



Newsletter

May/June 2011

SA's science minister welcomes new commitment towards building the SKA 1

African astronomy strides ahead at MEARIM II gathering 2

African Telescope Array on the cards 2

New radio telescope planned for Mozambique 3

MeerKAT science takes off 3

Successful ThunderKAT kick-off 4

IAU Global Office of Astronomy for Development launched in SA 4

New Research Chairs give extra momentum to skills development for SKA South Africa 5

More international science experiments blossoming in the Karoo 6

Cutting-edge MeerKAT control room now operational 6

Reader's Cambridge sabbatical links to SKA phase I 7

Focus on women in physics 8

Blog along with the barefoot astronomer 8

SA's science minister welcomes new commitment towards building the SKA

South Africa is one of nine countries that have signed a letter of intent to see the Square Kilometre Array (SKA) built - a move that has been welcomed by Science and Technology Minister Naledi Pandor. The letter was signed on 2 April 2011 at a meeting of SKA stakeholders in Rome, Italy.

The signatories – Australia, China, the United Kingdom, France, Italy, Germany, Netherlands, New Zealand and South Africa – agreed to work together to secure funding for the next phase of the project. The signatory parties represent organisations of national scale and will coordinate groups carrying out SKA research and development in their respective countries. More than 70 institutes in 20 countries, together with industry partners, are participating in the scientific and technical design of the telescope.

Professor John Womersley, chair of the Founding Board, said: "Given the current economic environment, it is reassuring that so many partners have recognised the importance of supporting the SKA. Our partners have taken this step not only because of the inspirational nature of the

discoveries that the SKA will make, but also because of the economic benefits that international mega-science projects can bring to participating countries."

The SKA project will drive technology development in antennas, fibre networks, signal processing, and software and computing. Spin off innovations in these areas will benefit other systems that process large volumes of data. The design, construction and operation of the SKA will impact skills development in all partner countries.

An SKA Founding Board was established to guide the project into the next phase, and it was announced that the SKA Project Office will be based at the Jodrell Bank Observatory near Manchester in the United Kingdom from 1 January 2012. Professor Richard Schilizzi, Director of the SKA, says: "The move to Jodrell Bank Observatory comes at a crucial time as the project grows from a concept to an international mega-science project. The new location and facilities will support the significant expansion that is planned."



Artist's impression of the SKA telescope (SKA Project Office)

Square Kilometre Array (SKA) Forum, Banff, July 4-8, 2011

The 4th annual international Square Kilometre Array (SKA) event is being held this year at The Banff Centre, about 150 km from Calgary, Canada, 4-8 July 2011. SKA scientists and engineers from around the globe will participate in the event alongside politicians and industry representatives. South Africa will be represented by a high-level delegation led by the Minister for Science and Technology, Ms Naledi Pandor. Find out more at www.ska2011.org

More info on the SKA South Africa Project at

www.ska.ac.za

E-mail: marina@southernscience.co.za to subscribe to this newsletter of the SKA South Africa Project.

African astronomy strides ahead at MEARIM II gathering

Prof. Roy Booth, SKA South Africa

“Africa’s SKA bid has support throughout the continent,” said South Africa’s deputy minister for science and technology, Mr Derek Hanekom in his opening address at the second meeting of MEARIM (Middle East and African Regional Meeting of the International Astronomical Union – IAU). The meeting took place in Cape Town from 11–15 April 2011. He congratulated the IAU for providing this platform that has created a vibrant and growing community of astronomers.

Nearly 200 delegates from South Africa, Algeria, Burkina Faso, Egypt, Zambia, Zimbabwe, Nigeria, Rwanda, Morocco, Mauritius, Ghana, DRC, Burundi, Ethiopia, Sudan, UAE, Qatar, Bahrain and Lebanon attended the meeting. These African delegates were joined by participants from the UK, USA, Pakistan, Nepal, Japan, France, Germany, Denmark and Sweden.

“The hosting of this meeting in South Africa is timely, given the IAU’s plans to promote astronomy throughout the developing world,” Hanekom said. “This will require a huge effort on the education and outreach front.”

The meeting began with a talk on the new IAU Global Office of Astronomy for Development, delivered with great enthusiasm by its Director, Kevin Govender. The new African Astronomical Society was also launched during the conference (see box).

Just about all aspects of astronomy were covered in the meeting and Southern African instruments, new and existing, were discussed in some detail. It was with great excitement that the commissioning results from SALT were revealed, showing that sub-arcsecond imaging is now a reality. Many exciting new results from HESS – on pulsars and gamma ray bursts - were shown for the first time and

there was a lot of interest in the MeerKAT engineering developments, the new offset Gregorian dish design and the large survey scientific projects, several of which featured on the programme.

The formal launch of the African Astronomical Society (AfAS) took place during MEARIM II. This followed discussion and a meeting in Burkina Faso in December 2010 where the “Ouagadougou Declaration” was signed by the members of the working group. Astronomy and physics organisations from around the world congratulated the new society.

AfAS’s vision is to be the voice of astronomy in Africa in order to promote research and collaboration on the continent, and to facilitate the use of astronomy in addressing the challenges faced by Africa. Find out more at www.africanastronomicalsociety.org



During MEARIM II the African Astronomical Society (AfAS) was launched, with Pius Okeke (right) elected as its first president. He is congratulated by Bob Williams (left), president of the IAU.

African Telescope Array on the cards

South African astronomers and their colleagues in other African countries are investigating the conversion of decommissioned telecommunications antennae across the African continent into a radio astronomy VLBI network.

There are at least 26 satellite ground segment dishes, possibly more, spread out over Africa. Some are either out of use already, or likely to be out of use soon,” explains Dr Mike Gaylard of the Hartebeesthoek Radio Astronomy Observatory. “These dishes have become redundant because fibre-optic cables have taken over their telecommunications function, but with some refurbishment they can become a substantial and important network for radio astronomy.”

An African radio telescope network would fill in a major gap in the global VLBI network. “It will require a bit of work, but within a year or two we could be making the first observations,” says Prof Justin Jonas. “We will equip them with new receivers and control systems suitable for radio astronomy use.”

Scientists from South Africa and the UK visited Ghana early in 2011 to assess the suitability of the 32-m dish in that country for the planned African network. A 32-m telecommunications dish near the Hartebeesthoek Radio Astronomy Observatory (HartRAO) is also being considered for refurbishment as a VLBI instrument.



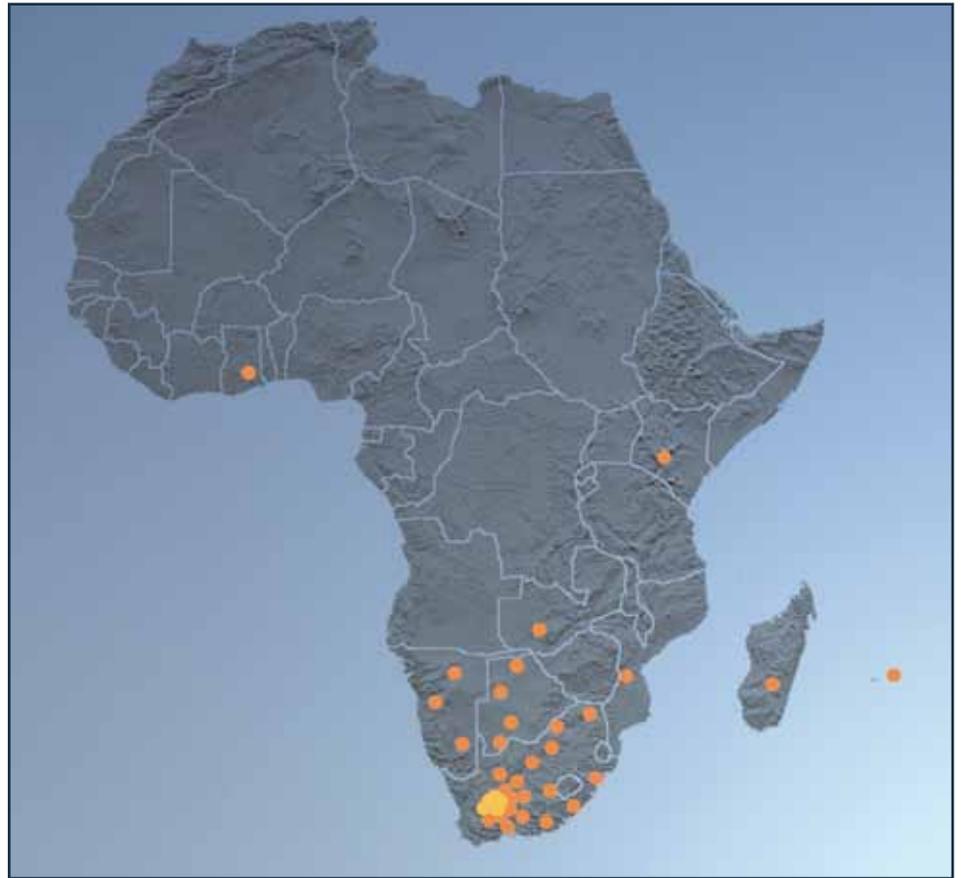
The decommissioned Vodafone 32-m satellite communications antenna at Kuntunse, Ghana

New radio telescope planned for Mozambique

South Africa will assist Mozambique with the construction of a new radio telescope adjacent to the country's Maluana Science and Technology Park over the next year. The radio telescope will boost postgraduate research and teaching programmes in radio astronomy at Eduardo Mondlane University and Mozambique's other universities.

"We are aiming to ensure that the Mozambique Radio Astronomy Observatory will be operational early in 2012," South Africa's science and technology Minister, Ms Naledi Pandor, said when she visited the Mozambican capital of Maputo during April 2011. "This would demonstrate our collective determination and capacity to the international community ahead of the SKA site decision."

Mozambique is one of South Africa's partners in the bid to host the SKA, and a potential host country for SKA stations. Other African partner countries are Zambia, Mauritius, Madagascar, Ghana, Kenya, Botswana and Namibia. "Skills development and training of students in radio astronomy is one of the focus areas of our efforts to assist the partner countries in participating in the SKA science," Minister Pandor added.



Layout of SKA core and stations across Africa

MeerKAT science takes off

Prof. Roy Booth, SKA South Africa

The principal investigators of the MeerKAT Large Survey projects assembled in Cape Town on 17 & 18 April 2011 for their first meeting with the project staff. The meeting was preceded by telephonic preparatory meetings with the project system engineers.

A set of 20 km baselines was agreed and will be costed for implementation by the project team. It was agreed to attempt to speed up the introduction of all three frequency bands (1.0–1.7 GHz, 0.6–1 GHz and 8–14.5 GHz) and to attempt to extend the lower end of

the first receiver to allow higher red-shift space to be investigated earlier by the high-z HI team.

Of special interest was the correlator and pipeline software and their ability to cope with concurrent continuum, polarisation and spectral line observations, as well as the demands of the pulsar projects.

The teams were invited to help with further pipeline and other software developments and will be able to test their observing modes

and software using KAT-7, when the major commissioning of that precursor array is completed.

It was agreed by all that such meetings should be arranged on an annual basis and that the technical communication channels that had been established prior to the meeting should remain in place to serve regular discussions. All of the discussions were deemed to be highly relevant to the SKA project, as expected given MeerKAT's status as an SKA precursor.



Participants in the MeerKAT Large Survey PI meeting, April 2011, in front of the MeerKAT project office in Cape Town

Successful ThunderKAT kick-off

The first meeting of the ThunderKAT project was held at Arniston (South Africa) from 19-21 April 2011. ThunderKAT is the MeerKAT Large Survey Project on transient radio (synchrotron) emission associated with accretion and explosive events (see also <http://www.ast.uct.ac.za/transients/>).

The workshop attracted 32 participants representing a wide range of expertise in science (compact accreting binaries, supernovae and gamma-ray bursts), software, data calibration and simulation, and multi-wavelength observations of potential ThunderKAT targets. They came from a range of countries, including South Africa, Australia, UK, the Netherlands, Sweden, France and the USA.

The workshop centred around discussions for developing software towards real-time transient detections in the image plane with MeerKAT and KAT-7, and the involvement of ThunderKAT in early commissioning science with KAT-7.

A strategy for multi-wavelength follow-up of radio-detected transients at optical, infrared, sub-mm, X-ray/gamma-ray wavelengths was discussed.

A full record of the workshop (including the programme, participants and all the talks) is available at the workshop web site: <http://www.ast.uct.ac.za/arniston2011/>

The organisers of the workshop acknowledge the financial support from a research development fund of the World University Network, a network of universities involving, amongst others, the institutes of the PIs of the LOFAR, ASKAP and MeerKAT transient surveys, namely Southampton, Sydney, and Cape Town, respectively.



Prof. Patrick Woudt (University of Cape Town) & Prof. Rob Fender (University of Southampton) – co-principal investigators, ThunderKAT (at KAT-7 site in South Africa)



Participants in the first ThunderKAT science meeting, April 2011, Arniston, South Africa

IAU Global Office of Astronomy for Development launched in SA

A new Global Office of Astronomy for Development (OAD), that will function under the auspices of the International Astronomy Union (IAU), was launched in Cape Town on 16 April 2011.

This office will be the nerve centre of a partnership between the IAU and South Africa's National Research Foundation to coordinate a wide range of worldwide activities designed to use astronomy as a tool for education and development. This is in line with the IAU's vision to use astronomy to stimulate development in the developing world. It builds on the success of 2009 as the International Year of Astronomy.

"In South Africa, people in the astronomy field, from those working on the ground to the highest levels of government, share the vision that astronomy will play a significant role in the development of society," South Africa's Minister for Science and Technology, Ms Naledi Pandor said at the launch. The President of the IAU, Prof. Robert Williams, spoke of the incredible potential of astronomy to impact on the developmental aspirations of Africa and the rest of the world. "It is appropriate that this global coordinating

office be situated in Sub-Saharan Africa as this is a focus region for the IAU's strategic plan," he said.

Kevin Govender, the first Director of the OAD, explained that while Africa would remain a region of strong focus, the office had to play a global role. "Lessons from developments in Africa and other parts of the world will be used to impact on every part of the world," he said. "I look forward to interacting with the broader astronomy community, both amateur and professional, to see how we can together realize the incredible potential of astronomy for development."

"This is a very important occasion for all of Africa, as it represents a project where the continent will take on a leadership role in coordinating a global development activity," commented Pheneas Nkundabakura, a young astronomer from Rwanda. "South Africa has demonstrated its capacity to host this office on behalf of Africa, through the training of astronomers like myself and in supporting astronomy development across the continent."

The OAD will mobilise talented professional and amateur astronomers, engineers and teachers around the world in the service of developing countries. The wide range of activities that will be coordinated by the OAD include the education of young disadvantaged children, science education at all levels, the training of school teachers and building up research capacity in university departments throughout the developing world.

(Source: www.iau.org)



Thumbs up for astronomy in Africa! Kevin Govender (Director: Global Office of Astronomy for Development) with Patrice Okouma, a member of the working group for the African Astronomical Society. Patrice, originally from Gabon, is studying towards a PhD in applied mathematics, majoring in cosmology.

New Research Chairs give extra momentum to skills development for SKA South Africa

Four of the five SKA SA Research Chairs allocated to South African Universities have now been filled by leading international researchers. "We are very excited that South Africa's MeerKAT telescope is generating significant interest in the international community, and is attracting high calibre researchers to the country," says Kim de Boer, manager of the SKA South Africa Human Capacity Building Programme. "These top researchers will add significant impetus to our ongoing efforts to expand the region's capacity in astrophysics and engineering."



Prof. Roy Maartens

Professor Roy Maartens took up the chair in **Astronomy and Astrophysics at the University of the Western Cape (UWC)** on 1 October 2010. Following studies and an early career in South Africa, Maartens was founding Director of the Institute of Cosmology and Gravitation, which became a premier cosmology research group in the UK.

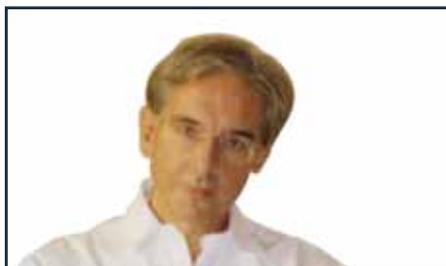
He has been a long-term visiting professor at the University of Cape Town, the University of KwaZulu-Natal, and the Inter-University Centre for Astronomy and Astrophysics, India. His group at UWC will focus on building theoretical models of the universe and testing them against observations, using in particular the current and upcoming data from radio telescopes, including the MeerKAT and later the SKA. "Cosmological observations of the background radiation and of galaxies and gas are delivering massive sets of data at ever higher precision, allowing us to test the various models that try to explain our universe," Maartens says. "MeerKAT and other SKA pathfinders will open new frontiers in our ability to probe the growth of structure and the accelerating expansion of the universe, and my team will aim to exploit these opportunities to develop new insights and new constraints on theories of the universe."



Prof. David Davidson

Prof. David Davidson was internally appointed to the chair in **Electromagnetic Systems and EMI Mitigation at Stellenbosch University** on 1 January 2011. Davidson studied in South Africa, and then worked at the Council for Scientific and Industrial Research before joining Stellenbosch University in 1988, where he has spent most of his academic career. During research sabbaticals, he has been a visiting scholar at the University of Arizona in 1993, a Visiting Fellow Commoner at Cambridge University in 1997, a guest professor at the Delft University of Technology in 2003 and an honorary visitor at the University of Manchester in 2009. Davidson's main research interest is computational electromagnetics. His research group will work on radio astronomy instrumentation, in particular the design and analysis of electromagnetic systems and the mitigation of electromagnetic interference, with specific relevance to MeerKAT and SKA. The focus on electromagnetics embraces reflector antenna systems, wideband feeds and receivers, as well as phased array feeds.

The research chair in **Multi-wavelength Extragalactic Astronomy at the University of Cape Town** has been filled by Prof. Claude Carignan, an expert on galaxy dynamics and dark matter. Carignan is from the University of Montreal in Canada and has been involved in the development of astronomical instrumentation on next generation telescopes, as well as in developing astronomy in Burkina Faso. His research focus will be galaxy dynamics and dark matter.



Prof. Sergio Colafrancesco

Professor Sergio Colafrancesco, currently a professor at the University of Rome and senior scientist with the Italian astronomy research institute, INAF, will take up a research chair in **Radio Astronomy at the University of the Witwatersrand** later this year (around August 2011). His research interests include observational and theoretical research in radio astronomy, tackling the most relevant challenges imposed by the advances in cosmology, extragalactic astrophysics and astro-particle physics. These include dark matter, dark energy, dark ages and large scale

structures in the universe, as well as tests of general relativity and gravity; and the origin and evolution of cosmological magnetic fields.

An excellent candidate has been identified to fill a chair in **Radio Astronomy Techniques and Technologies at Rhodes University**, and negotiations are currently underway to confirm the appointment.

MeerKAT attracts talented postdocs

The SA SKA Postdoctoral Fellowship Programme provides postdoctoral scientists from around the world with an opportunity to engage in research projects related to the mission of the South African SKA project. The following SKA SA postdoctoral fellows have been appointed:

- Dr Natasha Maddox, University of Cape Town. Research field: Preparation for MeerKAT science, and in particular the MHONGOOSE and LADUMA surveys.
- Dr Richard Armstrong, University of Cape Town. Research field: Radio transients science, with a focus on developing transient detection algorithms for the ThunderKAT survey.
- Dr Valerio Ribeiro, University of Cape Town. Research field: Radio transients science (ThunderKAT) and developing radio astronomy in SKA SA partner countries.
- Dr Mattia Vaccari, UWC. Research field: Multi-wavelength studies of galaxy formation evolution, with particular emphasis on using the data over the fields to be observed by the MIGHTEE and LADUMA surveys.
- Dr Jon Zwart, University of the Western Cape. Research field: Radio continuum science, in particular developing MeerKAT pipelines for the MIGHTEE and other surveys.

A postdoctoral fellowship, in Extragalactic Molecular Gas Studies, is still available at the University of Johannesburg. The candidate will work on an observational programme of molecular gas studies, as a precursor to related programmes using MeerKAT.

Contact: Dr Lerothodi Leeuw, lleeuw@uj.ac.za, for more information.

More international science experiments blossoming in the Karoo



William Walbrugh (junior project manager for PAPER and C-BASS)

The Precision Array for Probing the Epoch of Re-ionisation (PAPER) project at South Africa's Karoo astronomy site will soon consist of 64 antennae. A further 26 antennae – being shipped from West Virginia – will arrive at Cape Town harbour during the first week of June 2011 and will then be deployed on site.

When the PAPER science team arrives in South Africa later in June 2011, local technical interns will assist them with the assembly of the antennae, ground reflectors and electronic components. Commissioning of the 64-antenna array is tentatively scheduled for the end of June. An immediate challenge faced by the project is to provide grid power to the PAPER site through a safe and reliable, yet cost-effective design. The use

of an intermediate voltage system (3.3 kV) is investigated here, which can also act as a prototype for similar systems that might prove useful to some of the long baseline antennae of MeerKAT. Together with this, a fibre optic link will be installed to the nearest KAT-7 infrastructure about 2 km away from the site.

Another international partnership project in the Karoo is the C-Band All Sky Survey South (C-BASS South) telescope, with its counterpart based at the Owens Valley Radio Observatory in the USA. While the antenna structure for C-BASS is already in place in the Karoo, the receiver is currently being developed at Oxford University by a South African PhD student Charles Copley, with assistance from the University of Manchester. Once the receiver arrives in South Africa, it will be tested at the Hartebeesthoek Radio Astronomy Observatory (HartRAO). Following that, the receiver, with all its ancillary components, will be consigned to the C-BASS site at Klerefontein in the Karoo where it can take full advantage of the radio silence and low cloud percentage. The deployment of C-BASS is expected to occur as soon as August/September 2011.



PAPER antennae



An aerial view of the PAPER experiment



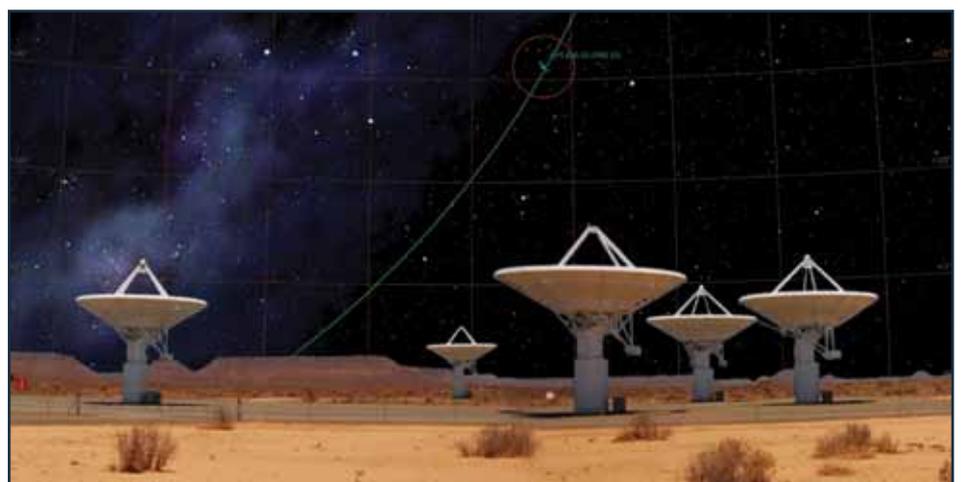
C-BASS antenna structure

Cutting-edge MeerKAT control room now operational

The new control room at the Cape Town MeerKAT project office is fitted with a live web cam link to the KAT-7 telescope site in the Karoo, as well as a real-time virtual sky display, based on the popular open source Stellarium software. This provides telescope operators with a synthesised view of the Karoo sky that includes radio and optical sources, satellites and the antenna pointing positions.

“KAT-7 and MeerKAT will use Stellarium to give the telescope's operators a real-time view of the sky,” explains Simon Ratcliffe, computing architect on the MeerKAT team. “This will help us to avoid observations that run too close to satellites and other sources of interference.” Future developments will include overlays that show historical observations, at radio and other wavelengths, and allow easy retrieval of archived data.

“We have made a number of modifications to Stellarium in order to integrate it with our telescope control system and include radio sky data,” Simon adds. “We will be pushing these changes back to the host project which will allow anyone to download Stellarium and get a view on what KAT-7 is currently observing.”



Reader's Cambridge sabbatical links to SKA phase I

Prof. Howard Reader, head of the EMC and Metrology research team at the Electrical and Electronic Engineering Department, Stellenbosch University, spent the last six months of 2010 as a visiting researcher at the Cavendish Laboratory in Cambridge. Here, he collaborated with Prof. Paul Alexander, head of the astrophysics group, Dr Andrew Faulkner, the SKA phase I systems engineer and post-doctoral fellows Dr Eloy de Lera Acedo and Dr Nima Razavi-Ghods.

Over the last five years, Reader's research team in Stellenbosch has been contributing to the EMC (electromagnetic compatibility) and RFI (radio frequency interference) mitigation modelling and measurement of South Africa's SKA demonstrators KAT-7 and MeerKAT. The South African XDM and KAT-7 dishes, their modelling, inter-connection, lightning protection and RFI quietness have all been carefully evaluated as part of the work undertaken. This has been done in collaboration with the mechanical and civil engineering project teams.

Reader used the sabbatical opportunity to learn about inter-planetary scintillations, early aperture array development and ALMA with his collaborators. He points out that there are obvious parallels between the system requirements for ALMA and MeerKAT projects. The sabbatical then formed around the development and metrology of scaled and full-size aperture array elements for the SKA phase I. Together with his host research group, Reader developed in-house techniques, using his experience on the KAT systems, to study the radiation properties and coupling of scaled-antenna elements. Some of the methods included time-domain gating and EMC cabinet principles to isolate the effects of the environment in the testing procedures.

In addition to this, common-mode current issues, prevalent in any-cabling-based systems, were identified using broadband probes and battery-driven instrumentation. "We also held weekly SKA research meetings on progress made and topics such as the end-to-end simulation of SKA systems. During these meetings, or on other occasions when there were visiting SKA teams, we critically discussed arrayed element properties, large scale deployment, interference and protection issues," Reader explains. "A healthy and active debate is required on these subjects for ultimate project success."

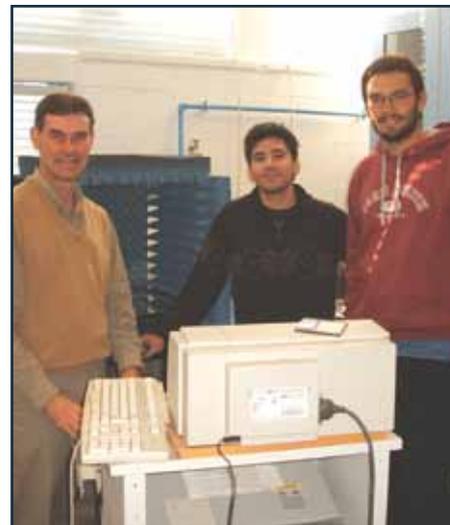
Reader also visited Astron, looking particularly at the Dutch aperture array pathfinders. "It was a valuable opportunity to examine interference mitigation, EMC and lightning issues dealt with the LOFAR and EMBRACE array systems together with their project

engineers," Reader says. "We then visited Manchester University to meet with SKA project team members concerning the choice of AAVP elements and array optimisation techniques. Signal transport, cabling and shielding at the Jodrell Bank site were also examined."

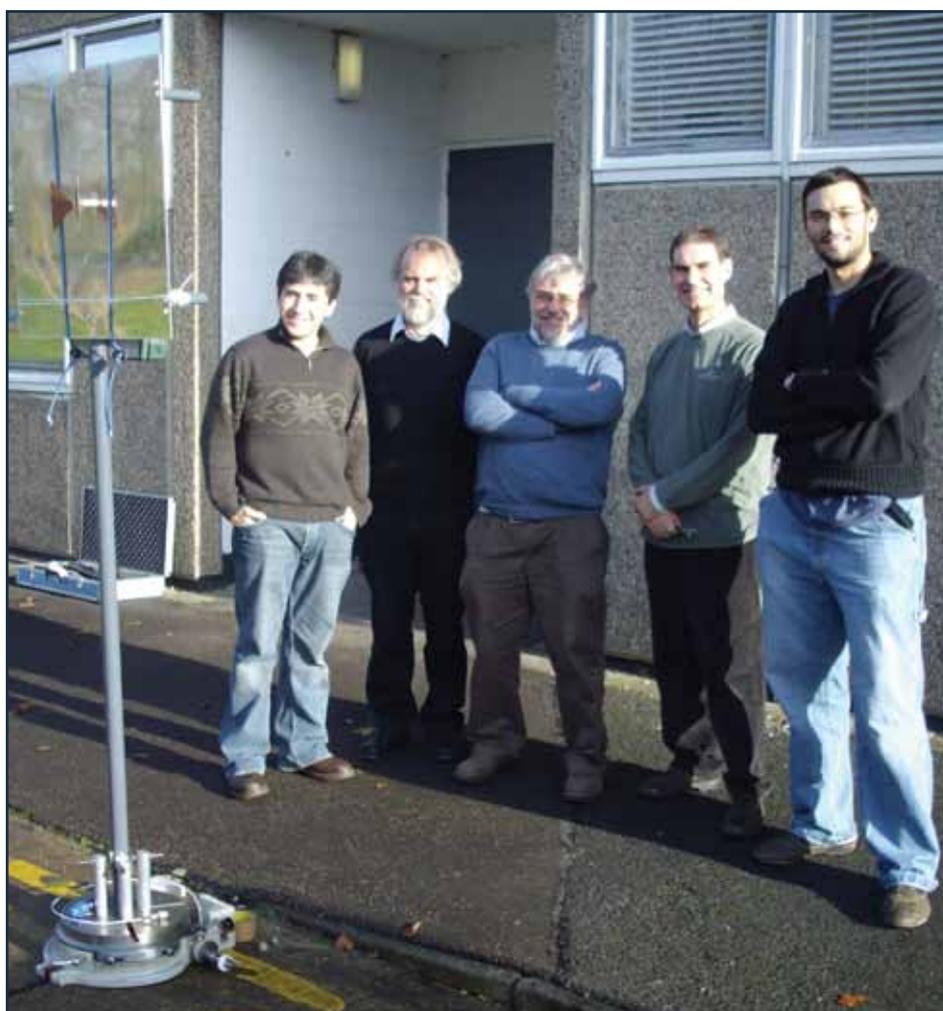
"The major event during the sabbatical occurred when the Aperture Array Verification Programme (AAVP) members from all participating organisations came to Cambridge for a two-day workshop," he says. "I was asked to start with a tutorial review on EMC, Metrology and RFI mitigation, and my work in Cambridge and South Africa."

Back in Stellenbosch, Professor Reader's group continue their research on MeerKAT EMC/RFI issues. Recent work, for example, has been a laboratory and site investigation on the signal attenuation levels obtained by burying cables or placing equipment rooms in bunkers. The sabbatical collaborations continue informally on the AAVP programme. They are studying some of the scaled-element arrays to contribute particularly to the deployment, layout and system hardening

for the AAVP. "There are universal system integrity issues which relate as much to the AAVP as they do to telescope deployment," Reader explains. "Ultimately, both aperture arrays and dish telescopes will appear on SKA sites and electromagnetic harmony will be essential."



Prof. Howard Reader (left) with Dr Nima Razavi-Ghods and Dr Eloy de Lera-Acedo making measurements on scaled aperture array bow-tie elements.



Dr Nima Razavi-Ghods, Dr Andrew Faulkner, Prof. Paul Alexander, Prof. Howard Reader and Dr Eloy de Lera Acedo during the first measurement of a scaled aperture array element outside the Cavendish labs.

Focus on women in physics



Two of the plenary speakers at ICWIP 2011: Prof. YanLai Yan (People's Republic of China, left) explained the physics of ancient Chinese chime-bells, while Dr Archana Bhattacharyya (India, right) presented a talk on space weather phenomena in the equatorial ionosphere.

The 4th IUPAP International Conference on Women in Physics (ICWIP), held in Stellenbosch from 5-8 April 2011, was attended by more than 230 delegates from about 50 countries. In addition to a full scientific programme, the conference devoted time to debating ways of attracting girls into physics as well as recruiting and retaining women physicists.

SKA South Africa co-sponsored the event and supported the participation of two plenary speakers – Dr Rachel Ivie (USA) and Professor YanLai Yan (People's Republic of China).

Dr Ivie, Assistant Director of the Statistical Research Centre at the American Institute of Physics, presented the first results from a global survey of physicists. She showed that, despite regional differences, there are significant issues that are common to women around the world and that many of these issues are different from those encountered by men.

Blog along with the barefoot astronomer



Simon Ratcliffe

The barefoot astronomer blog is “a story of science, engineering and a continent called Africa,” says Simon Ratcliffe. He is one of a team of engineers who are developing the software that will process and store the vast amounts of data from the MeerKAT telescope. Simon finds radio astronomy appealing because of the way it marries pure science with engineering challenges. “I hope to use this blog to showcase our work that is not only doing better science and building better radio telescopes, but also building a better tomorrow for our country and the continent as a whole,” he says.

Simon blogs at:
<http://barefootastronomer.com/>
and tweets at @BFAstro

SKA South Africa Project Office

Street address:
17 Baker St, Rosebank
Johannesburg
South Africa

Postal address:
PO Box 522940
Saxonwold
2132

Tel: +27 (0)11 442 2434

The MeerKAT Engineering Office

Postal/Street address:
SKA SA
3rd Floor, The Park
Park Road
Pinelands
7405
South Africa

Tel: +27 (0)21 506 7300

Directions at:
<http://www.ska.ac.za/contactus/index.php>



**science
& technology**

Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA



**National
Research
Foundation**