

CHAPTER 37

Justin Jonas and South Africa's participation in the international SKA project



Professor Justin Jonas at Rhodes University (photo supplied by Grocotts Mail)

Justin Jonas, who led South Africa's entry into the **international SKA project**, explained the following technical aspects of SKA when requested to do so for the purposes of general readership:

Radio telescopes, such as the Square Kilometre Array (SKA), collect information about celestial phenomena and objects via the reception of radio waves. These telescopes are implemented as various kinds of radio antennas as receptors: at lower frequencies the antennas look like arrays of TV antennas, and at higher frequencies they look like satellite dishes. To keep up with the advances of scientific investigation, telescopes at all wavelengths need to keep increasing in size and capability to avoid stagnation. In the radio regime there is a need to build a telescope that is ten times larger than any existing instrument, and in the longer term the goal is to achieve a hundred-fold increase in sensitivity (hence requiring an aggregate collecting area of one square kilometre, roughly equivalent to one million domestic satellite TV dishes). Such a telescope exceeds the financial and technical resources of any single country, so the concept of the international SKA project was devised. The SKA observatory will operate two telescopes, one for lower frequencies (SKA-low) and one for higher frequencies (SKA-mid). The sites for these telescopes were determined through a competitive process, and South Africa will host SKA-mid and Australia will host SKA-low.

For the first phase of SKA-mid the 290 dishes (each 15 metres in diameter) will be concentrated in a 'core' extending out to a few kilometres, with a smaller number distributed along three spiral arms extending out to about 100 kilometres from the core.

The science goals for the SKA can be summarised as the exploration of the origins of all celestial phenomena and objects (including life in the Universe), the testing of physical laws (such as Einstein's theory of gravity), and the detection of as-yet unknown phenomena.

The MeerKAT radio telescope, constructed on the SKA-mid site in the central Karoo, is a precursor to the eventual SKA-mid. It consists of 64 13.5-metre dishes contained within a circle with a diameter of 8 kilometres. It was designed and built by South African scientists, engineers and industry, and funded by the South African government. It is currently the most powerful radio telescope array of its type in the world, and co-investments into MeerKAT instrumentation have been made by the USA, European Union, UK, Germany and Australia.