

AUSTRALIAN ACADEMY OF SCIENCE

National Committees for Science: ANNUAL REPORT TO COUNCIL on 2003 activities

NATIONAL COMMITTEE FOR: Radio Science

CHAIR: Dr. Phil Wilkinson

PERIOD COVERED IN THIS REPORT: 1 January - 31 December, 2003

MEETINGS OF THE NATIONAL COMMITTEE

THE NATIONAL COMMITTEE MET ON:

- 26th February 2003, at IPS Radio and Space Services. Prof Kristian Schlegel, President of the International Union for Radio Science (URSI), also attended this meeting.
- Periodic meetings of the WARS04 Organising Committee were held.

THE FOLLOWING MEETINGS ARE PROPOSED FOR 2004

(include date and place, if possible):

- National Committee meeting, to be held in Hobart, Australia, 17 February, 2004
- WARS 2004 Conference, to be held in Hobart, Australia, 18-20, February, 2004
- Commission F Triennium Open Symposium, Cairns, Australia, 1 - 4 June, 2004
NCRS member, David Noon, is the Programme and Organisation Chairman for this meeting.

MEETINGS OF INTERNATIONAL ORGANISATIONS AFFILIATED WITH ICSU

IN 2003 THERE WAS A GENERAL ASSEMBLY OF (include date and place):

IUGG, (International Union of Geodesy and Geophysics) June 30 – July 11 2003, Sapporo Japan

An Australian bid, supported by the NCRS, to hold the 2007 IUGG General Assembly in Melbourne was unsuccessful.

IAU, (International Astronomical Union) July 13 – 26, 2003, Sydney Australia

The General Assembly of the International Astronomical Union (IAU) took place in Sydney, Australia, in July 2003. Most of the planning and preparation of the meeting was conducted by Australian astronomers. In addition, many Australian astronomers chaired symposia or other meetings associated with the General Assembly, in addition to those noted below. As well as the many scientific symposia and meetings associated with the General Assembly, of particular note were

- The IAU Industry Day, at which members of the optical and radio astronomy instrumentation communities discussed collaborative opportunities with representatives of Australian industry
- An exhibition open to the public, at which there were several displays of optical and radio astronomical technology, including specific SKA and Gemini displays.

Other meetings of interest for Radio Science

- The IEEE Frequency Control Symposium will be held jointly with the 17th European Frequency and Time Forum in Tampa, Florida, USA in May 2003.
- The 16th International Conference on Laser Spectroscopy will be held in Palm Cove, Queensland, in July 2003.

IN 2004 THERE WILL BE A GENERAL ASSEMBLY OF (include date and place):

COSPAR: Paris July 18 – 25, 2004

The next GENERAL ASSEMBLY/CONGRESS will be held in 2005

URSI General Assembly, New Delhi, October 23 – 29 2005

AUSTRALIAN OFFICE HOLDERS IN ICSU AND AFFILIATED BODIES**I RECOMMEND TO COUNCIL THE FOLLOWING VOTING AUSTRALIAN DELEGATION: (include title, name, address, telephone, email and fax number)**

(delegation represents Australian interests in URSI between General Assembly years)

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AUSTRALIANS WHO HELD OFFICE IN 2003 WERE:

Person	International Body	Position	Term
Wim Brouw	IAU SOFA Review Board	member	2003-06
Wim Brouw	IAU working group on astronomical data	member	2003-06
Michael Burton	IAU Working Group for Antarctic Astronomy	chair	2003-06
Mark Calabretta	IAU FITS working group	Member	2003-06
W. N. Christiansen	URSI	Honorary President	Life
David Cole	Study Group 3, Radiocommunication Sector, ITU	Chair	
David Cole	Australian Radiocommunication Study Group 3,	Member	
Peter Dyson	PSMOS Steering Committee, SCOSTEP	Member	
Peter Dyson	URSI-COSPAR Working Group on the International Reference Ionosphere	Member	2002-05
Ron Ekers	IAU	President-elect, member of exec. committee.	2000-03
Ron Ekers	IAU	President,	2003-06
Ron Ekers	URSI Global VLBI working group	Member	
Ron Ekers	IAU working group on "large scale facilities"	member	2000-06
Brian Fraser	Scientific Discipline Representative SCOSTEP		
Brian Fraser	S-RAMP Steering Committee SCOSTEP 1999-2004	Member	
Brian Fraser	IUGG / IAGA	Australian Delegate	2003
Brian Fraser	Working Group on Solar-Terrestrial and Astrophysical Research SCAR	Member	
Anne Green	IAU Division X.	executive committee	2003
Dave Jauncey	URSI Global VLBI Working Group	Member	
Dave Jauncey	IACG Working Group on Space VLBI	Member	
Dave Jauncey	SOC for IAU JD 18	Chair	
Don Melrose	IAU commission 10 (Solar activity)	Vice-President	2000-06
Don Melrose	IAU Division II (Solar)	Vice-President	2003-06
Don Melrose	IUPAP Commission 16 (Plasma Physics)	member	2002-05
Ray Norris	IAU working group on astronomical data	Chair	2003-06

Ray Norris	IAU Commission 5	Vice-president	2003-06
Ray Norris	CODATA:	IAU representative	2003-06
Ray Norris	IAA SETI post-detection committee	Chair	
Wayne Orchiston	IAU Comm. 41 History of Astronomy	Secretary	2000-03
Wayne Orchiston	IAU / IUHPS Inter-Union Commission for History of Astronomy	Secretary	2001-03
Wayne Orchiston	IAU Working Group on Historic Radio Astronomy	Chair	2003 - 06
Wayne Orchiston	The New Astronomy: Opening the Electromagnetic Window and Expanding our View of the Earth.", Seattle, 16-19 June 2004	SOC chair	2003 - 04
John Reynolds	IAU WG on reference Frames	Member	
Elaine Sadler	IAU commission 28 (Galaxies)	President	2003-06
Michelle Storey	IAU Working Group on Publishing	Chair	2003-06
Michelle Storey	IAU Comm. 50, Protection of Existing and Potential Observatory Sites Organising Committee	Vice-Chair	2003-06
Tasso Tzioumis	ITU Radiocommunication Study Group 7 (Sciences Services).	Member	2003-06
Tasso Tzioumis	URSI representative on IUCAF	Voting delegate of URSI	2002-05
Richard Thompson	International Space Environment Services (ISES)	Member	
Bruce Ward	URSI-COSPAR Working Group on the International Reference Ionosphere	Member	2002-2005
Carol Wilson	Australian Radiocommunication Study Group 3,	Chair	
Phil Wilkinson	URSI Commission G Working Group 1, Ionosonde Network Advisory Group	Secretary	2002-2005
Phil Wilkinson	URSI-COSPAR Working Group on the International Reference Ionosphere	Member	2002-2005
Phil Wilkinson	URSI Commission G Working Group 4, Ionospheric Research to support radio systems	Chair	2002-2005
Phil Wilkinson	URSI Standing Committee on Publications	Member	2002-2005
Phil Wilkinson	URSI representative on FAGS (Federation of Astronomical and Geophysical Data Analysis Services)	Member	2002-2005

THE FOLLOWING NOMINATIONS WILL BE MADE IN 2004:

No nominations will be made in 2004.

ACTIVITIES OF THE NATIONAL COMMITTEE

1. Completed, or extended activities (Work Plan outcomes)

• **WARS04 Preparation**

The location for WARS04 was selected and advertised widely through the NCRS mailing list. The NCRS sought and received URSI mode A support for the conference. This moral support is granted only if the international character and scientific value of the meeting is ensured. Papers were sought under two categories: information and research. All research papers were refereed to satisfy DETYA E1 classification for publications. An early proposal to seek industry-based speakers and give WARS more industry appeal was not adopted. The selection of Hobart for a venue made the normal WARS meeting more attractive, although a proposal for a special session on LOFAR and SKA developments was adopted.

• **NCRS Website (<http://www.ips.gov.au/IPSHosted/NCRS/>)**

The website was significantly upgraded during the last year. The site has been registered and archived with Pandora; the electronic archiving facility operated by the National Library of Australia.

- **NCRS Mailing list**
The NCRS electronic mailing list currently has 581 members, a small reduction in size compared to last year and consistent with weeding out non-interested and mobile people whose addresses lapse. A method for extending this listing to contain more industry people has been ineffective to date.
- **Directory of Australian Radio Science**
The earlier, very successful hardcopy Directory of Australian Radio Science was updated and made available on the NCRS webpages. The flavour of the original Directory has been maintained, the listing including names of many Australian radio scientists attached to their home institutes. It is unlikely the present compilation, ~60 entries, represents an exhaustive listing, but it is a useful start.
- **Develop contacts with Australian societies with radio science interests**
There was no significant progress in this area.
- **Advertising radio science meetings**
A page on the NCRS website has been set up to advertise radio science meetings likely to be of interest to Australian scientists. Where appropriate, messages about these meetings have been circulated using the NCRS mail list. While the meeting list has been kept up to date, radio science is a sufficiently broad discipline that it is very difficult to obtain reliable coverage of all the meetings taking place.
- **International activities**
Encouraging membership of URSI is a slow process that can, in part, be achieved through support for meetings such as AP-RASC'04 as well as following through with personal contacts. Other international support comes from work within URSI to strengthen our parent body. The NCRS Chair is also the Editor in charge of the Radio Science reviews that are published in the Radio Science Bulletin. The NCRS provided URSI with a response to its questionnaire on ways to improve URSI's image as well as comments on Emerging Issues initiative.
- **Summary**
The main outcomes of the NCRS Work Plan during the past year have been the complete revision of the NCRS website, including the development of new pages (as above), and preparations for WARS04.

2. Anticipated activities

- **WARS04**
The fifth residential WARS (Workshop on the Applications of Radio Science) Conference will be held in Hobart, Tasmania, 18 – 20 February, 2004. The Conference has been organised by the NCRS and was sponsored by Antarctic Division, CSIRO and IPS Radio and Space Services and will be attended by at least 70 delegates. There will be 49 poster presentations and five keynote addresses. One afternoon will be devoted to a special session on future major radio astronomy projects: LOFAR and SKA. Both these projects encompass a wide range of NCRS interests from signal processing to ionospheric corrections in LOFAR, including potential spin-off industrial and non-astronomical scientific outcomes. WARS offers an ideal venue to discuss these topics given the wide representation across national radio science disciplines that the Conference attracts.
- **Support for 2004 Asia Pacific Radio Science Conference (AP-RASC'04), Quingdau, China**
The NCRS and Australian delegates gave excellent support to the first meeting in this series held in 2002. However, advertising for the forthcoming meeting has not been strong. Although the Chair of the NCRS is a member of the International Steering Committee, to date there has been little advice on the meeting or its likely format. The NCRS still believes it is useful to support regional meetings such as this one and will endeavour to mount a reasonable presence at the meeting.

3. Other Australian Radio Science Activities

Commission A

- (a). Activities at the Department of Physics, University of Western Australia, include

- Development of a liquid nitrogen secondary frequency standard based on: A. sapphire-rutile whispering gallery mode resonator. B. A newly patented idea based on the difference frequency between orthogonal polarized modes in anisotropic crystals.
 - Improvement of a liquid helium secondary frequency standard based on a sapphire whispering gallery mode resonator.
 - Implementation of the above secondary frequency standards as pump oscillators to drive the atomic resonance of some atomic primary frequency standards at the quantum limit in collaboration with French Institutes.
 - A new test of relativity (local Lorentz Invariance), which confirmed relativity by a factor of 30 better than previous, by comparing a sapphire clock with a Hydrogen maser.
 - The group became official members of the Atomic Clock Ensemble in Space Mission, which will implement quantum limited primary standards and new secondary frequency standards to perform some fundamental physical experiments on board the international space station (ISS).
 - First phase noise measurement below the Standard Thermal Noise Limit
- (b). An Australian Research Council Centre of Excellence for Quantum-Atom Optics will be established in 2003. The Australian National University is the administering institution, with the other Australian participants being the University of Queensland, and Swinburne University. The Centre has been granted funding of \$10.9M over 5 years.
- (c). CSIRO NML is conducting regular Two-Way Satellite Time and Frequency Transfer sessions with the Communications Research Laboratory (Tokyo, Japan), the National Institute of Standards and Technology (Boulder, USA) and the Telecommunications Laboratory (Taipei, Taiwan).

Commission G

- (a). TIGER (Tasman International Geospace Environment Radar) (www.tiger.latrobe.edu.au) is now entering its fourth year of operation as a component of the international SuperDARN (Super Dual Auroral Radar Network). The data are now available in real time. A successful application for funds means this twin radar development can now be completed, and a second radar is now being constructed in Invercargill, New Zealand. This radar, called the Unwin radar after Dr R. S. Unwin a New Zealand scientist who pioneered this form of radar research, should be commissioned later in 2004.

Commission J

- (a). A very successful international SKA (Square Kilometre Array) Meeting was held in Geraldton, WA, from 27 July-2 Aug 03. Many international visitors attended, including the International SKA Steering Committee. The location was significant in being close to one of the prime candidate sites in the world for the construction of the SKA.
- (b). In September 2003, the Mileura site in WA was ranked by the LOFAR (Low Frequency Array) International Steering Committee as the best site in the world on science and technical grounds for building the international LOFAR radio telescope (a precursor to the SKA). As a result, negotiations are now in progress with the International LOFAR consortium aimed at building LOFAR on this site.
- (c). A historic display and replica of the 1951 8-Yagi antenna at the site of the Dover Heights field station, which made pivotal discoveries in the early days of radio-astronomy, was opened by the Governor of NSW, Professor Marie Bashir, in July 2003.
- (d). The UNSW astronomy group
- UNSW continues to use the Mopra 22m millimetre-wave telescope to study star formation in the Galaxy. A survey of chemical tracers of the evolutionary route to massive star formation is underway, through the 3mm molecular lines emitted the various species. A search for biogenic molecules from molecular clouds, for instance propylene oxide and the amino acid glycine, is also underway. See www.phys.unsw.edu.au/astro/mopra
 - UNSW leads an ARC LIEF grant to develop a wide-band (8 GHz) correlator for the Mopra telescope, greatly increasing the power of the facility over the current 256 MHz bandwidth available. The project involved collaboration with U. Sydney, U. Monash, the CSIRO ATNF and the UNSW.
 - Site testing the Antarctic plateau for sub-millimetre astronomy continues, with measurement of the 350 micron sky flux at the high plateau site of Concordia Station, Dome C. Measurements were made remotely through the 2003 winter using an

automated observatory, the AASTINO, communicated with via an iridium satellite phone link. See www.phys.unsw.edu.au/~mcba/aastino. With scientists from France, Italy and the USA, UNSW is developing a proposal to site a sub-mm telescope at Dome C once it opens for winter-time operation.

- (e). University of Tasmania Radioastronomy Group
- The University of Tasmania has become the first observatory in the Southern hemisphere to install a mark5 disk-based VLBI recording system (at the Mt Pleasant observatory). This system is being used in the weekly geodetic VLBI sessions, replacing the mark3 tape unit. The Ceduna 30m antenna is being utilised 24 hours a day in a project to closely monitor a number of intra-day variable radio sources. The continuous monitoring observations commenced in March and the intention is to collect at least 2 years worth of data. A team comprising of the University of Tasmania and the ATNF received an engineering excellence award for the conversion of the Ceduna antenna to a radio telescope and the intra-day variability project. See <http://kerr.phys.utas.edu.au> for more details.

Commission K

- (a). Victorian and South Australia Research Institutes Form Centre of EME Research Excellence
- The Federal Minister for Health, announced in July that a consortium of research institutions, led by the Royal Melbourne Institute of Technology (RMIT), will establish a \$2.5 million national research centre to study potential health effects of emissions from mobile phones and their base stations. The Centre of Research Excellence in EME will include researchers at RMIT, Monash University, Swinburne University, Telstra Research Laboratories and the Institute of Medical and Veterinary Science in South Australia. This consortium, led by Professor Irena Cosic from RMIT, will receive \$500,000 a year over five years to conduct research on potential health risks and boost research expertise in this area by providing research training and career development programs in EME-related areas.
- (b). Government Initiatives & Standards
- Electromagnetic Radiation (EMR) Health Complaints Register.
In July the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) announced the establishment of an EMR Health Complaints Register (http://www.arpansa.gov.au/media/mr1_040703.htm) for members of the public who believe they have suffered ill-effects as a result of exposure to EMR to lodge a written complaint. A standard reporting form will allow people to describe the nature of their exposure and any adverse health effects they claim to have experienced. ARPANSA have said information could be used by them to help identify future areas of research into the effects of EMR on people and the environment. The information may also be disclosed to the National Health and Medical Research Council for its consideration.
 - A New National Standard for Radio communications Equipment
On 1 March 2003 by the Australian Communications Authority (ACA) mandated new standards for radio communications transmitting equipment (www.aca.gov.au/media_releases/media_enquiries/2003/03-07.htm). These standards apply to mobile phone and base station emissions as well as all broadcast installations. The ACA standard is based on the 2002 standard for human exposure to radiofrequency fields developed by ARPANSA. The ACA will conduct random audits to ensure licensees and suppliers are complying with the new regulations. Under the Radio communications Act 1992, suppliers can face penalties of up to \$165,000 for supplying a non-standard device. The ACA's regulatory regime also includes an industry code of practice, Deployment of Radio communications Infrastructure, registered by the ACA on 10 October 2002. The code aims to address community concerns about the placement of mobile phone base station and allow the community and councils greater participation in decisions made by carriers.
- (c). Conferences
- The first was the World Congress on Medical Physics and Biomedical Engineering in Sydney, Australia, August 2003. This was a great event, and very well attended from overseas and national delegates. Numerous presentations stimulated much discussion on the relevance of radio communications in the area of health care – topics included the remote monitoring of patients requiring health care and the more traditional topics

of electromagnetic interference/electromagnetic compatibility of wireless communications and the appropriate care of hospitalized and home care patients.

- The second conference was hosted by the Australian Radiation Protection Society – several sessions focused on non-ionizing radiation (NIR) which covers the range of DC to UV. In the past, NIR was known as non-interesting radiation but in recent years has captured much greater interest from the traditional Health Physics Societies.

I SUBMIT THE FOLLOWING REPORT TO COUNCIL ON THE ACTIVITIES OF THE NATIONAL COMMITTEE IN calendar year 2003 (200-250 words):

The Committee focussed on improving communications with Australian radio scientists during 2003. The principal outcome was a significantly enhanced website (www.ips.gov.au/IPSHosted/NCRS/). Using the already established mailing list, the earlier, very successful hardcopy Directory of Australian Radio Science was updated and made available on the NCRS website. The flavour of the original Directory has been maintained, the listing including names of many Australian radio scientists attached to their home institutes. A page on the NCRS website has been set up to advertise radio science meetings likely to be of interest to Australian scientists.

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Yours faithfully,

Phil Wilkinson
4 February 2004