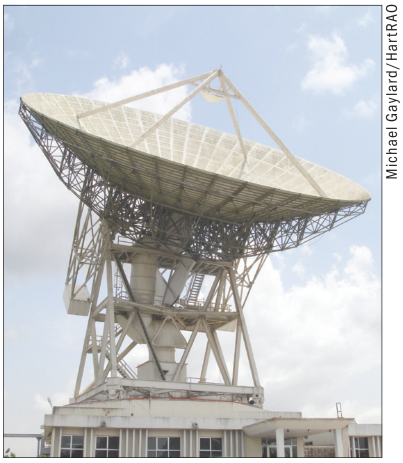
Astronomy

Recycled dishes give fresh boost to African research

Astronomers in Africa are building a new telescope array by converting dormant satellite-communications dishes for use in radio astronomy. Work began last month to refurbish the first of four dishes – located in Kuntunse, Ghana – that is expected to be up and running by next year. Once similar facilities in Kenya, Zambia and Madagascar are adapted, they will then be connected to form part of a continent-wide observation network. The telescopes will also help build up radio-astronomy expertise in Africa in preparation for the Square Kilometre Array (SKA) – set to be the world's most powerful radio telescope – which will be split between sites in southern Africa and Australia.

The availability of the telescopes is a result of communications companies replacing much of their satellite infrastructure with high-speed fibre-optic cables. The 32 m dish in Kuntunse was donated to the Ghanaian ministry of environment, science and technology by the telecommunications company Vodafone Ghana. While the cost of building a new radio telescope is about $6m, scientists plan to convert the Kuntunse dish for around a third of that.

"We are exploring options tailor-made for each partner country," explains Bernie Fanaroff, director of SKA South Africa. "This is essentially a bottom-up project, where governments are talking to telecommunications operators to gain access to redundant dishes." Once operational, the four dishes will join with the existing Hartebeesthoek Radio Astronomy Observatory (HartRAO) in South Africa to create the African Very Long Baseline Interferometry Network (AVN), which will allow astronomers to observe compact, bright radio sources such as astrophysical masers, pulsars and active galactic nuclei.


Michael Gaylard/HartRAO

A new lease of life A former satellite-communications dish in Kuntunse, Ghana, is being refurbished for use in radio astronomy as part of plans for an Africa-wide interferometry network.

Very-long baseline interferometry (VLBI) arrays emulate a telescope with a diameter equal to the separation between the different observatories in the array. This means that observers can view objects in deep space with high levels of angular resolution, providing more detail than would be possible using a single telescope. The radio telescope at Hartebeesthoek is at present Africa's only VLBI-capable facility. It was converted from a 26 m antenna that was used in the 1970s by NASA to monitor unmanned space missions. The facility currently carries out VLBI observations with the European VLBI Network and the Australian Long Baseline Array.

As well as providing a valuable addition to the global VLBI network, scientists hope that the new telescopes will also help to boost engineering and science skills across the continent as Africa prepares to co-host SKA. "The aim of the AVN project is to develop capacity in the SKA partner countries in Africa," says astronomer Michael Gaylard who is HartRAO's managing director, "not only for the technical capability to support SKA outstations, but also for astronomical research capability so that the partner countries can benefit scientifically from SKA." There are also plans to construct four additional telescopes in southern Africa that will connect to the AVN at a later date.

Simon Perks

Space

New mission to provide insights into Mars's seismology

Just as NASA's Curiosity rover begins to survey the Martian surface, the space agency has announced another new venture to the red planet. Due for launch in March 2016, the $425m InSight mission will probe deep beneath the Martian surface to measure the seismology of Mars for the first time. The mission received the go-ahead after beating off 27 other proposals, including missions to a comet and to Saturn's moon Titan.

InSight will carry two cameras and three other instruments, all of which will be deployed by the craft's robotic arm. These include a geodetic instrument to determine the planet's rotation axis built by NASA's Jet Propulsion Laboratory (JPL) in California as well as a device made by a consortium led by France's Paris-based National Centre for Space Studies that can measure seismic waves travelling through the planet. The other instrument, made by the German Aerospace Center in Cologne, will measure the flow of heat from the interior of the planet.

"We know very little about the deep interior structure of Mars," principal investigator Bruce Banerdt, a geophysicist at JPL, told *Physics World*. "But for the first time we'll be able to map out the underground geography of Mars."

The probe is expected to land near Curiosity's area of operation in September 2016, with scientists already studying images from NASA's Mars Reconnaissance Orbiter and the European Space Agency's Mars Express to choose a relatively flat spot. Mission planners expect InSight to start transmitting data about a month after it lands, and to continue to do so for at least two years. That timeframe, Banerdt says, "will give us a good sampling of the Martian seismicity that we'll use to probe the interior".


NASA

Into the heart of the matter NASA's new InSight mission will probe the interior structure of Mars when launched in 2016.

But the mission's objectives extend beyond understanding Mars alone. "The goal is to identify the formation processes of the terrestrial planets," says Banerdt. "It's a terrestrial planets mission that happens to be going to Mars."

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