Astronomers count the cost of thinking big

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Optical astronomy is now dominated by the word 'large', which is posing a sizeable problem for many countries that want to remain at its cutting edge.

Increasingly, ground-based projects are centred on big, expensive endeavours as exemplified by several proposals currently being circulated for an extremely large telescope (ELT). But medium-sized countries such as Australia face an uphill struggle to achieve meaningful participation in these large, internationally funded projects.

Australian astronomers are keenly aware of the dilemma, and a task force set up in May by the National Committee for Astronomy (NCA) is seeking a way for the country to establish a prominent role in an ELT project.

"We need to be part of a large telescope programme to survive," says Ken Freeman, an astronomer based at the Australian National University (ANU) in Canberra.

"There is an urgent need for Australia to decide what it wants to do, how it does it and with whom," says Matthew Colless, who is chairing the task force. The panel aims to help prepare a case that could convince a sceptical government to fork out upwards of A\$100 million (US\$65 million) for participation in an ELT project.

The NCA, part of the Australian Academy of Science, is preparing its decadal review of astronomy priorities, which it will deliver to the government within two years. The task force's report is expected to help set some of those priorities.

"We'll need to make some tough decisions over the next year about the science we want to be doing over the next decade," says Chris Tinney, acting director of the Anglo-Australian Observatory (AAO), headquartered in Sydney.

The Southern hemisphere has a built-in advantage for astronomers — the centre of the Milky Way can best be seen from that half of the planet. But Australian observatories cannot compete with the higher altitude sites in the Andes, where future optical telescopes are likely to be built.

Australian astronomers want their government to spend at least A\$100 million to participate in such a telescope project, which will cost of the order of US\$1 billion in total. They hope to secure one-off funding for the construction, but operations could eat into the country's astronomy research budget of about A\$40 million a year.

The task force is holding informal discussions with colleagues in Europe, the United States and Canada to explore options for the ELT project. "Japan would also be a very attractive overseas partner," says Colless.

But Australia is not about to abandon its existing facilities to pursue international

The Anglo-Australian Observatory, which recorded these star trails, has had to redefine its priorities.

projects. Local telescopes are being upgraded to carry out surveys of the entire southern sky, including the Radial Velocity Experiment and 6dF Galaxy Survey. "We depend on Australian observatories to do these essential surveys," says Richard McMahon, an astronomer at the University of Cambridge, UK.

Nevertheless, the AAO — one of Australia's main observatories — was hit hard two years ago by a British decision to withdraw financial support after 2006 to concentrate on the European Southern Observatory in Chile (see *Nature* 414, 678; 2001). At the moment, Britain provides half of the AAO's annual A\$8-million budget.

To compensate for its impending shortfall, the AAO is honing its skills in instrument building in anticipation of supplying equipment to the European Southern Observatory, among others. "The United Kingdom is far from pulling out of the AAO," Tinney contends. After 2006, he says, Australia and Britain will remain partners, but the observatory's focus "will move away from the support of current telescopes, and into instrument building for larger telescopes".

Australia is already recovering some of the costs it incurred when it became a member of Gemini — the US-led international observatory based in Hawaii and Chile, which it joined in 1998 — through instrumentation contracts with other Gemini participants. "It's clear we can be a small-percentage player but gain huge returns,"

says Penny Sackett, director of the ANU's Mount Stromlo Observatory, which is building two instruments for Gemini.

The AAO, meanwhile, has built equipment to position optical fibres for the European Southern Observatory's Very Large Telescope, and is currently making a similar tool for the Subaru telescope in Hawaii. The Subaru machine will be the first of its kind, says Tinney. The fibres, which carry the telescope's signals, are usually put in place one by one using robot arms, but the new system encases them inside 'spines' and positions them in parallel. "Instead of taking an hour to position the fibres, we can do it in minutes," says Tinney.

Such shifts in emphasis may be helping Australia's observatories to survive, but an ELT will be harder to finance. Tinney says that redirecting funds from existing astronomy projects or even shutting entire facilities wouldn't cover the costs of joining an ELT project. "We need substantial new funds," he says.

But getting such funding for an optical telescope won't be easy — particularly when radioastronomers in Australia are also hoping to host two major facilities, a low-frequency array and a square-kilometre array. The astronomy community insists it is united behind the home-based radio telescopes and the optical one overseas. "It's not a question of either/or — it's a question of which foot forward first," says Rachel Webster, of the University of Melbourne and chair of the NCA. ■