

THE ATNF IN BRIEF

The Australia Telescope National Facility (ATNF) supports Australia's research in radio astronomy, one of the major fields of modern astronomy, by operating the Australia Telescope, a set of eight individual radio telescopes.

Mission

- ◆ To operate and develop the Australia Telescope as a national research facility for use by Australian and international researchers.
- ◆ To exploit the telescope's unique southern location and technological advantages to maintain its position as a world-class radio astronomy observatory.
- ◆ To further the advancement of knowledge.

Size and funding

The ATNF employs 135 staff. In 2000 – 2001 the organization's total funding was \$16.3M, of which \$12.4M was direct appropriation from CSIRO.

Status within CSIRO

The ATNF is managed as a National Facility by Australia's largest national research institution, CSIRO. Formerly part of the CSIRO Division of Radiophysics, it became a separate Division in January 1989. The Australia Telescope Steering Committee, appointed by the Minister for Science to advise the ATNF Director, also acts as the Advisory Committee for CSIRO's Radio Astronomy Sector.

Status as a National Facility

The ATNF became a National Facility in April 1990. As a National Facility, the Australia Telescope

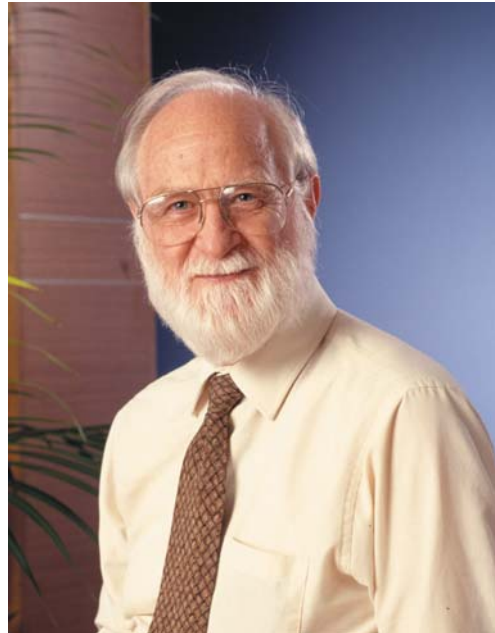


Photo: Kristen Clarke

Professor Ron Ekers, Director of the ATNF

provides world-class observing facilities in radio astronomy for astronomers at Australian and overseas institutions. The Australia Telescope is operated as a National Facility under guidelines originally established by the Australian Science and Technology Council.

Users of ATNF telescopes

Observing time on the ATNF's telescopes is awarded to researchers on the basis of the merits of their proposed research programs by a Time Assignment Committee appointed by the Steering Committee. More than 80% of the telescopes' users come from outside ATNF. In 2001 the telescope proposals allocated time included 115 researchers at the ATNF and other Australian institutions and 240 researchers from 108 institutions in 19 overseas countries.

The ATNF in the Australian context

The ATNF is the largest single astronomical institution in Australia. Approximately 90% of Australian radio astronomy is carried out through the ATNF. The organization has strong links with its primary user base, the university community. The interests of telescope users are represented by the Australia Telescope Users Committee.

The ATNF's Sydney headquarters are co-located with those of the Anglo-Australian Observatory, an independent bi-National Facility that provides world-class optical and infrared facilities. This close association is unique, in world terms, and promotes valuable collaboration between the two organizations.

The ATNF in the global context

Of the fields of modern astronomy—X-ray, ultraviolet, optical, infrared and radio—Australia's most important contribution to the global practice of astronomy is arguably through radio astronomy. This is a result of Australia's early lead in the field, continuous technological advances, and southern hemisphere location. The Australia Telescope is the only major radio telescope of its kind in the southern hemisphere, and thus can view part of the sky which is out of reach of northern hemisphere telescopes. It provides one of the most powerful radio astronomy facilities in the world.

Australian and international observers use the telescope without access charges. This is in accordance with a general practice of the worldwide astronomical community, in which telescope users from different countries gain reciprocal access to facilities on the basis of scientific merit. This allows Australian scientists to use telescopes in other countries and international facilities such as particle accelerators and space-based instruments. Such access provides Australian scientists with a diversity of instruments and leads to a rich network of international collaborations.

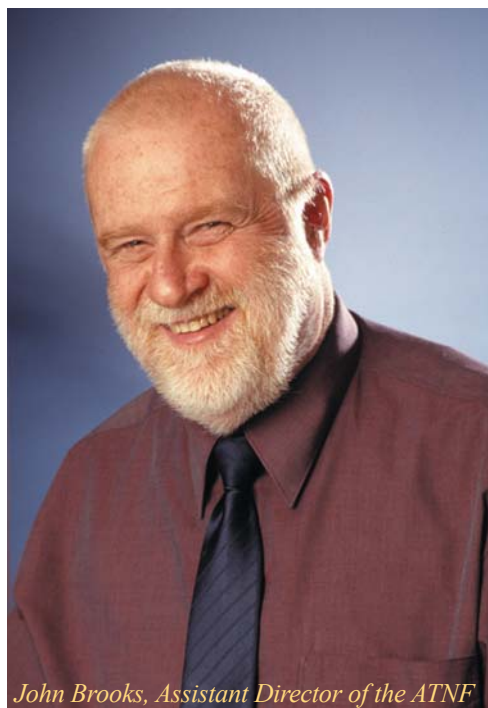


Photo: Kristen Clarke

John Brooks, Assistant Director of the ATNF

The ATNF's observatories

The Australia Telescope consists of eight radio-receiving antennas, located at three sites in New South Wales.

Six of them make up the Australia Telescope Compact Array (ATCA), located at the Paul Wild Observatory near the town of Narrabri. Five of these antennas sit on a 3-km stretch of rail track running east-west; they can be moved to different points along the track to build up detailed images of the sky. A sixth antenna lies 3 km to the west of the main group. Each of these antennas has a reflecting surface 22 metres in diameter. After the radio signals from space are "collected" by the antennas' surfaces they are transformed into electrical signals, brought together at a central location, and then processed. The end result is usually a picture of the object being studied—a picture equivalent to a photograph, but made from radio waves instead of light.

A further 22-m antenna, known as the Mopra telescope, is located near Mopra Rock, in the Warrambungle Mountains near Coonabarabran, New South Wales.

The other key component of the Australia Telescope is the Parkes 64-m radio telescope, located near the town of Parkes. This telescope has been successfully operated since 1961 and is famous as a national symbol for Australian scientific achievement. Recent upgrades to accommodate a 13-beam focal-plane array have maintained its world-class position as a state-of-the-art instrument.

The eight ATNF telescopes can be used together as a Long Baseline Array (LBA) for a technique known as Very Long Baseline Interferometry (VLBI) which is used to obtain high resolution images of small areas of sky. The LBA is used as part of a larger Australian network of radio telescopes which includes the NASA satellite tracking antennas at Tidbinbilla, near Canberra, and radio antennas in Tasmania, South Australia and Western Australia. The LBA is also regularly used as part of the Asia Pacific Telescope which links radio telescopes in Australia, Japan, China, Hawaii and India, and the VLBI space observatory program (VSOP).

Engineering and technology development

The advance of radio astronomy depends crucially on exploiting the latest technological developments in a range of areas which include electronics,

receiver technology, signal detection and processing, control systems, data processing and information technology. The ATNF provides a platform for the development of cutting-edge technology in Australia.

ATNF Steering Committee

ATNF policy is determined by the ATNF Steering Committee, an independent committee appointed by the Minister for Science and Technology. The Committee helps CSIRO to develop the ATNF's long-term strategy. The inaugural meeting of the ATNF Steering Committee was held in May 1989. Since then it has met at least once a year, to define the broad directions of the ATNF's scientific activities and the development of the Australia Telescope. It is also responsible for promoting the use of the Facility and, indirectly, for allocating observing time.

The ATNF's host organization, CSIRO, is composed of 22 business units called Divisions; the ATNF has the status of a Division. These Divisions are grouped into research sectors. The ATNF is the sole member of the Radio Astronomy Sector, and the ATNF Steering Committee acts as

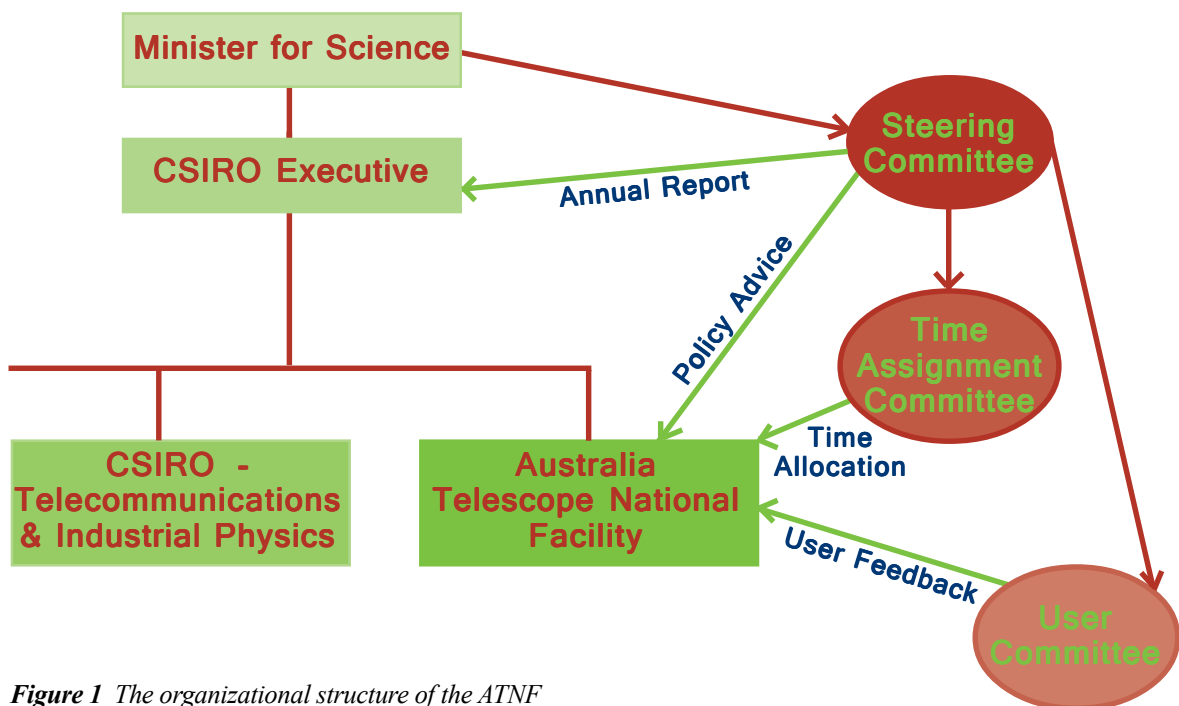


Figure 1 The organizational structure of the ATNF

the CSIRO Sectoral Advisory Committee for radio astronomy.

The Steering Committee appoints an Australia Telescope Users Committee (ATUC) to provide feedback and advice from the user community, and a Time Assignment Committee (TAC) to review proposals and allocate observing time. The committee members for the year 2001 are listed in Appendix C.

Australia Telescope Users Committee

ATUC represents the interests of the Australia Telescope's users. In 2001 it consisted of a total of 19 scientists from the ATNF and institutions around Australia. This committee provides feedback to the ATNF Director, discussing problems with, and suggesting changes to, AT operations; it also discusses and ranks by scientific merit various future development projects. ATUC meetings are a forum for informing AT users of the current status and planned development of ATNF facilities, and recent scientific results. ATUC discussions can be found on the Web at www.atnf.csiro.au/management/atuc.

Time Assignment Committee

The ATNF receives more applications for observing time than it can accommodate: proposals for time on both the Parkes and Narrabri telescopes exceed the time available by a factor of approximately two. The proposals are assessed, and time allocated to them, by the TAC. The TAC meets three times a year and reviews approximately one hundred telescope applications at each meeting.

Strategic objectives

The ATNF is one of the world's leading radio astronomy organizations. The strategic objectives for the ATNF are:

- ◆ **To continue to operate the Australia Telescope in such a way as to maintain a leading international position**

The ATNF will provide access to its facilities to satisfy the needs of Australian and overseas users. At least 70% of time on the Parkes and Narrabri telescopes will be used for astronomy. Time lost during scheduled observing periods will be kept to below 5%.

- ◆ **To upgrade the Australia Telescope to maintain its competitiveness in the medium term (3–8 years)**

The Narrabri and Mopra telescopes are now being upgraded, under the Major National Research Facilities (MNRF) Program, to work at shorter (millimetre) wavelengths. The upgraded telescopes will use innovative devices for the detection of extremely weak millimetre-wave signals from space. These are being jointly designed by the ATNF and CSIRO Telecommunications and Industrial Physics (CTIP), a project funded by the CSIRO Executive Special Project. The MNRF upgrade will also extend the Australian network of telescopes used for VLBI, which has both astronomical and geodetic applications. The MNRF upgrades will be completed in 2002.

- ◆ **To position the ATNF to participate in major international radio astronomy projects developing over the next decade**

The MNRF upgrade will allow the ATNF to maintain a leading position for the next eight to ten years. Beyond that, radio astronomy will be dominated by two major international developments: the Atacama Large Millimetre Array (ALMA) and the Square Kilometre Array (SKA). These instruments will allow astronomers to pursue key questions about the early evolution of the Universe. For Australia to maintain its position in radio astronomy, it needs to have a significant role in at least one of these projects. The SKA is a billion-dollar project, the "next-generation" radio telescope with a collecting area of one square kilometre. Its construction is expected to start around 2012. Australia is well positioned to play a key role in the development

of the SKA. In some respects Australia offers an ideal location for the SKA as it has a number of regions of low population density which are relatively free from radio interference. The technology development required for the SKA will have wide industrial applications and the construction will involve significant industrial contracts.

A preliminary research development program for the SKA, funded by CSIRO, was initiated in 1999, and this has been further expanded in anticipation of the MNRF-2001 funding expected to start in July 2002.

◆ **To conduct an effective outreach program**

The ATNF operates Visitors Centres at the sites of the Parkes and Paul Wild Observatories and has an active public outreach program which has several goals: to raise the national profile of astronomy and related technology in Australia,



Photo: Kristen Clarke

Professor Ray Norris, Deputy Director of the ATNF

to encourage the next generation of scientists by providing educational resources targeted at high school students and their teachers, and to maintain good community relationships.

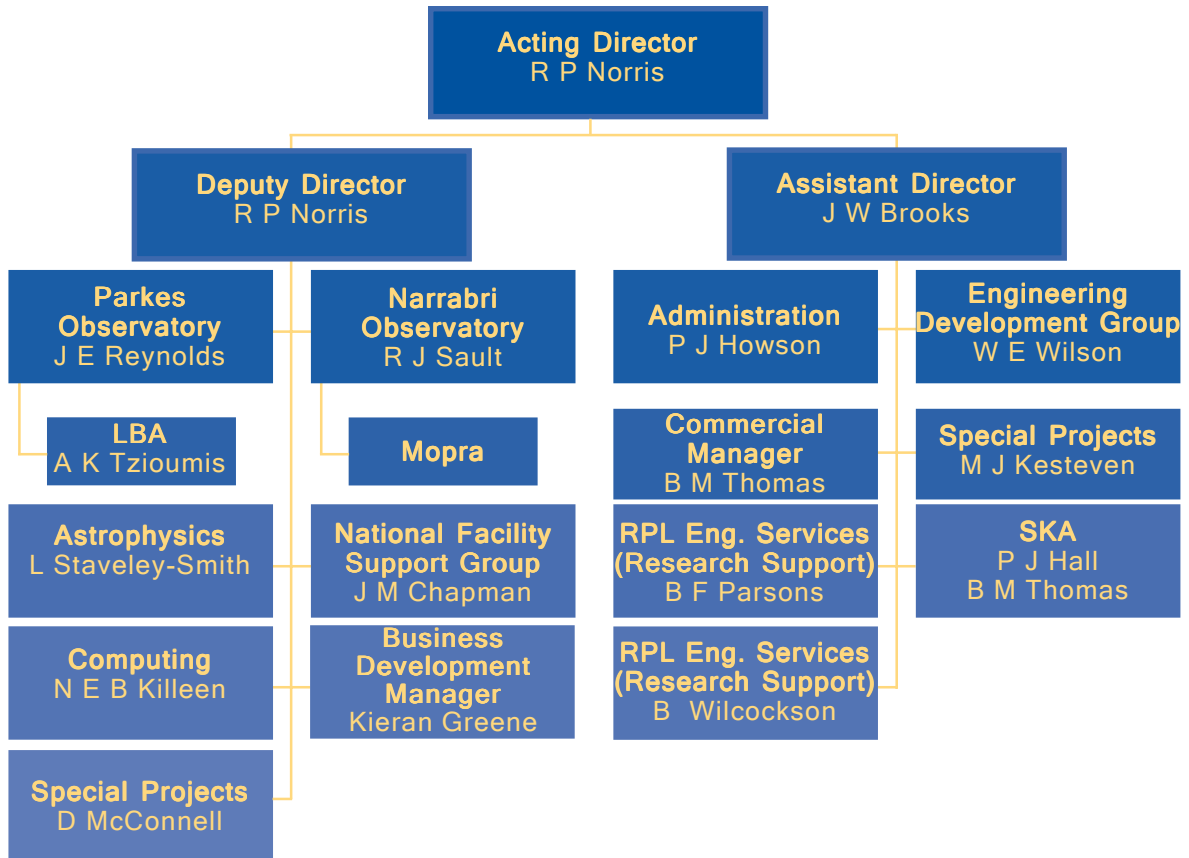


Figure 2 The management structure of the ATNF in December 2001

ATNF management changes in 2001

The ATNF Deputy Director, Dr John Whiteoak, retired in February 2001. Following John Whiteoak's retirement, Professor Ray Norris was appointed as the Deputy Director, with overall responsibility for Astrophysics, Computing, National Facility Support and the Parkes and Narrabri Observatories. In other management changes, Dr Lister Staveley-Smith replaced Ray Norris as Head of Astrophysics, Dr Neil Killeen took on extra duties as Head of the Marsfield Astronomical Computing Group, and Dr Jessica Chapman replaced John Whiteoak as the Head of the National Facility Support Group.

In September 2001, Mal Sinclair retired as Head of the Receivers Group after an outstanding career in engineering and science which covered 46 years with the Division of Radiophysics and the ATNF. Mal first joined the Division of Radiophysics in

March 1954 as an apprentice electrical fitter. He became an outstanding microwave engineer and evidence of his skill can be seen at all the ATNF observatories. Mal was an inspirational group leader with a strong sense of history, a deep understanding of the culture of science and a gentlemanly manner. He will be greatly missed for his many contributions to the ATNF.

Following Mal Sinclair's retirement, Dr Warwick Wilson was appointed as Head of the Engineering Development Group with responsibility for both electronics and engineering.

The ATNF Director, Professor Ron Ekers, was on leave of absence from July 2001 until April 2002 to take up a Miller Professorship at the University of California Berkeley astronomy department. During his absence, Ray Norris took over as the Acting Director of the ATNF with John Brooks continuing as Assistant Director.



Mal Sinclair, Head of the Receivers Group

Photo: John Masterson

CSIRO changes in 2001 and their implications for the ATNF

Over the last few years, the size and budget of CSIRO have faced increasing funding pressures. When the new Chief Executive for CSIRO, Geoff Garrett, was appointed in December 2000, he embarked on a program to rejuvenate CSIRO. At a CSIRO management meeting in May 2001, the Chiefs of the CSIRO Divisions and the Executive of CSIRO put together a Strategic Action Plan, which is intended to set CSIRO on a new and healthier path. Although the ATNF's budget has not decreased, the ATNF, like all other Divisions of CSIRO, has to respond and take advantage of this changing environment.

The CSIRO Strategic Action Plan can be summarised by six “Key Messages”:

- ◆ **“Look out”** CSIRO will shift its approach to stakeholders and the community, such that CSIRO is responsive and driven by the needs of the Government and the community. The high visibility and high performance of Australian astronomy, the Government support implicit in the MNRF-2001 funding, and the ATNF core role of providing support for the astronomical community, aligns the ATNF well with this message.
- ◆ **“Service from Science”** CSIRO will increase its focus on delivering service from excellent science. There is now an explicit commitment in CSIRO to delivering world-class science, and this has always been a strong focus for the ATNF.
- ◆ **“Focus”** CSIRO is currently spread across many research areas. It will refocus to concentrate greater resources on a smaller number of key research areas. The ATNF already has a strong focus on radio astronomy and associated technology.
- ◆ **“Partner or Perish”** There will be an increased focus on participating in partnerships with other organisations and companies, both within Australia and internationally. The ATNF already does this well.
- ◆ **“One CSIRO”** The “One CSIRO” initiative encourages multi-Divisional projects and teams, presenting a unified face to the world. The ATNF is responding to this message by starting a number of cross-Divisional projects. As an example, the SKA Lunenburg lens project involves four Divisions (page 55).
- ◆ **“Go for Growth”** If CSIRO succeeds in implementing these changes, Australia will benefit and the business and impact of CSIRO will grow. The ATNF has responded with a strategic plan which shows growth in several areas. This plan should be realistic given the MNRF funding and the international support for astronomy over the next few years.

In summary, CSIRO is experiencing a period of rapid change. The ATNF strategic directions, which focus on delivery of world-class science, responsiveness to the stakeholders, and planning for growth over the next few years, are well aligned with those of the new Strategic Action Plan for CSIRO.



A banksia in the ATNF garden at Marsfield

Photo: Stewart Duff



The Kennedy 18-m antenna at Parkes was originally used in Australia at the Fleurs radio astronomy site. It was transferred to the Parkes site in 1963.