Workshop

In early May 2010 the New Zealand Ministry of Economic Development (MED) convened a workshop in Wellington on the SKA and the educational opportunities the project offers.

Facilitated by Ian Kennedy, Chair of the New Zealand SKA Education Advisory Group and Director of the National Science Technology Roadshow Trust, the workshop involved primary and secondary school teachers from a range of disciplines, curriculum facilitators and science organisation representatives.

To help set the scene for the workshop participants, Victoria University of Wellington’s Dr Melanie Johnston-Hollitt presented the SKA concept and suggested ways to inspire a new generation of radio astronomers.

Over the remainder of the day a range of ideas were brainstormed, including reworking the Australian *Window to the Universe* teaching resource (see anzSKA Newsletter 24) for New Zealand teachers, creating a virtual visit to a radio telescope site, inspiring students with visual resources such as posters or short films, and a numeracy resource to explore the magnitude of the ‘numbers of the SKA’.

New Zealand’s SKA Project Leader, Jonathan Kings from MED, said that the workshop was a great way to kick-start wider SKA education activities in New Zealand.

“As well as getting students interested in radio astronomy, the possibilities of extending educational resources into areas better known to New Zealand students, such as geothermal energy or the existing technology curriculum, are exciting,” says Jonathan.

## PULSE@Parkes Conducted Live from Europe

Dutch high school students took control of the iconic CSIRO Parkes radio telescope in Australia via the Internet on 28 May 2010 as part of CSIRO’s *PULSE@Parkes* program (see anzSKA Newsletter 24). Projects such as *PULSE@Parkes* show the potential for future radio telescopes such as ASKAP and the SKA to interest and inspire students around the world in astronomy.

Held at The Netherlands Institute for Radio Astronomy (known as ASTRON), the students from Emelwerda College had two hours to use the telescope to observe several pulsars and analyse the data they collected.

While it was daytime in The Netherlands it was around midnight in Australia. The 64-metre radio telescope was floodlit so that the students could see it move with a webcam.

The students talked via videoconference with CSIRO pulsar astronomer Dr George Hobbs in the telescope’s control room at Parkes, while Dr David Champion, an astronomer from the Max Planck Institute for Radioastronomy in Germany, visited ASTRON to assist with observations and tackle the students’ questions about pulsars.

According to *PULSE@Parkes* Coordinator Robert Hollow, the students were impressed by taking control of the 1000-tonne telescope. "They really appreciated the opportunity to interact with professional scientists and use a major telescope such as Parkes," says Rob.

CSIRO plans to build on the experience of *PULSE@Parkes* to develop remote observing education programs for ASKAP and later for the SKA. ASTRON astronomer Dr Marijke Haverkorn has been active in establishing a similar program, *Dwingeloo Live*, at ASTRON. She has worked with Emelwerda College teacher Cornelis de Boer to develop educational materials for Dutch students.

## Indigenous Art Tour Extended to South Africa

A selection of about 20 works from the *Ilgarijiri – Things Belonging to the Sky* exhibition of Australian Aboriginal art that was inspired by Indigenous and non-Indigenous astronomy (see AuSKA Newsletter 23) travelled to Cape Town as part of the *Communicating Astronomy to the Public* conference held in March 2010.

Conference participants from around the world discussed public education in astronomy and the many outcomes from the International Year of Astronomy in 2009. The *Ilgarijiri* artworks exhibited were a highlight, and the audience was very interested to hear presentations on aspects of Australian Indigenous Astronomy by Professor Steven Tingay and John Goldsmith from ICRAR. An important result of the conference was the establishment of a global network of people working in the area of Indigenous astronomy, including researchers from Africa, Australia, Canada and the United States.



Participants in the *Communicating Astronomy to the Public* conference with some of the *Ilgarijiri* artworks that were on display. Image Credit: John Goldsmith, ICRAR.

*Ilgarijiri* is a collaborative project between artists of Yamaji Art cooperative in Geraldton and ICRAR astronomers. During the International Year of Astronomy *Ilgarijiri* toured to Geraldton, Perth and Canberra, including the Australian Institute of Aboriginal and Torres Strait Islander Studies during the first national workshop on Australian Indigenous astronomy, drawing big crowds at each location.

For more information on the *Ilgarijiri* project visit <http://astronomy.curtin.edu.au/ilgarijiri> or <http://ilgarijiri.wordpress.com>.

## Subscribe to the International SKA Newsletter

The international SKA Program Development Office will soon be relaunching its regular newsletter, which brings together SKA-related news from the 20 countries involved in the telescope's development. If you don't already subscribe to the newsletter you can register your details on the international SKA website at [www.skatelescope.org/pages/page\\_genpub.htm](http://www.skatelescope.org/pages/page_genpub.htm) (see the 'SKA Newsletter' section at the top right of the page).

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