NEW STAFF

Dr. Robert Braun appointed as the SKA Science Director, starting on 13th June, 2013.

Robert comes to us from his position as Chief Scientist of CSIRO Astronomy and Space Science. Before CSIRO he worked at ASTRON for 18 years, for the last 4 of which he held the position of Head of the Scientific Staff. In the mid to late 80s he was based at NRAO in Socorro. Robert is one of the world’s experts on interferometry, with deep knowledge of the techniques required to push telescopes to their limit. He has been engaged in SKA activities since its inception in the early 90s; indeed Robert, working with Russ Taylor, edited the first SKA science case in 1999. Robert’s research career has focused on the interstellar and circum-galactic medium of our own galaxy and its nearby and more distant cousins. He is an expert in the study of neutral hydrogen, but also studies the physics of such objects through radio continuum and infrared. Robert is a highly-cited researcher with more than 100 refereed publications.


FEATURED STORY: INTERESTED IN PARTICIPATING IN THE DESIGN OF THE WORLD'S LARGEST RADIO TELESCOPE?

On 12 March 2013, the SKA Organisation released its Request for Proposals (RfP) to the SKA community, inviting research organisations and industry to participate in the design of the SKA telescope.

The SKA Organisation is proceeding with the design phase for the SKA telescope described in the Project Execution Plan (PEP) (available at http://www.skatelescope.org/publications/ in Project documents). Two stages are identified in the preconstruction phase: stage 1 is a requirements analysis and preliminary design stage and stage 2 is a detailed design stage. The RfP covers both stages although consortia are free to propose for stage 1 only.
The purpose of the design activities is to prepare the SKA project at element level to proceed with the construction of the first phase of the SKA telescope (SKA1). The design activities undertaken by the consortia shall not restrict future competitive procurement of Elements. The SKA intellectual property policy requires that consortia ensure that the SKA has unrestricted access to any foreground IP generated within the design phase for the purpose of the construction and operation of the SKA telescope.

The value of the design effort in stage 1 and 2 for each element is assigned by the SKA Board. All work to respond to this call and to undertake the work is to be funded by the consortia responding to the call. There exists no provision for financial support by the SKA Organisation to the consortia.

In establishing the scale of the effort anticipated in the design of each element guidance can be found in the project execution plan. The consortia are free to propose justified modifications. Following the earlier work and taking inputs broadly from the community and the precursors and pathfinders, the SKA project office has developed a baseline design for the telescope. This baseline design is considered the starting point for the preliminary design phase. The baseline design aims to provide interpretation to the requirements for the SKA telescope as a system and does not imply a decision by the SKA Organisation to proceed with a particular solution or technology.

The telescope is broken down into Elements that largely follow a traditional radio telescope work breakdown structure and these are described in the documentation associated with this call. These Elements are applicable across the two sites; their scope, where applicable, includes both of the Elements required at the South Africa Site and the Australia site, incorporating any necessary differences.

Based on past SKA Board decisions certain elements of the baseline design are firmly established. The telescope sites are selected; as are the basic parameters of the telescope configurations in the South Africa and Australian sites.

**Financial support provided by Australian and South African governments**

As previously stated, there exists no provision for financial support by the SKA Organisation to the consortia. Nevertheless, the Australian and South African governments launched mechanisms in their respective countries to assist research and development related to SKA pre-construction activity by providing financial assistance to national organisations wishing to participate as partners.

Through the SKA Pre-Construction Grants Program, the Australian Government has made $AUD18.8 million (approximately €15.3 million) available in grant funding to support the involvement of Australian organisations in the SKA Pre-construction Project. First announced on 27 December 2012 and officially opened in March 2013, the SKA Pre-construction Grants Program is designed to complement and support the SKA Organisation’s RfP for consortia of partners to undertake relevant pre-construction work-packages. Funding provided under the program will assist Australian organisations to participate in the work of partner consortia chosen by the SKA Organisation through the RfP process. The Program aims to:

- Enable the SKA Organisation to draw on relevant resources and capabilities from Australian organisations to meet the requirements of the Pre-construction Project.
- Provide opportunities for Australian Organisations to participate in the Pre-construction Project, to gain experience within the SKA Project and to further develop capabilities needed to help deliver the SKA Project in the longer term.
- Enhance and develop Australia’s overall capability to participate in and contribute to the SKA Project.


Similarly, SKA South Africa announced that South African industry and institutions with appropriate existing expertise may be eligible for financial assistance on a shared cost, shared risk basis towards participation in the Square Kilometre Array (SKA) design phase, extending to 2016. “The SKA is an iconic and global science project and we are excited to be able to assist local industry and institutions with appropriate skills in participation in the initial design phase” said Dr Jasper Horrell, General Manager: Science Computing and Innovation at SKA SA. “This involvement should serve to strengthen the global competitiveness of local organisations in high tech domains, focused on the SKA, but extending beyond radio astronomy”. Expressions of Interest are invited from registered South African organisations wishing to participate as partners in the SKA South Africa response to the RfP. Financial assistance for local organisations is being
targeted in the areas of Dishes, Central Signal Processor (correlator/beamformer), Science Data Processor and Signal & Data Transport and Synchronisation & Timing. Instructions for registering interest and pre-qualification application forms for financial assistance are available from public.ska.ac.za/industry. Organisations must respond before 17h00 on 22 April 2013 (SAST). SKA South Africa will facilitate the introduction of programme partners into the appropriate work package consortia.

**DEVELOPMENTS**

1. On the science front...

Recent work from the Science perspective has included the re-organisation of the Science Working Group and the first science assessment workshop (see more details below in the Workshops and Meetings section).

The Science Working Group (http://www.skatelescope.org/people-contacts/committees-working-groups/swg-general-description/) is a scientific advisory group that provides input to the Office of the SKA Organisation on issues relating to the design, construction, and future operations of the SKA that are likely to affect the Observatory’s scientific productivity and user relations. The SWG is organized into a set of Science Teams. Each Science Team has a focus on a specific aspect of the larger SKA Science Case. Current Science Teams are:

- Epoch of Reionization & the Dark Ages
- Fundamental Physics with Pulsars
- H I and Galaxy Evolution
- Cosmology
- Cosmic Magnetism
- Astrobiology/Cradle of Life
- Continuum Surveys
- Radio Transients

Science Teams meet on a regular basis, both via telecons/videocons and in face-to-face meetings, to each Science Team, to review progress.

*Cosmic Dawn-Epoch or Reionization Science Assessment Workshop, held at the SKA Office on 26-28 March 2013*
Membership
Members of the Science Teams provide advice and guidance, based on their experience with existing telescopes and from the perspective of potential users of the SKA, on the design and development of the SKA. Specific activities include (i) Providing advice on the science requirements for the SKA, such as the suite of expected measurements, processing approaches, and data products; (ii) Providing advice on the expected operation of the telescope; (iii) Making recommendations about potential improvements, particularly as they result from emerging research; and (iv) Serving as liaisons to the broader community of SKA science and design and development progress and science at fora such as major astronomy meetings and colloquia at universities and astronomical research institutions.

Membership on Science Teams is open to any researcher with a science interest in SKA and willingness to contribute an appropriate level of effort toward SKA science needs. If interested in joining a Science Team, please contact the Science Director or the Chair of the relevant Science Team with a statement of interest and expected contribution.

2. On the engineering front…
2.1. The Dish Verification Antenna (DVA-1)

The DVA-1 project in Canada is progressing on many fronts. The foundation is complete and now sits beneath a 3m pile of regolith to post-load the soil. Trenching for power and data is also complete.
To improve surface accuracy the primary and secondary molds have been faired. Results on the secondary are extremely good with an error of \( \sim 0.1 \text{mm rms} \) from the design shape.

Measurements of the primary are underway and are expected to be \( < 0.5 \text{mm rms} \). Fabrication of the secondary reflector will begin in mid-April, followed by a large scale infusion test panel for the primary reflector. Layup and infusion of the primary reflector should be complete by July.
Steady progress is being made on the telescope pedestal by Matt Fleming’s team at Minex Engineering in California. With the major pieces complete, work is focused on integrating parts and measuring performance.

Other subcontractors such as Profile Composites, FormaShape, and Vectorworks Marine are respectively fabricating sub-components such as carbon feed legs, composite backing pieces, and dish rim connectors. Integration of DVA1 assemblies will begin in early summer with testing expected to begin in the fall.

2.2 Kermode FPGA Board

Testing of NRC’s Kermode FPGA board is nearly complete. The board is being developed for the Advanced Focal Array Demonstrator (AFAD) and is well suited to SKA1-scale beamforming, correlation, as well as other I/O intensive signal processing.

Based on the Industry Standard AdvancedTCA platform, each board has eight Xilinx V6-SX475 FPGAs each with two 4GB memories. The total I/O date rate is 1200 Gpbs via the Zone 3, 2 and four front panel FCM connectors. The board will soon be available commercially through Nutaq, and uses their board support development kit to facilitate rapid development. For more information contact Gary.Hovey@nrc.ca
3. The DOME Project: When Big Bang Meets Big Data

Progress at the ASTRON & IBM Center for Exascale Technology
Albert-Jan Boonstra (boonstra@astron.nl) and Ton Engbersen (aj@zurich.ibm.com)

The previous SKA Newsletter (http://www.skatelescope.org/wp-content/uploads/2011/03/ SKA_NEWSLETTER_VOLUME_25.pdf) included a report on the DOME project, a collaboration between ASTRON and IBM in which novel approaches in exascale computing are being investigated at the newly established ASTRON & IBM Center for Exascale Technology in Drenthe, the Netherlands. In December 2012, SKA South Africa joined ASTRON and IBM in the DOME project (read more: http://www.skatelescope.org/news/big-bang-meets-big-data/). Scientists will collaborate remotely and at the Center for Exascale Technology. More specifically, scientists from SKA South Africa will focus on fundamental research into signal processing and advanced
computing algorithms for the capture, processing, and analysis of SKA data. The DOME team is researching and prototyping micro-server architectures based on liquid-cooled 3D stacked chips. The team in South Africa will extend this research to make the micro-servers “desert proof” to handle the extreme environmental conditions at the SKA telescope sites. The third focus area of the South Africa collaboration is using the MeerKat telescope for developing and testing a sophisticated software programme that will aid in the design of the entire computing system holistically and optimally, taking into account cost and performance trade-offs.

The DOME project was presented at CeBIT 2013 in Hannover as part of the Big-Data focus area of the IBM booth. CeBIT was opened by Dr. Angela Merkel, Chancellor of the Federal Republic of Germany. The picture shows the Chancellor at the IBM Booth talking to the IBM Germany General Manager Martina Koederitz. The inset (left below) shows some of the project results presented at the DOME booth: a 3-D stacked chip, a phase-change memory chip, a low power ADC chip so small a magnifier is needed to see it, and a very thin photonic link replacing a wire stack the size of a small tree trunk. Also a printed circuit board for a micro-server was on display, produced by a manufacturer in Drenthe, the Netherlands.

In March, at the third face-to-face meeting at ASTRON the progress of the DOME project was presented and discussed. One of the results presented was the computational and data transport cost for parts of the LOFAR and SKA phase-one signal processing chains. This work is part of and based on the LOFAR retrospective analysis. The figure shows, as an example, how the compute requirements for different processing steps scale with number of telescope stations.

![Compute requirements for different processing steps](image)

*This figure shows how the compute requirements for different processing steps scale with number of telescope stations.*
The DOME project is currently recruiting new employees, several positions are still open. On March 26, IBM and ASTRON scientists hosted a SmartCloud virtual recruiting event for several open positions within the DOME project. The on-line event with presentations, questions and answers was well-attended.

The initial five-year DOME collaboration is realized with financial support of the Dutch Ministry of Economic Affairs and from the Province of Drenthe. More information about the DOME project can be found at:

- www.dome-exascale.nl
- DOME photos: http://www.flickr.com/photos/ibm_research_zurich/
  sets/72157629212636619https://www.youtube.com/watch?v=zU7KNRpn6co
- Dome videos: https://www.youtube.com/watch?v=zU7KNRpn6co

NEWS FROM PRECURSOR TELESCOPES AND PATHFINDERS
1. First Call for Proposals for the MWA (Murchison Widefield Array)

The first Murchison Widefield Array (MWA) Call for Proposals is now open, from March 1 to May 1, 2013. The proposal template is available from http://mwatelescope.org and should be read in conjunction with the MWA Announcement of Opportunity (AO), available from the same URL. The MWA, an SKA precursor instrument, is a next generation low frequency radio telescope, located on the pristine site of CSIRO’s Murchison Radio-astronomy Observatory in Western Australia. This first Call covers the observing period designated 2013-B (July - December 2013). A total of 600 hours of observing time is available during this period, as detailed in the AO
documentation (in the Guaranteed Time and Director’s Discretionary Time categories – note that no Open Access allocation is available in 2013-B).

As outlined in the AO, the final pre-operations briefing for potential users was held on February 25/26, following the close of the Expression of Interest stage (January/February 2013). Notes from the pre-operations meeting, plus MWA Management Team presentations made during that meeting, are available at http://mwatelescope.org/meetings/eoi-perth-2013/

At this stage, the timeline to the commencement of MWA operations is as follows:

May 1, 2013: proposals due with MWA Director;
Mid May, 2013: MWA Time Allocation Committee (TAC) meets to assess and rank proposals, with recommendation to MWA Director;
Early June, 2013: proposal teams notified of TAC outcomes;
Mid June, 2013: proposals are scheduled for observation during 2013-B;

2. ASKAP update

Following the celebrations of the ASKAP and Murchison Radio-astronomy Observatory (MRO) Opening Ceremony in October 2012, CSIRO’s ASKAP team now focuses on continuing

A number of CSIRO’s Australian SKA Pathfinder antennas at the MRO, where engineering and science commissioning continues.
engineering and science commissioning activities. Using the ASKAP antennas at the Murchison Radio-astronomy Observatory (MRO), the team demonstrated single- and multi-beam observations using three phased array feed receivers. The results reflect excellent progress and confirm that the ASKAP’s preliminary systems are working as expected.

Remote operation of the ASKAP antennas was also successfully achieved for the first time from the Sydney headquarters, over 3,400 km away. The tests provide insight into the remote science operations and observations that will take place with ASKAP and a national and international research community, resulting in increased efficiency for commissioning activities in a remote desert environment.

The new MRO Control Building, a state-of-the-art power and data distribution hub with two layers of RFI shielding, was completed. The building is a unique facility which houses power distribution, networking and communications equipment, telescope control computers, and the complex digital processing, beamforming and correlator equipment to be used by ASKAP and other major instruments under development at the MRO.

CSIRO’s ASKAP team has successfully controlled its ASKAP telescope in Western Australia from its Sydney based Science Operations Centre (SOC) – a distance in excess of 3,400km. The SOC will be an invaluable platform as remote commissioning continues to ramp up in earnest.

Exploring the Universe with the world’s largest radio telescope
3. All systems go, say MeerKAT project leaders

The South African SKA site in the Karoo is currently a hub of construction activity, and plans are on track to deliver the 64 MeerKAT antennas by the end of 2016, says MeerKAT project manager, Willem Esterhuyse. “Antenna 1 will be installed by December 2013.”

“The project team is motivated to build the best telescope we can,” he said. (MeerKAT is one of the SKA precursor telescopes). “We are confident that we will build it to budget, and on schedule, while exceeding the original specifications.”

The work being done by the MeerKAT team is providing strong momentum to integrate MeerKAT
into SKA Phase 1. Discussions about this integration are in progress between SKA SA and the International SKA project.

Various subsystems of MeerKAT are at the requirements review, or preliminary design review, stages. The full qualification, and critical design review, is expected to be completed early in 2014.

“Until the SKA is completed, MeerKAT will be the most sensitive radio interferometer in the world in the L-Band,” Esterhuyse explains. He noted that his team has been able to increase the sensitivity of its offset Gregorian dish design from 220 m2/K to 300 m2/K by using system and value engineering processes, without increasing overall cost. “This constitutes a 36% improvement in sensitivity, and an 86% improvement in survey speed, compared to the initial specifications!”

**Infrastructure update**

The upgrade to the Karoo substation in Carnarvon was completed and handed over to Eskom in December 2012.

By mid-April 2013 the roads and civil works, as well as the electrical and fibre ducting reticulation for MeerKAT should be completed. At the same time construction teams are busy with extensions to the dish assembly shed, as well as the pedestal integration shed, Karoo Array processor building and on-site power facility.

*New workshops, stores and offices taking shape at Klerefontein*
Site inspection by Riette Basson (architect); Anton Lourens (technical director at Aurecon) and Neels Hoek (SKA SA)

Karoo Array Processor building and on-site power facility under construction
4. LOFAR progress update

After a long period of testing and commissioning of LOFAR, the first truly operational period, Cycle 0, was kicked off successfully at midnight on December 1st 2012, with a 12 hours observation for the Epoch of Reionisation (EoR) key science project. When the LOFAR Program Committee made final project allocations, the production efficiency was expected to ramp up gradually to where LOFAR would spend 50% of the time on sky for Cycle 0 projects, with the rest of the time shared between maintenance/bug fixing, testing, and commissioning. During the first trimester of Cycle 0, the actual on-sky efficiency increased rapidly and reached nearly 70% in February 2013!

Almost everyone in the Radio Observatory, and many others at ASTRON as well, have been tremendously busy in the past several months to support this significant achievement. It has required dedicated personal attention by many of our staff, and has benefited from a constant improvement in stability of LOFAR hardware and software during the last three months. Bug fixes and some improved operational functionality have been introduced on a regular basis. All Dutch LOFAR stations have now received an upgrade to the clock system in the form of SyncOptic boards. These boards reduce phase drift of the distributed clock signals within one LOFAR station, thereby significantly improving station sensitivity. Providing the international stations with SyncOptic boards is underway.

*The LOFAR superterp housing six LOFAR stations. Credits Top-Foto, Assen.*
LOFAR Long Term Archive
The LOFAR Long Term Archive has grown to contain over 4.5 petabyte of scientific data and more than a million data products by the end of February 2013. The sites in Amsterdam (SURFsara) and Juelich (FZJ) are fully operational. The Groningen LTA site (RUG/Target) has been through a period of improvements and repairs following a file system crash last year. The Groningen disk storage is now operating at full capacity (over 1 petabyte for LOFAR data). It is expected that in the coming month the remaining services, in particular the tape based storage tier and the main data servers to be used for LOFAR data ingest and distribution, become operational and the Target system in Groningen will join Amsterdam and Juelich as a fully operational LOFAR LTA site. Since February, the character of data to be placed into the LOFAR Long Term Archive (LTA) has changed from mainly raw observation visibilities to mainly processed visibilities. The ingest process has been improved to support the increased load on the LTA services that resulted and is again ready to keep up with the planned observing programme for the coming period. In order to improve the quality of the information gathered about LOFAR data products and entered into the catalog, feedback mechanisms from the LOFAR instrument (both for observations and processing pipelines) have been enhanced. All in all, we have been able to collect excellent data in optimal scheduling for numerous projects during the past winter, when there is also longer nighttime available. It is clear, however, that in order to keep up this efficiency over the long term, a strong drive to further end-to-end automation and additional operational functionality will need to be maintained.

Multi-frequency Snapshot Sky Survey with LOFAR
At the end of January, the decision was made to push ahead with the HBA part of the Multi-frequency Snapshot Sky Survey (MSSS), the project led by ASTRON astronomer George Heald to deliver the first all-sky survey with LOFAR. The expectation is that MSSS HBA will be completed in June 2013, and can yield science results quickly, while completion of the LBA part follows later. The first MSSS runs in HBA took place at the beginning of February 2013, and have already produced spectacular wide-field mosaicked images (see also the next news item).

Science with LOFAR: Scientists discovered new giant radio galaxy in all-sky survey with LOFAR
A team of astronomers led by George Heald discovered a previously unknown gigantic radio galaxy, using initial images from a new, ongoing all-sky radio survey with LOFAR. The team is currently performing LOFAR’s first all-sky imaging survey, MSSS. While browsing the first set of MSSS images, Dr. Heald identified a new source the size of the full moon projected on the sky. The radio emission is associated with material ejected from one member of an interacting galaxy triplet system tens to hundreds of millions of years ago. The physical extent of the material is much larger than the galaxy system itself, extending millions of light years across intergalactic space. The MSSS survey is still ongoing, and is poised to discover many new sources like this one. The international team of astronomers that is performing the MSSS survey is made up of about fifty members from various institutes, mostly in the Netherlands, Germany, the UK,
Poland, France and Italy.
You can find more information about MSSS at: http://www.astron.nl/radio-observatory/lofar-msss/lofar-msss.

*Overlay of the new GRG (blue-white colors) on an optical image from the Digitized Sky survey. The inset shows the central galaxy triplet (image from Sloan Digital Sky Survey). The image is about 2 Mpc across.*
5. Progress on the Apertif Phased Array Feeds

Placement of Apertif telescope cabins
In these past months, Apertif telescope cabins have been placed at the twelve dishes of the Westerbork Synthesis Radio Telescope (WSRT) in which the Apertif receivers will be installed. The Telescope Cabins will house the receivers and digital processing electronics of the APERTIF Phased Array Feeds. Faraday cages will be installed in the cabins to shield the highly sensitive antennas from the RFI generated by the powerful processing boards. The design of the cabins is very similar to the containers placed near the LOFAR international stations.

Grant for high-speed telescope camera
Radio flashes from neutron stars, black holes, and many of still unknown origin, continuously appear all over the sky. Van Leeuwen (ASTRON) and team have received funding to build a high speed camera for the Westerbork telescope. It will make use of the thirty times enlarged field of view, made possible by Apertif. With this camera, many new flashes can be found, for a detailed investigation of their nature. The project is funded through a ‘Investeringen NWO Middelgroot’ grant from the Netherlands Organisation for Scientific Research (NWO).

The field of view of the Westerbork telescope is being significantly enlarged by the new Apertif receivers. The new field of view (the large hexagon) is thirty times bigger than the old one (central circle) and the full moon. With the new high speed camera, astronomers will be able to detect weak and rare cosmic flashes. Recently, with the test system two fast pulsars have already been observed simultaneously. These flashes are visible at the bottom right.
Full chain Apertif digital beamformer successfully demonstrated
At the end of 2012, ASTRON firmware engineers successfully demonstrated a working beamformer at full speed (200 MHz), from beginning to end. In the test, a digital waveform generator was used to input 64 signal paths (emulating 64 antennas). This signal was filtered by the digital filterbank which splits the input bandwidth in 512 subbands. The subbands of each antenna are selected by a subband selector. Multiple subsets of the subbands for all antennas are transported to the beamformer nodes. Each beamformer node deals with one subset of 24 subbands and computes on average 40 beams from the 64 input antennas. In total, 16 beamformer nodes are used for one polarization of one telescope. To this end, four UniBoards are integrated in a subrack. The described test involved all four

About Apertif
APERTIF, Focal Plane Array technology, aims to increase the field of view of the Westerbork Synthesis Radio Telescope (WSRT) with a factor 30. Besides this, it is important pathfinder technology for the SKA. One of the major improvements that the SKA will bring is that the field of view, i.e. the region of the sky that can be imaged in a single observation, will be much larger than what is possible now. Apertif is a project that explores one of the technologies giving such a larger field of view, while also exploiting it for doing science.

6. Beam Pattern Verification of EMBRACE: new results from the AA-mid demonstrator
Jan Geralt bij de Vaate (vaate@astron.nl)
EMBRACE is the AA-mid verification system. To verify a cross cut of the EMBRACE station beam a GPS satellite has been used as a point source which drifts through the beam. This is shown by a red track in the left plot. The right plot shows, in blue, the station beam as predicted by the array factor model of EMBRACE, and in red the measurement with the GPS satellite. It seems that the EMBRACE station beam can be modelled accurately with the array factor model (note the logarithmic scale on the vertical axis). Also the positions of the nulls agree with this model.

The used GPS satellite for this plot is transmitting at a frequency of 1227.60 MHz. Other GPS satellites can be used as well to verify the EMBRACE station beam at another frequency.

The script written for the EMBRACE station beam verification is able to select and track other GPS trajectories in order to verify other cross cuts of the EMBRACE station beam with the array factor model. With this script the right satellite track is selected dependent of the angle of the beam a user likes to scan.

Currently the EMBRACE station in Westerbork consists of 98 tiles and spans an area of 110 m². The number of antenna elements is 7000. Another EMBRACE station is in Nancay which consists currently of 64 tiles.
OTHER NEWS

1. Germany joins the SKA Organisation

On 20 December 2012, the SKA Board of Directors approved Germany, represented by the Federal Ministry of Education and Research (BMBF), as the tenth member of the organisation to participate in the detailed design of the SKA telescope. Professor John Womersley, chair of the board of the SKA Organisation, welcomed Germany’s membership. “Germany has an excellent track record not only in radio astronomy but also in the management and delivery of science megaprojects and associated engineering. This expertise will be of great benefit to the SKA project as we move towards the construction phase of this inspirational telescope”, he said.

Dr Beatrix Vierkorn-Rudolph, Deputy Director General, Federal Ministry of Education and Research and Professor Michael Kramer, Director of Max-Planck-Institut für Radioastronomie, an institute of the Max-Planck-Gesellschaft (MPG), have been appointed to represent Germany on the SKA Board of Directors. The German contribution to the SKA Organisation amounts to 1 million Euro and is financed 50% each by BMBF and MPG.

“We live in an exciting time for science and the unprecedented scale of the multi-national SKA project ensures that we will continue to be able to push the boundaries of physics and astronomy. The SKA genuinely has the potential to completely transform our understanding of the universe as we know it today”, says Professor Kramer.


2. Herschel Medal for Michael Kramer

The Royal Astronomical Society in London honoured Michael Kramer, Director at the Max Planck Institute for Radio Astronomy, with the Herschel Medal for his work in the field of gravitational physics. Kramer’s successes include the best tests for Einstein’s General Theory of Relativity for strong gravitational fields. Michael Kramer is one of the German Representatives in the SKA Board.

Full story at: http://www.mpg.de/6808732/herschel-medal-kramer
3. Outcomes of January SKA Board meeting

The Directors of the SKA Organisation met at SKA HQ on 30-31 January for the 8th meeting of the Board of Directors.

Amongst other things, the decision to host the SKA in both Australia and South Africa, which was made in 2012, was formally ratified at this meeting by the signing of the Members’ resolution passed in November 2012. Also, it was agreed that the 2007 cost estimate for the first phase of construction (SKA-1) should be increased to €400 M to take account of inflation since the original cost estimate was made. This figure refers to ‘new’ money to the SKA project but does not take account of the additional costs associated with the dual site decision. An updated cost estimate for SKA-1 will be produced later this year.

Outcomes of the meeting are available at: http://www.skatelescope.org/meetings/outcomes-of-the-ska-board-meeting-on-30-31-january-2013/

MEETINGS AND WORKSHOPS
1. Portugal- SKA and African-European radio astronomy cooperation

A workshop on the Square Kilometre Array and African-European radio astronomy cooperation took place in Lisbon, Portugal on 30 November 2012. The workshop brought together scientists,
engineers and industry to discuss the SKA and how it can become a precursor to future internet technologies powered by green energies, and offering a great societal change promise. Find out more at [http://ska-ptafrica.org/](http://ska-ptafrica.org/)

2. South Africa- Focus on calibration and imaging for the SKA

Creating the best possible images from the information gathered by the SKA telescope will be a major challenge, which can only be solved by combining high quality hardware and software. This was the focus of the 7th Workshop on Calibration and Imaging (CALIM), hosted in Cape Town at the end of 2012. “Hosting the workshop in South Africa strengthens local participation, and research,” says Ludwig Schwardt, research developer at SKA South Africa and one of the event organisers.

The main topics discussed were “antenna sensitivity” and “deconvolution algorithms”. Antennas must be sensitive enough to detect radiation from different directions in high-fidelity, and the ‘deconvolution algorithms’ are required to reconstruct the radiation data into images. “These kinds of workshops are excellent as they ensure that our local research...
community can access the results of a much larger group, even though our methods predated some of their current ideas by several decades!” said Schwardt.

Schwardt points out that the skills obtained through this kind of research - software development, modelling and high-performance computing - can be widely applied to other fields outside radio astronomy, for example in medical imaging.

3. South Africa- Focus on high-performance signal processing

A workshop on high-performance signal processing was held at the University of Cape Town (UCT) from 28 – 31 January 2013. The workshop, funded by the South African SKA Project, provided engineers and scientists with an opportunity to share ideas on the technology underpinning high-performance computing, and to present signal processing to young students considering a career in a field critical to the MeerKAT and SKA, and to almost every other high-tech engineering industry


4. South Africa- Nova meeting in Cape Town – the next decade

By Patrick Woudt (co-PI of ThunderKAT) and Valerio Ribeiro (SKA SA Postdoctoral Fellow, ThunderKAT)

Roughly every 10 years, astronomers studying nova outbursts get together to discuss their latest research. Since the last meeting in Sitges (Spain) in 2002, ground-breaking results, facilitated by new telescopes and supercomputing simulations, have given insight into the physics of the nova explosion, and the associated outflow of matter into the interstellar medium, and have
increased our understanding of the binaries in which novae occur. To discuss the current state of nova research, the Astronomy department at the University of Cape Town (UCT) hosted and organised the 4th meeting in this series under the header “Stella Novae: Past and Future Decades”, from 4 – 8 February 2013. It brought together about 90 researchers from 22 countries. As the title of the meeting suggests, there was a strong emphasis in the meeting on the future decade of nova research. The directors of the Large Synoptic Survey Telescope (LSST) and the European Extremely Large Telescope (E-ELT) gave presentations via skype, and talks about nova research with SALT, MeerKAT and the SKA were prominent in the programme. Participants were given a taste of what to expect from MeerKAT, and the SKA, through talks by Dr Laura Chomiuk (Jansky Fellow at Michigan State University), who gave an invited review on observing transients with the SKA and its pathfinders, Dr Tim O’Brien (associate director Jodrell Bank Observatory) who gave an overview of recent progress in radio observations of novae, and Prof Patrick Woudt (UCT) who presented on ThunderKAT, the MeerKAT Large Survey Project for explosive transients. Highlights from the conference include the realisation to most that nova ejecta are bipolar (contrary to the previously assumed spherical outflow), and that (some) novae emit at all wavelengths, including gamma-rays, as seen in recent examples such as Nova Mon 2012, observed by Fermi. From the lively discussions at the conference, we can look forward to the next decade in nova research with great excitement and anticipation.


Nova outbursts are energetic thermonuclear explosions on the surface of accreting white dwarfs.

“The Stella Novae conference highlighted some of the most exciting recent developments in the field of nova studies – such as the discovery that nova explosions can produce gamma-ray emission, as well as the important role that radio observations will have in revealing the origin of this and other surprising phenomena.” – Dr Jennifer L Sokoloski, Columbia University, USA
5. South Africa- Confronting the elephants in the (SKA) room

“The elephants in the room” was the theme of a workshop on third-generation calibration (3GC) in radio astronomy, held in Port Alfred, in the Eastern Cape of South Africa, during February 2013. 3GC is catch-all term for the calibration, imaging techniques and algorithms that are required to deal with the increased capabilities of the new crop of SKA pathfinder telescopes, and the SKA itself. “By ‘elephants’, we refer to possible fundamental or practical limits on the scientific performance of upcoming telescopes,” explains Prof Oleg Smirnov, SKA SA Research Chair at Rhodes University. “With orders-of-magnitude increases in the sensitivities, and fields-of-view, of our instruments, some of these ‘elephants’ may now be taking shape and we can’t afford to overlook them as we design and build the SKA.”


6. The Netherlands- LOFAR Science Meeting in Dalfsen

About one hundred participants, older but especially younger ones, gathered for the LOFAR Science Meeting in Dalfsen on March 19 and 20. They discussed a very exciting and broad range of results from the last weeks and months. The event also gave rise to numerous more technically oriented interactions, and real cross-fertilization between the different disciplines within the LOFAR community.
7. Canada- Central Signal Processing (CSP)

The National Research Council of Canada (NRC) continues to work with MDA Corporation in establishing and leading an international SKA-CSP consortium. Recently, NRC hosted the “Digital Platform Study Group” (DPSG) meeting in Vancouver BC, to discuss a common platform approach to SKA signal processing. The first day was “industry day” with presentations given by Xilinx, Altera, IBM, Linear Tech, as well as others. The second day’s talks were on current developments and lessons learned, followed by facilitated discussions which continued to the third day.

In response to the recent SKA RFP NRC will be hosting a kick-off workshop April 15-19 in Vancouver. A major challenge will be to determine the feasibility of alternative approaches and to select a few candidates to focus on and flesh out sufficiently for the proposal response.

8. The SKA STFC Knowledge Exchange Workshop

Over 110 people attended this event on the SKA held jointly by STFC’s Innovations Club with STFC’s Astronomy Programme group at Jodrell Bank Observatory on 20 March 2013. This workshop aimed to pull together the interest from both the academia and industry in order to facilitate knowledge exchange between STFC funded researchers and industry with a view of exploiting technologies and advances being made through SKA. The technologies required for the SKA are at the core of the future ICT and communications industries and have the potential to be technology driver with impact far beyond the direct return via construction contracts for this £1.2bn radio telescope.

STFC has been funding the technical involvement in the SKA since 2006 focusing on R&D in phased array technology, signal transport and software and computing. On 1 February 2013 the Chancellor of the Exchequer announced further £11m investment for the SKA to develop software and techniques capable of handling unprecedented amount of data.
From the technical presentations it was clear that industry engagement is central to the SKA and funding for the industry is available through TSB as well as STFC Innovation Partnership Schemes and direct government funding.

STFC is currently coordinating the UK SKA community’s response to the SKA Office’s Request for Proposals to undertake work in the pre-construction phase and to secure a strong position in the various project work packages.

For more information on STFC’s astronomy programme in SKA please contact Dr Simon Berry (simon.berry@stfc.ac.uk) or Dr Vlad Skarda (vlad.skarda@stfc.ac.uk) for STFC Innovation Partnership Scheme funding.

9. SKA Organisation Headquarters- Science Assessment workshop

The SKA HQ hosted the first of a series of science assessment workshops on 26-28 March. The topic of Cosmic Dawn and Epoch of Reionization, with a particular focus on how, or the extent to which, the recently published Baseline Design would be able to conduct Cosmic Dawn and Epoch of Reionization science. The 2.5 day meeting was marked by considerable and vigorous discussion on the science that we want to extract and the likely Baseline Design performance. Many open questions, both scientific and technical, were identified, and participants agreed that it was a fruitful meeting, with many remarking that they emerged invigorated to re-examine how the SKA could benefit studies of the Cosmic Dawn and Epoch of Reionization.
SOME OUTREACH ACTIVITIES

1. South Africa- Fun and games (and learning and networking) at the annual student conference

A friendly game of cricket, a tradition started by the late Prof Steve Rawlings, marked the end of yet another successful South African SKA Postgraduate Bursary Conference. Teams for the 2012 match were drawn from the Electromagnetics Research Group at Stellenbosch University and the MeerKAT project team based in Cape Town. Lunch time discussions on team choices and strategy provided some light-hearted diversions in-between the 13 conference sessions.

The 2012 event was the seventh SKA SA bursary conference, and the attendance list included nearly 200 delegates. The conference has become a highlight for local and international radio astronomers and engineers working on the MeerKAT and SKA. As in previous years, the 2012 conference brought together SKA SA funded postgraduate students and postdoctoral fellows, as well as selected SKA SA funded undergraduate students. Supervisors, the SKA SA Research Chairs, other interested researchers, and invited speakers from universities in Europe and America also attended.


2. Australia- Astronomy on show at Australia’s largest astronomy festival

Australian astronomy and the SKA were the stars of the ‘Astrofest’ show in Western Australia on February 16.
Australia’s biggest astronomy event, Astrofest, brought the astronomical community of Perth together to celebrate the night sky, astronomy and space science.

“We had about 4,000 people come down to Astrofest this year, and the feedback has been astronomically positive. There is definitely an excitement building around the developments in Western Australia with the precursors which launched last year, and the SKA looming on the horizon,” says Kirsten Gottschalk, Astrofest Coordinator from the International Centre for Radio Astronomy Research (ICRAR) in Perth.

Members of the public were treated to over 40 telescopes displaying Jupiter, the Moon, the Sun, as well as an array of nebulae and other astronomical delights. Indoors, the stage was always busy with talks on meteorites, the basics of telescopes and science shows from WA’s science centre Scitech.

On the main stage the SKA and its precursor the Murchison Widefield Array (MWA) featured in a well-attended talk by MWA commissioning scientist Dr Natasha Hurley-Walker from ICRAR-Curtin University.

One of the highlights for the young (and young-at-heart) was the SKA display from the WA Department of Commerce, where visitors could make their own Lego radio telescope model to take home.

Beautiful astronomical scenes were part of the astrophotography exhibition, demonstrating the exceptional talent of WA’s astrophotographers. From scenic shots of the Milky Way stretching above WA landmarks, to stunning deep space images of nebulae and globular clusters there was a wide array of images on show.

Astrofest is coordinated by the ‘Astronomy WA’ collective; The International Centre for Radio Astronomy Research (ICRAR), The Astronomical Group of WA (AGWA), Scitech and the WA
branch of the Australian Science Communicators (ASC-WA), with support from BTOW, Curtin University, Western Australian Department of Commerce, Gingin Observatory, Lotterywest, Perth Observatory, and the University of Western Australia.

LOCAL INITIATIVES

1. South Africa- SKA SA encourages young, local skills development

Virgillian Kasper and Priscilla Malgas are electrical assistants working at the MeerKAT site. Thanks to SKA SA’s artisan programme, they received bursaries to train as electrical artisans at the Kimberley FET College.

“I feel very proud to be part of something so big,” says Kasper, whose daily activities include adding new power points in the various buildings on site. Although he sometimes has to work out in the desert heat, he says it is very rewarding to know that his work enables others to do their work.

Malgas and Kasper both agree that for them, the SKA SA project represents opportunities for local economic growth and career development, especially for young people like themselves. “The positive effect of the SKA being built near our town is already improving the socio-economic circumstances of our people, because there are a lot more job and business opportunities,” said Kasper.

Kasper also said that the scientists and engineers on site constantly motivate the young staff members to develop their skills, and make the most of this opportunity to work for the project. Malgas is furthering her studies, part-time, at the College of Cape Town.

Both artisans feel it is very important for the public to be interested in science. They have begun to follow astronomy research and each has a favourite recent development: For Kasper, it is the discovery late last year of a planet made largely of diamonds. For Malgas, it’s the SKA project itself.

Kasper and Priscilla say that the SKA SA project provides such exciting study and career opportunities, and they encourage the other young people in Carnarvon, Williston, Van Wyksvlei, Brandvlei and elsewhere, to take these opportunities and make the most of them, and to make the most of themselves.

“The young people on our team, such as Priscilla and Kasper, are really keen, willing to do anything and eager to learn”, says Dawie Fourie, manager at SKA South Africa’s Karoo site.
2. Australia- Starshow gives Australian Mid West schools a sparkle

If anyone had asked students from the Mid West what they did at school recently, they would have got an astonishing answer: weighing a galaxy. This was one of several activities kids enjoyed thanks to a visit by scientists and science communicators from The University of Western Australia, the International Centre for Radio Astronomy Research (ICRAR), Aspire UWA, SPICE and Scitech.

Over 12 days, students in Carnamah, Morawa, Meekatharra, Mt Magnet, Pia Wadjari, Kalbarri and Jurien were treated to a smorgasbord of celestial delights as part of UWA's Centenary celebrations. During the days, school students and teachers looked at the Sun through specially designed telescopes. They also built radio telescopes and found out how to calculate the weight of a galaxy. At night, communities came together to reconnect with their own brilliant night sky by taking a closer look at the stars, galaxies, nebulae and planets above.
In Mt Magnet, a special ‘Astrofest’ was the biggest event of the trip. With an inflatable planetarium, glow in the dark water rockets, an astrophotography exhibition featuring work of WA photographers and science shows and talks, it was very popular.

One of the organisers, Pete Wheeler, ICRAR’s Manager of Outreach, said it was a great tour. “We’ve seen some amazing places and met some amazing people along the way. We leave behind people who know more about their night skies and the radio astronomy happening right on their doorstep,” Mr Wheeler said.

“Maybe one of the students we worked with will go on to study science and make an important discovery. We couldn’t have done it without the help of the schools and communities, and we hope to be back in the near future for a follow-up.”

The astronomy roadshow was a way for UWA to thank the West Australian community. This initiative – and others like it – are a way for the University to ‘give back’ in return for the 100 years of community support the University has enjoyed.

The Mid West is becoming a global hub of astronomy and related research, with several new radio telescopes coming online in the Murchison including of course the Australian component of the SKA.

More details of the Aspire to Astronomy Tour.
UPCOMING MEETINGS

The Modern Radio Universe 2013  |  22-26 April 2013, Bonn, Germany
More info at:  https://indico.mpifr-bonn.mpg.de/indico/conferenceDisplay.py?conflId=21

Cherenkov Telescope Array (CTA) and Square Kilometre Array (SKA) Industry Day  |  24 April 2013, Bonn, Germany
With the Cherenkov Telescope Array (CTA) and the Square Kilometre Array (SKA) there are currently planned two research infrastructure with several hundred to a thousand telescopes that will revolutionize the scientific opportunities in their areas. The design and subsequent construction of these facilities require a multitude of technologies, in which German companies have a leading position in the development as well as in sales and even could expand this position.
This workshop will inform interested German companies about these two major projects and their technological challenges, and furthermore will introduce various investment opportunities. These include the areas of energy (solar energy and energy storage), and telescopic antenna construction, high performance computing, and “data handling, management and mining.”
Please note, that most of the presentations and discussions will be held in German. Please inform us (ska@mpifr-bonn.mpg.de) if you are interested in presenting the areas of interest of your enterprise. In such cases, we would inform you about appropriate possibilities.

Radio Astronomy in the LSST Era  |  5-8 May 2013, Charlottesville, VA, US
More info at:  https://science.nrao.edu/science/event/RALSSST2013

Annual meeting of the Italian Astronomical Society  |  7-10 May 2013, Bologna, Italy

International Virtual Observatory Alliance Inter-op  |  12-17 May 2013, Hamburg, Germany
More info at:  http://g-vo.org/pmwiki/Interop/Interop

Canadian Astronomical Society (CASCA) Meeting  |  28-30 May 2013, Vancouver, BC, Canada
More info:  http://casca2013.phas.ubc.ca/?q/welcomepage

AAS Meeting  |  2-6 June 2013, Indianapolis, IN, USA
More info:  http://aas.org/meetings/aas-222nd-meeting
Japan- East Asian Science Workshop on SKA | 5-7 June 2013, Nagoya, Japan

The SKA Organisation has been informed of an SKA East Asian Science Workshop to be held in Nagoya in June 2013. A similar Asian workshop was already held in 2011 as a kick-off discussion to have efficient collaborations among East-Asian countries both in scientific and engineering sides. The aim of the 2013 workshop is to put together the scientific efforts in various fields of astrophysics from East-Asia as well as other countries.

Plenary review talks, oral and poster presentations are planned. Significant time for a deep scientific discussion for each field of astrophysics will also be considered.

Young researchers including PhD students are particularly encouraged to attend the workshop.

**Invited Speakers:** Minh Huynh (University of Western Australia: Deputy international SKA project scientist): Summary of the current status of the SKA. Matt Jarvis (University of Oxford/University of the Western Cape): The AGN session. Ye Xu (Purple Mountain Observatory): The astrometry session. Tzu-Ching Chiang (ASIAA): The cosmology and high-z session. Kyungjin Ahn (Chosun University): The cosmology and high-z session. Takuya Akahori(Sydney University): The cosmic magnetism session. Adam Deller (ASTRON: TBC): The pulsar session.

Registration here
21 Apr. 2013: Abstract submission deadline
15 May 2013: Registration deadline N.B. People who need a visa are encouraged to submit their registration form before 15 Apr. 2013.

**Astronomy, Radio sources and Society: The Wonderful Century | 10-13 June 2013, Leiden, the Netherlands**

**International Pulsar Timing Array | 23-26 June, Krabi, Thailand**
More info at: [http://www.ipta4gw.org/?page_id=37](http://www.ipta4gw.org/?page_id=37)

**Annual meeting of Astronomical Society of Australia | 7-12 July 2013, Melbourne, Australia**
EWASS Meeting | 8-12 July 2013, Turku, Finland

Reionization in the Red Centre: New windows on the high redshift Universe | 15-19 July 2013, Uluru-Kata Tjuta National Park, NT, Australia
More info at: http://www.caastro.org/event/2013/uluru

Synergistic Science with Euclid and the Square Kilometre Array | 16-18 September 2013, Oxford, UK
More info: http://euclidska.physics.ox.ac.uk

SKA Organisation - 2013 SKA Engineering Meeting | 7-11 October 2013, Manchester, UK

The SKA has recently released the Request for Proposals inviting organisations and industry to participate in the design of the SKA telescope. It is foreseen that the process of allocating work packages will be completed during the third quarter of this year. This provides an excellent opportunity for the SKA engineering and science community to get together during early October in Manchester.

The aim of this meeting is to provide a global overview of the status, progress and way forward for the project in terms of engineering, management and science. Part of the meeting will be devoted to presentations on the science capabilities of the suite of SKA telescopes, incorporating input from science assessment workshops, which will have been held over the previous months.

Work Package Consortia will be provided an opportunity to present an overview of the composition, people, work, concepts and approach to their particular work package. In addition the SKA Office will provide the status, progress and way forward with regards to aspects such as the Concept of Operations, hosting agreements, the baseline design, project management and system engineering. The meeting will furthermore provide a forum for interface work sessions as well as general face-to-face discussions among SKA Office staff, members of the SKA Work Package Consortia and other members of the science and engineering community.

The main meetings will be held Tuesday to Thursday, October 8 to 10, with additional breakout and work sessions on Monday, 7 October and Friday, 11 October.

Please contact Jason Spyromilio or Peter Dewdney for information and/or suggestions for the programme. More information will also be made available here.
A second announcement will be issued in July 2013 and will provide more information with regards to the venue and the agenda.

The meeting is open to all personnel from SKA Work Package Consortia members as well as SKA committees and workgroups.

**Celebrating 50 Years of Radio Astronomy, 9-13 December 2013, Pune, India**

More info at: [http://mwsky.ncra.tifr.res.in/mwsky/](http://mwsky.ncra.tifr.res.in/mwsky/)

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