

Arecibo enters 'new era' in astronomy

[BOSTON] After extensive renovations, jointly funded by the National Science Foundation and the National Aeronautics and Space Administration, an inauguration ceremony will be held on Saturday (14 June) at the Arecibo Observatory in Puerto Rico, the world's largest radio telescope.

The \$26-million project has taken five years to complete — twice as long as expected. However, scientists are delighted with the overall result, which will greatly increase the telescope's performance and lead to what is described as a 'new era' in radioastronomy.

"These are the most dramatic changes made to any radio telescope, and perhaps to any existing telescope," says Donald Campbell, associate director of the National Astronomy and Ionosphere Center (NAIC), which is based at Cornell University and which operates Arecibo. He points out that when Arecibo opened in 1963, it was generally assumed that it would operate for only about 10 years. But the "soundness of the original design" has allowed major improvements to be made over the decades.

The latest upgrade involved three main tasks. First, a 16-metre-high screen has been built around the perimeter of the telescope to reduce thermal radiation from the ground and block out extraneous radio noise.

Second, a 'gregorian' subreflector system, using two mirrors housed in a 90-tonne dome suspended high above the main dish, has been erected to send signals to the planets

and asteroids, picking up the return scatter to analyse for rotation, surface features and temperature. It is also used extensively to investigate the Earth's upper atmosphere.

Finally, a more powerful radar transmitter has been installed. The receivers can now collect more of the photons that fall on the primary dish.

Most of the construction work was completed last autumn, and astronomers are now fine-tuning their revamped instrument, planning to resume observations later this year. Says Campbell: "It takes a while to get a new telescope fully operational, and we have to think of this as a new telescope, since just about everything has changed, save for the primary reflector."

The increased versatility promises exciting results. According to Paul Goldsmith, director of NAIC: "The range of frequencies we can look at has roughly expanded by a factor of five, while the instantaneous bandwidth — which means the chunk of the spectrum we can examine at any one time — has increased 20-fold."

Furthermore, the greater sensitivity of the new gregorian system will permit astronomers to study weak sources that could not be seen before. The improved performance will boost the hunt for new pulsars and pulsar planets, as well as the investigation of star-forming regions.

But there will also be substantial gains for those studying objects in the Solar System.

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Eye in the sky: The sub-reflector system is raised into the radome of Arecibo radiotelescope.

"We had the world's most powerful radar telescope before, and we've improved it by a factor of 20," says Campbell. "That will enable us to survey about 10 times as many asteroids and comets with very high resolution."

One peripheral activity to benefit from Arecibo's enhanced sensitivity and wider frequency coverage is the search for extraterrestrial intelligence (SETI). SERENDIP, a SETI project based at the University of California, Berkeley, will begin 'eavesdropping' this year with a new and improved receiver.

According to Woody Sullivan, an astronomer at the University of Washington in Seattle, one project, called SETI@home, intends to analyse chunks of SERENDIP data in greater detail, producing what would be the equivalent of a whole new survey. Provided that funding can be secured, Sullivan hopes to line up 50,000 or more volunteers, who would each be given software to process the data on their home or office computers while operating in screensaver mode. This would eliminate the need for — and cost of — a supercomputer. "If we could keep that up for two years, we should have a scientifically significant survey," he says.

Meanwhile, astronomers at Cornell are planning the next round of improvements at Arecibo. One task will be to reset the 38,778 aluminium panels that form the giant antenna, to improve its accuracy and permit detection of shorter-wavelength signals.

The panel-setting project, estimated to cost \$1 million, could begin within a few years. "We have an obligation to keep this instrument viable," says Mike Davis, project scientist for the upgrade project. "When you have the world's biggest telescope, you have a responsibility to push the system to the limits."

Steve Nadis

'No change' while NIH revises peer review

[WASHINGTON] Procedures for grant applications to the US National Institutes of Health (NIH) will remain unchanged for now, even though the agency is in the process of overhauling its peer-review system.

According to Wendy Baldwin, deputy director for extramural research at NIH, which distributes more than \$5 billion a year in grants, there will be no substantial changes to the application forms used by external scientists for up to two years, as it is planned to combine them with the launch of a new system of electronic applications.

Until then, said Baldwin, "the astute applicant is going to be more up front about these features in what they write". This is a reference to five new criteria for judging grant proposals, announced by Harold Varmus, the NIH director, last month.

The five criteria are: significance, approach, innovation, investigator and environment. For now, they will simply be outlined in the instructions to applicants that accompany application forms. In these, "it will be clear" to applicants what the criteria are, Varmus said last week.

One of the five criteria has proved controversial: the demand for "innovation". As outlined by Varmus last month, peer-reviewers will ask of an application: "Does the project employ novel concepts, approaches or methods? Are the aims original and innovative? Does the project challenge existing paradigms or develop new methodologies or technologies?"

Some scientists complain that the "innovation" criterion will work unfairly against clinical researchers. But others back it strongly, most prominently among these Keith Yamamoto, a molecular biologist at the University of California, San Francisco, who chairs the panel that advises the NIH's Division of Research Grants.

The NIH is also overhauling its system of peer review, with changes likely in structure, membership and subject areas of study sections. The effort is being led by Elvera Ehrenfeld, a molecular biologist from the University of California, Irvine, who is the new head of the Division of Research Grants. She expects to propose a reorganization within 18 months.

Meredith Wadman