



## Focus on SKA challenges and opportunities in the beautiful Cape



South Africa's Minister for Science and Technology, Mr Mosibudi Mangena, delivered the opening address.



Delegates networking during the SKA Forum 2009 lunch.

*Marina Joubert, for SKA South Africa Communication*

Delegates from around the world gathered in Cape Town, South Africa during February 2009 for a series of SKA meetings, workshops and events. They met to discuss the cutting edge technologies and novel design solutions that the telescope demands, as well as its future science goals. Equally important was the opportunity to interact with funders about the cost challenges of the project, as well as the opportunity to engage politicians about the capacity building and development potential offered by this mega science project.

Following the SKA Continuum Imaging workshop from 18 - 20 February, about 50 guests visited South Africa's proposed site for the SKA near Carnarvon in the Northern Cape over the weekend 20 - 22 February. The SKA Science and Engineering Committee met from 22 - 24 February 2009, followed by a meeting of the SKA African Working Group, with 8 African countries represented, on 24 February 2009.

The SKA Forum on 25 February 2009, hosted in the Cape Town International Convention Centre, was a highlight. More than 300 astronomers, politicians, representatives from national funding agencies and business leaders made up the diverse audience. The forum provided an excellent opportunity to update and engage a wide range of stakeholders on the project.

The events concluded with a meeting of representatives from funding agencies on 26 February 2009.

### Key thoughts from the SKA Forum on 25 February 2009

"It is so inspiring because it is so new!" said Professor John Womersley of the UK Science and Technology Facilities Council in his closing remarks at the SKA Forum 2009, held in Cape Town on 25 February 2009. "We don't yet know how to build the SKA, but we know we can learn together how to do it." His words about the excitement and inspirational value of the project, as well as the collaborative path ahead, captured the essence of an exciting day of presentations and discussion.

The cost challenges of building the world's largest telescope at a time of a global economic downturn, was a pertinent point of discussion. "Despite the global economic situation, this is the time to invest," Professor Womersley said. "The current and future challenges demand scientific thinkers and innovation and therefore the quickest way to get out of the economic dilemmas is to be able to evolve scientifically." Many speakers agreed with his views that the SKA project provided a unique opportunity to invest in scarce skills that will be critical for future growth.

In his opening address, South Africa's Minister for Science and Technology, Mr Mosibudi Mangena, once again confirmed the government's backing of South Africa's bid to host the SKA.

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Prof Justin Jonas (SKA South Africa) explaining the KAT-7 array and the foundation details.



International visitors to the SKA South Africa site investigate the earthing cables for one of the 12 metre diameter antennas in the KAT-7 array.



The SKA African Working Group with 8 African countries represented, met on 24 February 2009.

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These sentiments were echoed by Ms Dipuo Peters, Premier of the Northern Cape Province, who spoke about the commitment of the provincial government to the project which they see as a major opportunity to develop the region.

"Africa's time has come", said Gill Marcus, Chairperson of the ABSA Bank Group. She believes that the SKA presents a new way of looking at development on the continent. "The imperative for us is to move away from the image of poverty, conflict and disease towards a continent that is capable of the best and deserves the best," she said. "Putting the SKA in South Africa will enable a developing country to grow its capacity, overcome historical divides and develop a crucial pool of scientific expertise. It will give our young people confidence in the future and a sense of purpose. It gives us an opportunity to inspire and sharpen young minds to think about the world differently and reach for the stars - quite literally."

"The SKA will deliver the next revolution is astrophysics and cosmology. It will help us to solve the unknown unknowns; answers questions we don't know we don't know!" said Professor Malcolm Lonair, astronomer and cosmologist at Cambridge University. His talk focused on the exciting science that will be made possible by a powerful time machine able to look back in time to the early universe and the key role that young people will

play in making the great discoveries of the future. "They don't know how difficult these problems are and they don't know that these questions are impossible to solve; therefore they go and solve them!" he said. "That is what is so heartening about re-search!"

The key role of the youth featured in many talks. The pathfinder projects and the SKA itself are powerful magnets to draw young people into science and engineering. While astronomers want to study the universe, investors are drawn by the potential of the project to deliver innovative thinkers and future problem solvers, Professor Longair believes. They are interested in the new knowledge that will be generated by the project that is likely to find application across diverse fields and have unpredictable spin-offs. "It is not just about understanding the universe," Professor Womersley agreed. He elaborated on the importance of getting young people excited, interested and involved in the SKA project and using it as a vehicle to deliver bright engineers and scientists keen to take on global challenges in areas such as energy and health.

Speaking about the enormous technical and computational challenges presented by the SKA, Dr Bruce Elme-green of IBM in the USA said that the project would push technology way beyond what we have today and extend the boundaries of what is currently possible in many areas.

"If you want to study galaxies up to 14 billion light years away, even today's best computers are far too slow," he explained.

Australian and South African SKA project leaders updated the audience about progress with building their respective SKA pathfinders - The Australian SKA Pathfinder (ASKAP) and the Karoo Array Telescope Meer-KAT<sup>1</sup>). Both countries have similar, excellent sites, and both have measures in place to protect the radio quietness of their proposed sites into the future.

While competing to host the SKA, Australians and South Africans at the Forum agreed that collaboration will enhance science outcomes for the pathfinders and for the SKA in future. At the meeting, Minister Mangena announced a new collaborative agreement between South Africa and Australia specifically in doing collaborative science projects with complementary SKA pathfinders.

"In selecting the best site, we have to marry astronomical wishes with funding realities, and take many other things into account," said Professor Richard Schilizzi, SKA International Project Director. Following site selection around 2011 to 2012, Professor Schilizzi believes that implementation of the SKA will start in 2013 and that early science can be expected from 2017 onwards.

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Honourable Troy Buswell, Western Australia's Minister for Science and Innovation, told delegates that he had a hard time convincing his colleagues that he was coming to South Africa to attend a series of meetings, and not to watch the cricket series between the two countries played at the same time. "Unlike our competition on the cricket pitch, the SKA project is a far more collaborative approach," he said. He introduced three representatives of the Wajarri Yamatji community, the traditional owners of the land in the Murchinson region where the Australian SKA site is located. They travelled with the Australian delegation to South Africa. "This project could not proceed without their partnership and support," he said. "I hope that they will go back and spread the news about the potential and benefits of this project to their people."

According to Dave DeBoer, ASKAP project manager, the Australian pathfinder will be built for speed and sensitivity. "We are going into uncharted waters and will be using transformational technologies to achieve a much wider field of vision than any existing radio telescope," he said. "Our project is geared for the first antenna to arrive and be commissioned by the end of 2009."

In his update on the MeerKAT pathfinder in South Africa, SKA South Africa Project Director Dr Bernie Fanaroff told delegates that the first seven dishes of MeerKAT (called KAT-7) will be on site in the Karoo by the end of 2009. In preparation, the South African team has already completed extensive work on providing infrastructure to the site, such as accommodation, offices, workshops, roads and a shed for dish assembly. They are now installing the optical fibre and optimised hybrid power transmission line to the site. "The pathfinders will help us to bring down the cost of building the SKA and gives us hands-on experience of cutting

edge science," he said. "We will use this project to give young people skills to solve problems that they can then apply to other challenges, as well as to create jobs locally and do all we can to benefit the local community and economy."

Dr Fanaroff reminded delegates that eight other African countries are supporting South Africa's bid and are committed to help optimising the SKA across the continent. Their support was reconfirmed at a meeting of the SKA African Working Group on 24 February 2009.

"The EU has supported the SKA since day one," said Dr Robert-Jan Smits, who represented the DG Research of the European Commission at the Forum. "We are excited about the SKA because it will allow us to shift the frontiers of knowledge, train a new generation of scientist and engineers and promote global cooperation," he said. He called on the SKA project leaders to broaden the political support for the project through a joint road show targeting leaders in many more countries, and get them on board.

Dr Gustav Rohde, CEO of consulting engineers Africon, spoke about the challenges presented by big projects such as the SKA. "Learning from mega projects in the past, we know that continuity and flexibility is important," he said and added: "Get hold of the best expertise - don't try to solve all the problems on your own!" He also noted that projects can out-source risk, but must then expect to pay for someone else to take on that risk.

Professor Womersley told delegates about the visit to the proposed SKA site near Carnarvon in the Northern Cape. "We were all incredibly impressed by the work done, and the commitment of the local provincial government," he said. "South Africa's progress is obvious and extremely impressive!"

The beauty, attraction and universal appeal of astronomy also featured in many talks and discussions. "It stirs the soul of everybody," Professor Womersley said. "Wherever you are, you can experience the joy of looking up to the sky!"

To order a DVD with highlights of the talks presented at the SKA Forum 2009, including presentations, photos and a selection of radio, television and print media stories, send your name and postal address to: [marina@ska.ac.za](mailto:marina@ska.ac.za)

Some of the materials can also be downloaded at [www.ska.ac.za/ska2009](http://www.ska.ac.za/ska2009)

<sup>1</sup> The initial plans for the South African Pathfinder, or Karoo Array Telescope - or KAT - was to build a 20-dish array. When the South African government increased their support for the project it became possible to build up to 80 dishes. The team then renamed the project MeerKAT (meaning "more of KAT"). At the same time the "meerkat" is also a well-known inhabitant of the Karoo that many people will know from nature documentaries and the award winning BBC series "Meerkat Manor".

## Mission MeerKAT 2 launched



An inquisitive school girl Hannah and the young astronomer Naledi are two key characters in colourful comic books developed by the SKA South Africa to engage children (and their families) in the story of the SKA and MeerKAT. A real meerkat also features prominently, along with an adorable bat-eared fox - both animals found in the Karoo. The first edition of "Mission MeerKAT" was so popular that a sequel "Mission MeerKAT 2" has now been launched. The stories are set in and around a small rural town in the Karoo and help readers to understand - in a very accessible style and with a good dose of humour - how radio astronomy works and why the pathfinder telescope - and possibly later the SKA - will be built in the Karoo. The comics are distributed to schools in all the towns near the proposed SKA site (Carnarvon, Williston and Van Wyksvlei), as well as at public science events such as SciFest Africa (March 2009) and National Science Week (May 2009). They will also be available at science centres in the country throughout the International Year of Astronomy 2009. Download the Mission MeerKAT series at [www.ska.ac.za/education](http://www.ska.ac.za/education)

## SKA Science and Engineering Committee (SSEC) meeting

*Justin Jonas, Rhodes University & SKA Project Scientists, SA*

The second meeting of the SKA Science & Engineering Committee (SSEC) took place in Cape Town on 23 & 24 February at the Breakwater Lodge in the Cape Town Waterfront. The SSEC is the successor to the International SKA Steering Committee (ISSC) that had overseen the project since 2001. The inaugural meeting of the SSEC was held in Perth during April 2008.



The SKA Science and Engineering Committee (SSEC). Photo: Colin Greenwood

The SSEC comprises 24 members, with equal numbers of members from the US Consortium, the European Consortium and the rest of the world. The countries officially represented at SSEC-2 were (with membership in brackets): Australia (2), Canada (2), China (1), France (1), Germany (1), India (1), Italy (1), Netherlands (2), Portugal (1), South Africa (2), UK (2), USA (8).

There were also invited observers from countries that may join the SSEC in the future, including Korea, Russia, New Zealand and Japan. The SKA Project Development Office (SPDO) was represented by the Project Director (Richard Schilizzi), the Project Engineer (Peter Dewdney), the Project Scientist (Joe Lazio), and the Executive Officer (Colin Greenwood). The meeting was chaired by Ken Kellermann, who is a member of the USA consortium.

In terms of the International Collaboration Agreement for the SKA (Square Kilometre Array) Programme, signed in 2007, the SSEC is tasked with providing scientific and technical guidance for the SKA programme, reviewing the project finances, plan and schedule, managing interactions with science funding agencies, and overseeing the activities of the SPDO. The packed agenda of the two-day SSEC-2 meeting reflected these various responsibilities of the committee. Much of the day-to-day work of the international project is handled by the SPDO and various scientific and technical working groups, and a good fraction of the agenda was set aside for reviewing the activities of these groups.

Interaction with the science funding agencies and their processes is an important function of the SSEC. In this regard time was devoted to discussing input into the US Decadal Review of Astronomy (Astro2010), reviewing progress within the SKA Preparatory Phase project (PrepSKA) funded by the European Commission and partner countries, and drafting a presentation for the Informal Funding Agencies Group meeting that was held two days later. Strategic issues discussed by the committee included the processes and timelines required to make a site decision, matching the science goals of the SKA to appropriate technologies, and the modalities for interacting with the larger astronomy and scientific community.

At the end of two days of exhausting and often robust discussion there was a consensus that SSEC-2 had achieved the goals that had been set at the start of the meeting, and that the SKA project had advanced significantly in the period under review. An excellent SSEC dinner at the Five Flies restaurant provided welcome respite on the Monday evening after the first day of business.

The SSEC-3 meeting will be held from 26 till 28 October at the SPDO offices, which are located within the University of Manchester in the UK.

## SA audiences love Longair's cosmology

*Wendy Williams, astronomy research student at UCT and SKA bursary holder*

During his visit to South Africa for the SKA Forum 2009 and related events, Professor Malcolm Longair, an eminent cosmologist from Cambridge in the UK, presented two very popular public talks and participated in a phone-in programme on Radio 702.

At the University of Cape Town his talk "Hot News from the Big Bang: Why Inflation is a Good Thing" was attended by about 300 students, staff and public. The talk was part of a series of annual lectures co-hosted by the National Astrophysics and Space Science Programme (NASSP) at UCT, with previous lectures by Jocelyn Bell-Burnell (2008) and Joe Silk (2007).

Professor Longair explained how cosmologists have slowly reached a general consensus regarding the values of the cosmological parameters - what is missing now is the Physics to explain their values. These values show that we live in a flat universe consisting of 4% ordinary matter, 21% Dark Matter and 75% Dark Energy, but we "haven't the slightest clue what Dark Matter and Dark Energy are". These problems, he said, will be solved by the next generation of scientists through projects like the Square Kilometre Array.

After outlining some of the current problems in cosmology, he argued that cosmological (not economic) inflation is a good thing as it provides a "somewhat compelling" solution to some of these problems. In particular, it answers the fundamental problem of producing the gross irregularities of the observed extragalactic structure from the remarkably smooth Cosmic Microwave Background.

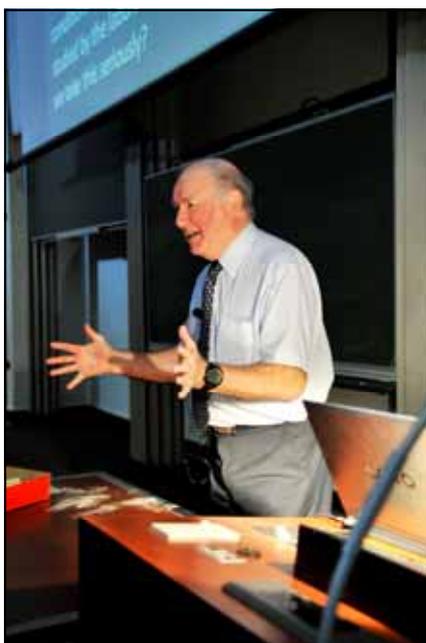


Photo: Katherine Traut, UCT

A vibrant and enthusiastic lecturer, Longair's talk was enjoyed by those present. Professor Longair concluded that it is young people who will pick up the challenge and convert the unknown unknowns of cosmology to known unknowns and then known knowns.

Professor Longair also spoke to a packed auditorium at the MTN ScienCentre in Cape Town. Young and old enjoyed his light-hearted approach to the topic "Black holes made simple". He told the audience that black holes are the furniture of modern astronomy, representing the ultimate state of collapse of matter and that they are the source of many of the most energetic phenomena in the Universe.

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*Email [marina@ska.ac.za](mailto:marina@ska.ac.za) if you would like a copy of Professor Longair' lively discussion with local radio talk show host Jenny Crwys Williams on Radio 702, broadcast on 26 February 2009.*

## Shepherd shows what astronomy outreach is all about

Dr Debra Shepherd, the North American Deputy for Computing in the Atacama Large Millimeter Array (ALMA) project, visited South Africa during February and March 2009 to interact with the KAT-7 team and to give a series of technical and popular lectures to students and the general public.

She devoted much of her time in South Africa to public talks on the wonders of stars and how planets are formed. She spoke to students at two local universities and visited the MTN ScienCentre several times to engage young learners and educators. The South African SKA outreach office arranged her outreach visit to Carnarvon, the nearest town to the SKA South Africa site. At Carnarvon High School 600 students had the opportunity to listen to Dr Shepherd, while almost 300 adults and their children also attended her public lecture in Carnarvon, which was followed by an "amazing star party".

Dr Shepherd was very impressed with the youth of Carnarvon. "I gave them a rather advanced lecture on star and planet formation and they were attentive and asked some of the best questions I have ever had," she said. "Their enthusiasm for astronomy and learning in general seemed to have no bounds - I believe that, given the right opportunities and support, these students will show the world how South Africa can move into the future with grace and intelligence."

She was thrilled to see South Africa's proposed SKA site. "The construction at the SKA site in the Karoo is rapidly progressing to become a world-class radio facility," she commented. "With its protected zone to avoid radio interference and the dry air of the desert, the Karoo is an ideal place for a radio telescope. I've been impressed with the planning that has gone into this facility and the pace at which the site construction is being accomplished. Clearly, the people in South Africa's SKA project are fully committed to bringing South Africa to the forefront of technology in the world."