



Federal grant to revitalise the Dome

One of the best recognised symbols of Australian science, the Academy's Becker House in Canberra (the Dome), is to have a facelift. The Federal Government will fund the work as a Federation Cultural and Heritage Project.

The Dome, pictured below in an early architectural sketch, became the Academy's home in 1959, and represents the technical and creative achievements of Australian science. While the building is still recognised as a landmark design, time has taken its toll.

Fortunately the Academy has been successful in obtaining funding to repair the Dome and modernise some of its facilities. It is planned that these works will be completed in time for the Academy to host Australian Science Festival events in 2001, to mark 100 years of progress in Australian science, technology and engineering.

The construction of a home for Australian science was one of the first priorities of the Academy after its establishment in 1954. Leading architect Roy Grounds' futuristic design was a response to the surrounding environment, the geometric design reflecting the rounded hills and valleys which frame Canberra. The strength of Grounds' design is evident in the fact that only two improvements are planned

after 40 years. The Wark Theatre, in particular, is to benefit from new cabling and equipment to facilitate modern presentation techniques and make the building more computer-friendly. Two new bridges are also planned, which will replace the temporary bridge at the rear of the building.

While the design has stood the test of time, building technology has come a long way. Three building systems are to be modernised. Anyone who has tried to work in the Dome during summer will be relieved to hear that a new air-conditioning system is being installed. This will make it possible to work in the building year-round and protect historic documents in the Basser Library from deterioration. The existing thermal fire-detection system is going to be replaced by a modern system with smoke detectors. And the water in the moat is going to be kept clean by a new reticulation system combining chemical dosing and filtration.

Planned maintenance works include waterproofing the roof, resurfacing the vermiculite ceiling coating and the terrazzo flooring, and replacing the carpets. The forecourt will be redesigned as the entrance and drop-off point and landscaped appropriately.

The Dome will be at the centre of the Academy's activities to mark the

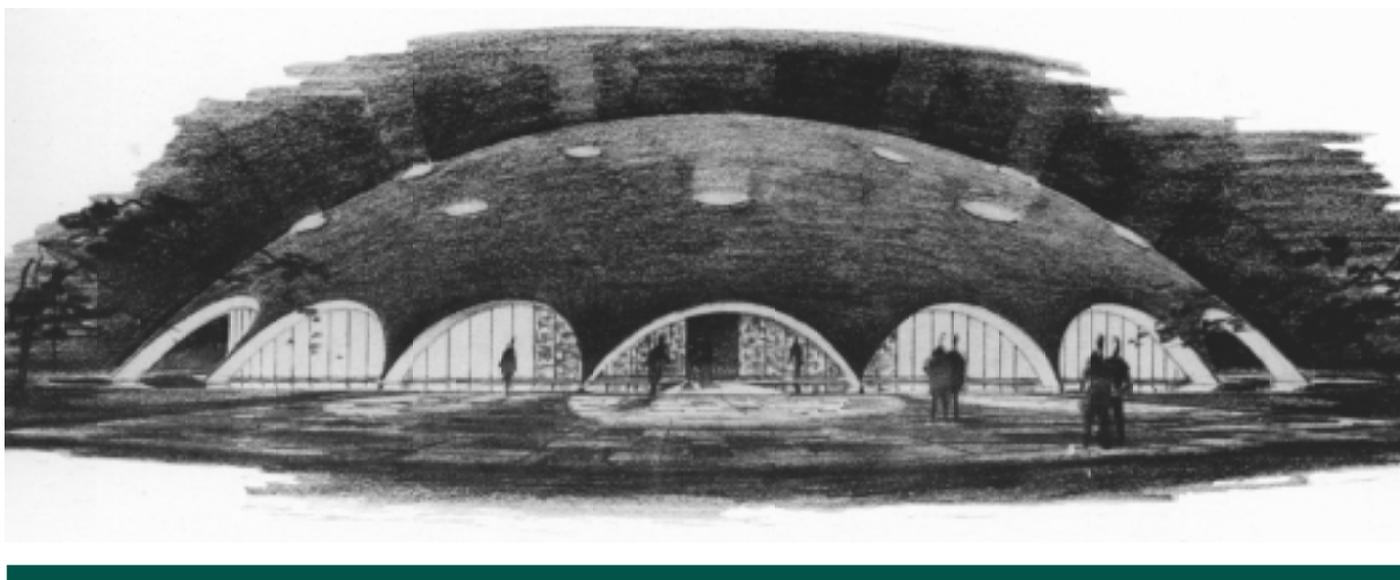
Centenary of Federation. The launch of the renovated building is planned to coincide with the Australian Science Festival in 2001. This will be the beginning of a busy, year-long program of open days, national and international scientific and environmental conferences, exhibitions, launches and oral history activities. The Academy is also planning to celebrate founding President Sir Mark Oliphant's 100th birthday and his enormous contribution to Australian science.

Other grants for the Dome

The Academy has received three other heritage grants for the conservation of the Dome and materials relating to its construction. The Australian Heritage Commission has given a National Estate grant to prepare a conservation management plan for the Dome.

The National Library of Australia has provided a Community Heritage Grant for the preservation of architectural materials related to the design competition for the Academy's headquarters, and the ACT Heritage Grants Program is providing funds to undertake video interviews relating to the design and construction of the Dome.

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Telephone numbers

Executive Secretary (02) 6247 5777

Publications (02) 6247 5385

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Finance (02) 6249 1362

Fellowship administration (02) 6247 3966

National Committees (02) 6247 3966

International programs (02) 6247 3966

Library (02) 6247 3966

Australian Foundation for Science (02) 6247 5777

Facsimile (02) 6257 4620

Australian Foundation for Science

(02) 6247 5777

Facsimile (02) 6257 4620

Email

aas@science.org.au

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Science in the election

Science did not make a big splash during the federal election campaign in September and October. However the Academy did attempt to stir interest in the subject by commenting on the science and higher education policies of the two major parties.

The Academy called for:

- additional funding for the Australian Research Council
- continuation of the Cooperative Research Centre Scheme
- restoration of the 150 per cent tax concession for industrial research and development
- recognition of the importance of support for Australian participation in global science projects
- rebuilding of the research infrastructure in universities and institutes
- improved career prospects for young researchers
- additional funding for universities and increased salaries for academic staff.

The President of the Academy, Professor Brian Anderson, said, 'The science and technology communities face a major task in convincing the next government to adopt the policies

of our major OECD comparators and competitors. For example, both Britain and the US have increased their investment in basic research substantially in the past 12 months.'

New Minister for Science

Following the re-election of the Liberal and National Parties on 3 October, Professor Anderson welcomed the appointment to Cabinet of the new Minister for Industry, Science and Resources, Senator Nick Minchin.

Professor Anderson said, 'The new grouping of responsibilities strengthens the portfolio. It makes possible appropriate linking of research, technology and some of the most important economic bases to which they should be applied.'

'The Academy is ready to assist the new Minister in whatever ways it can.'

'I look forward to working with Senator Minchin to strengthen the role of science and technology in the economic and social development of this country.'

Professor Anderson was making arrangements to see the new minister in order to take up the issues raised during the election campaign.

Forthcoming events

Reception to recognise, strengthen and celebrate links between Australian and Japanese scientists, 13 November, Becker House, Canberra.

Conferences

The Academy's web site has a conference and events database that lists events occurring in Australia and New Zealand between now and 2001. Events include seminars, exhibitions, science fairs, summer schools, workshops and lectures on the subjects of science, health, information technology, engineering, mathematics and the environment. The database, prepared by the Royal Society of New Zealand, is at www.science.org.au/conf.htm.

New topics on Nova

- Looking down the track at very fast trains
- Wind power gathers speed
- Pointing the bone at osteoporosis
- Mobile phones - communications on the go

Nova: Science in the news is at www.science.org.au/nova/.

The Basser Library

Anyone wishing to use the Basser Library should contact the librarian, Rosanne Walker, telephone (02) 6247 3966 or email rosanne.walker@science.org.au.

Gifts to the Academy

If you would like to make a gift or a bequest to the Academy of Science or the Australian Foundation for Science, please contact the Executive Secretary or the Development Officer, telephone (02) 6247 5777.

Plans for the ARC

The future of the Australian Research Council has been under scrutiny. The Council has been preparing a strategic plan including a review by Emeritus Professor David Penington.

The Chair of the ARC, Professor Vicki Sara, spoke at a dinner of the combined Academies in Melbourne in August. She raised two critical issues: the need for increased investment in research and the need for the ARC to be independent of the Department of Education, Training and Youth Affairs.

In her paper Professor Sara said, 'Without increased investments in the Australian research system being made, we face a loss in the quality of Australian research and research facilities. This will erode the basis for future technology developments and economic growth, as well as our international competitiveness and access to the world's knowledge store and markets.'

She said the Penington report had

recommended a charter of independence for the ARC. This urgently needed to be implemented. To be a broker of research activities, the Council had to have responsibility for both strategic policy and its implementation through the management of ARC programs.

'Through this organisational structure, the ARC can effectively translate the government's research directions into outcomes which will bring benefits to the community and ensure economic, social and cultural growth,' she said.

In a letter to the Academy's Secretary, Science Policy, Professor John White, Professor Penington thanked the Academy for its detailed comments on his interim report. He addressed a number of the issues raised by the Academy.

In June the Academy made a submission to the review covering such topics as the purpose and structure of the ARC, and program management.

International ocean networking

As part of the activities undertaken in 1998 as the International Year of the Oceans, the Chair of the Academy's National Committee for Atmospheric and Oceanic Studies, Dr Angus McEwan, has prepared a paper on the importance of international networks in oceanography.

Oceanography has progressed since the 1960s from being an academic discipline with only a handful of leaders to being regarded as an important 'hard' science with applications in all kinds of maritime activity and in the prediction of climate variability and change. Australian strength in applied mathematics and the enlargement of Australian marine science in the 1980s have placed Australia among the top ten or so nations in oceanographic contribution.

'It has been recognised that the scale and interconnectedness of the world ocean make it impossible for any individual scientist or team to obtain all the data needed for a comprehensive address of many of the critical dynamical questions,' the paper explains. United Nations intergovernmental mechanisms have been used to obtain governmental sponsorship and sanction and there is now a highly interlinked network of

international, governmental and non-governmental processes which depend on the participation of practising oceanographic scientists, technologists and managers worldwide for their planning and function.

Participation in international networks is an almost mandatory requirement for involvement in large-scale experiments. The networks also provide an effective means of sponsoring oceanographers' involvement in the design and development of the programs.

Australians have played a leading role in several programs and in some instances, the program objectives are central to the objectives of Australian organisations, which benefit from international effort. An example is the international effort devoted to predicting El Niño, which required improved understanding of the dynamics of the equatorial Pacific Ocean.

However, the paper sounds a caution about Australia's future ability to participate effectively in international oceanographic networks due to low levels of government resources and narrow channels of sponsorship.

Nobel prize for Corresponding Member

The President of the Academy, Professor Brian Anderson, has warmly congratulated the distinguished chemist, Professor John A Pople, who has been awarded the 1998 Nobel prize for chemistry.

'John Pople has been a foreign member of the Academy since 1993. His election to that position – which he shares with only 18 other of the world's best scientists – reflects his close involvement in Australian science,' Professor Anderson said.

Professor Pople, a British citizen and Professor of Chemistry at Northwestern University in Illinois, was awarded the prize for his development of computational methods in quantum chemistry. He shared the prize with Professor Walter Kohn of the University of California.

Professor Pople's work has revolutionised the way chemistry is practised by making it possible to perform chemistry in the computer as a complement to the laboratory. The computer is fed a molecule or a chemical reaction and the output is a description of the molecule or reaction.

Professor Pople made his computational techniques accessible to researchers by designing the GAUSSIAN computer program, which was first published in 1970. The program has been further developed and is now used by thousands of chemists in universities and companies throughout the world.

Professor Pople has made several extended visits to Australia.



Professor John Pople

Australia reports on climate change

Australia's report to the International Climate Variability and Predictability (CLIVAR) Conference will be presented at the conference in Paris from 2-4 December 1998. The report, entitled *Beyond El Niño: the Australian plan for CLIVAR*, was developed by the CLIVAR Subcommittee of the Academy's National Committee for Climate and Global Change and involved scientists across the range of national organisations associated with climate research.

The CLIVAR program includes studies of variations in the natural climate system as well the effects of human activities on climate. These studies examine not only the inter-annual climate fluctuations associated with El Niño but also other phenomena affecting global climate. The program also provides a research focus on climate change arising from human actions associated with the production with greenhouse gases.

As Australian scientists contributed to the international CLIVAR Implementation Plan, published in June 1998, the Australian CLIVAR plan is consistent with the international program but focuses on issues relevant to Australia.

The scale and scope of the program, which covers the overall climate system, means that scientists need to coordinate their activities so that the national effort produces the best possible outcome. A particular focus of CLIVAR over the next few years will be on research that will contribute to the third assessment report of the Inter-Governmental Panel on Climate Change.

Curriculum concern

A symposium on the intellectual content of school education expressed concern about the lack of consultation with scientists and academics in the writing of state and national school curriculums and frameworks. Where scholars and scientists had been consulted in some disciplines, that consultation was considered insufficient or tokenistic.

The symposium, held in Melbourne on 3 October 1998, was organised by regional groups of the Academies of Science and the Humanities.

The organisers felt that pedagogical matters were the province of professional educators, but that scholars had a role to play in the

disciplinary and intellectual content of the curriculum. The symposium provided an opportunity to debate what needed to be taught to children.

During the morning, distinguished exponents presented their ideas in the fields of language, mathematics, the arts, social sciences and natural sciences. In the afternoon, working groups discussed the issues and possible action.

The President of the Academy of Science, Professor Brian Anderson, visited the Melbourne regional group of Fellows at the time of the symposium. He also spoke to the Canberra regional group in October.

Primary school science

Several sponsors have donated funds for starter grants to make the Academy's primary school science program, *Primary Investigations*, available to schools with special needs. Sponsors include the 1998 Australia Prize winner, Dr Suzanne Cory; the patron of the South Australian Science Teachers Association, Mrs Barbara Hardy; the Kirby Foundation; and Queensland Metals Corporation. A former sponsor, Dr Catherine Le Fèvre, died earlier this year.

Schools receiving the starter grants in 1998 have been Springvale Primary School in Victoria, Lyons Primary School in the ACT, Larapinta Primary School in the Northern Territory, and Kotara South Public, St Michael's Primary and Jerangle Public Schools in

New South Wales.

The Science Teachers Association of Queensland ran another *Primary Investigations* trainers course in Brisbane in October. The Science Teachers Association of Western Australia also organised a conference on *Primary Investigations* in Perth in October.

For more information about the Academy's primary school science program, visit the *Primary Investigations* web site at www.science.org.au/pi. The site includes the introductory pages from the teachers books, sample lessons, equipment lists, and contact details for trainers in each state.

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Academy TV

The C&W Optus education channel 55 continues to screen programs produced by the Academy. They are shown on Tuesdays from 2.00-3.30pm and repeated on Thursdays from 8.30-10.00pm in Sydney, Brisbane and Melbourne.

Four interviews recorded for the Academy's *Video Histories of Australian Scientists* project will be screened in November and December as the series, 'Scientists Reflect: Medical Researchers'. The scientists are Professor Mollie Holman, Professor Donald Metcalf, Professor Priscilla

Kincaid-Smith and Sir Gustav Nossal. Dr Max Blythe of the Medical Science Video-archive of the Royal College of Physicians and Oxford Brookes University conducted the interviews with support from C&W Optus and the Fenner Fund.

For program details check the Academy's Internet site at www.science.org.au/academy/media/optus5.htm.

Supported by the Australian Foundation for Science

Malthus and his legacy

The National Academies Forum and the National Library of Australia presented a conference entitled *Malthus and his legacy: 200 years of the population debate* on 17 and 18 September at the National Library. The conference commemorated the 200th anniversary of the publication of *An essay on the principle of population* by the Reverend TR Malthus.

Speakers came from the forefront of scholarship in demography, history, economics and medical science and discussed the impact of Malthus and his book on the population debate from the late 18th century to the 21st century. They also considered his influence on contemporary debates about population, resources and the environment.

Speakers at the conference included John C Caldwell, University Fellow at the Health Transition Centre, ANU; Janet McCalman, Senior Lecturer in the Centre of Health and Society at the University of Melbourne; Susan Serjeantson, former Deputy Vice-Chancellor at the ANU; Roger Short, Professorial Fellow in the Department of Perinatal Medicine at the Royal Women's Hospital in Melbourne; and Professor Jonathan Stone, Challis Professor of Anatomy at the University of Sydney.

Support from C&W Optus enabled the symposium to be videotaped for screening on the Optus educational channel 55 in October and November 1998. For details check the Academy's Internet site at www.science.org.au/academy/media/optus5.htm.

JG Russell awards

A friend of the Academy, Miss JG Russell, has provided funds to encourage young Australian scientists to work in Australia. The Russell awards recognise the additional infrastructure cost involved in experimental research and honour outstanding young researchers. The first awards were made in 1996.

The awards are made to recipients of Queen Elizabeth II Fellowships in the physical sciences. Queen Elizabeth II Fellowships are awarded to postdoctoral researchers of very high levels of achievement.

The 1997 recipients of the JG Russell awards were:

- Dr BH Andrews, from the Department of Mathematics at the Australian National University
- Dr RP Gore, from the Research School of Information Science and Engineering at the Australian National University
- Dr SJ Miklavcic, from the Ian Wark Research Institute at the University of South Australia
- Dr E Wenger, from the Research School of Chemistry at the Australian National University
- Dr LT Ball, from the Department of Physics at the University of Sydney
- Dr QH Qin, from the Department of Mechanical Engineering at the University of Sydney

Dr SA Revets, from the Department of Geology and Geophysics at the University of Western Australia

Dr XM Zhang, from the Department of Computer Science at the University of Wollongong.

Foundation for Science funds projects

The President of the Academy of Science, Professor Brian Anderson, has been appointed to the Board of Directors of the Australian Foundation for Science.

At its last meeting the board agreed to underwrite the following projects:

- infrastructure costs of *Nova*
- the feasibility study for the lower secondary school science project
- the updating and promotion of the biographical memoirs on the Internet
- pilot public lecture programs.

Nova and the biographical memoirs can both be found on the Academy's web site at www.science.org.au.

Supported by the Australian Foundation for Science

Honours to Fellows

In August, 20 European, Australian and US researchers retreated to the rural centre of Arnshausen in Germany for a small discussion meeting to honour the research of **Dr Jan Anderson**. Made possible through a Humboldt research prize to another Fellow from the Australian National University, Professor Barry Osmond, the researchers were able to ponder 'Why Grana?' Discussions centred on structural and functional properties of these stacked membranes in chloroplasts.

Professor Neville Fletcher, of the Australian National University, has been awarded the Silver Medal in Musical Acoustics by the Acoustical Society of America, 'for contributions to understanding sound production, and especially the role of non-linear processes, in string, wind and percussion musical instruments'.

Sir Robert May, a Corresponding Member of the Academy and Chief Scientific Adviser to the UK Government, has been awarded the Balzan Prize 1998 for his work on biodiversity. Sir Robert was awarded the prize for his contributions to our understanding of the relationship between biological diversity and the structure and functioning of the resulting ecosystems.

The Academy's Foreign Secretary, **Professor Michael Pitman**, received the award of *Chevalier dans l'Ordre National du Mérite* from the French Ambassador to Australia, His Excellency the Honourable Dominique Girard, at the Embassy of France in Canberra on 6 October 1998. The award was made for Professor Pitman's work in strengthening scientific links between Australia and France, particularly when he was Australia's Chief Scientist.

Professor Jim Pittard, Head of the Department of Microbiology at the University of Melbourne from 1972 to 1997, has been awarded Honorary Life Membership of the Australian Society of Microbiology in recognition of his contributions to science and the Society.

Bede Morris Fellows

Six Australian scientists will visit institutions in France in 1999 under the Bede Morris Fellowship Scheme. The scheme, set up in 1989, honours the achievements of the late Professor Bede Morris, an immunologist at the Australian National University, who formed close ties with the French scientific community.

The scheme's major sponsor is Rhône-Poulenc Australia, a division of the international pharmaceutical and chemical company. The company conducts research into animal health and nutrition, genetics and vaccines as well as producing speciality chemicals, fibres and polymers, and agricultural chemicals and seeds. Other sponsors are the French Embassy, the Australia-France Foundation and the Commonwealth Government.



Dr Judith Walker

Dr Judith Walker, of the School of Physiology and Pharmacology at the University of New South Wales, will take up the Rhône-Poulenc Fellowship for 1999. She will visit the Rene Descartes University in Paris for six weeks to examine the mechanisms responsible for opioid analgesia and dependence in chronic pain.

Opioids such as morphine have been used for centuries for the treatment of pain. However, if they are repeatedly used, patients develop a tolerance to the effects of the drugs and can become physically dependent on them. This is especially the case when treating cancer pain. The human body, like all mammalian tissue, produces its

own opioids in the forms of enkephalins and endorphin, which are broken down by enkephalin-degrading enzymes in the body. Dr Walker will use 'knock-out' mice (genetically modified mice) to investigate the role of the body's opioid system by testing new agents that inhibit these enkephalin-degraders, leading to improved clinical management of tolerance and dependence in the treatment of cancer pain.

Dr Walker has already conducted research in Sydney that shows that experimental arthritis can be cured by a new opioid, asimadoline, which is unable to enter the brain and thus acts specifically at the site of the inflammation. The drug therefore has no serious side effects such as tolerance, dependence, sedation and respiratory depression.

Recently, Dr Walker worked for ten weeks in Paris at a leading laboratory in this area and discovered that asimadoline had powerful analgesic properties and showed no cross-tolerance with morphine. In the laboratory of Professor Rafael Maldonado, a distinguished and internationally recognised scientist in opioid analgesia, Dr Walker will now be able to continue her investigations into the pharmacology of analgesic drugs and will learn new procedures for determining the mechanisms responsible for tolerance and dependence.

The French Embassy Fellow is **Dr Darryl Veitch** of the Software Engineering Research Centre at RMIT in Victoria. Dr Veitch will spend two months at the Institut National de Recherche en Informatique et en Automatique in Sophia Antipolis to analyse loss and delay in traffic on the Internet. These problems have important implications for the use of real-time multimedia services such as telephony, video-conferencing, distributed games and virtual reality across the Internet.

The project aims to study the relationship of packet losses and delays to improve our ability to predict and compensate for them, and to examine the fractal or fragmented properties in loss or delay processes. These fractal processes have only recently been discovered and are regarded as the



Dr Bin Wang

most significant discovery in teletraffic in decades. They make it very difficult to measure and analyse data because they create non-standard statistical properties. Dr Veitch has already begun some of this work and expects to make great headway during his French visit on what is a significant and ambitious research project.

The 1999 Australia-France Foundation Fellow is **Dr Bin Wang** of the School of Engineering and Technology at Deakin University. Dr Wang will visit the Laboratoire de Physique et Mécanique des Matériaux in Metz for six weeks to study the constitutive behaviour of porous materials at high strain rates.

Porous materials are widely used as structural and packaging components. Most of the applications and research and development have been restricted to those with porosity ratios above 70 per cent but recent studies show that materials of a lower porosity appear to be promising in a broader range of applications. However, their behaviour is not fully understood and Dr Wang plans to study their mechanical properties and particularly their damage mechanism under various dynamic loading conditions. Dr Wang has carried out a number of research projects in the last six years on the response of materials and structures under various loading conditions.



Dr Piroska Rakoczy

Three scientists will take up Commonwealth Fellowships in 1999.

Dr Piroska Rakoczy, of the Centre for Ophthalmology and Visual Science at the Lions Eye Institute in Western Australia will visit the Institut National de la Sante et de la Recherche Medicale in Paris for six weeks to investigate whether a new drug delivery method can be used to introduce therapeutic agents into diseased regions of the eye.

Choroidal neovascularisation (CNV) is the leading cause of blindness in the developed world. At present, therapeutic genes are delivered into the eye by injection, an invasive method that is not always suitable for humans suffering from CNV. Professor Yves Courtois' group at the institute in Paris has pioneered the use of a drug delivery method which is non-invasive. Dr Rakoczy's project will investigate whether this method can be used to deliver therapeutic genes efficiently and safely into the eye.

Dr Zdenko Rengel, of Soil Science and Plant Nutrition at the University of Western Australia, will visit the Institut National de la Recherche Agronomique in Montpellier for five and a half weeks to determine the quantity and composition of the substances exuded by the roots of crop genotypes that are able to use fixed phosphates.

Only about 20 per cent of phosphorus fertiliser added to the soil is used by crops. The rest is fixed in the soil in forms that plants cannot use. Some crop genotypes are able to unlock

this fixed phosphorus but the mechanisms that allow this to happen are not well understood. An understanding of these mechanisms will allow greater crop yields to be achieved using fewer chemicals and less energy in agriculture, resulting in more environmentally friendly food production.

Dr Peter Sedwick, of the Antarctic Cooperative Research Centre at the University of Tasmania, will visit the Institut Universitaire European de la Mer in Plouzane for two months to undertake a collaborative investigation of iron biogeochemistry in the Southern Ocean.

Dr Sedwick has been invited to participate in a French research cruise, named ANTARES-4, in the Southern Ocean, during which he will collaborate with French scientists in an investigation of the role of iron in controlling the growth of phytoplankton (marine algae) in the region. He will contribute expertise and equipment to measure minute quantities of iron in ocean water and

will perform shipboard incubation experiments which determine the nutritional sufficiency of iron for phytoplankton growth in these waters. The research will improve our understanding of the role of iron in controlling the growth of phytoplankton and the biological uptake of atmospheric carbon dioxide in the Southern Ocean.



Dr Peter Sedwick



Participants in the Second Korea–Australia Workshop on Rheology.

Korean workshop a success

The Second Korea–Australia Workshop on Rheology was held in Seoul from 5 to 9 July 1998 and was considered a great success. Rheology, the science of the flow and deformation of matter, covers a broad range of applications, including the use of toners in the fixing process of electrophotography, the use of epoxy emulsion moulding compounds in the electronics industry, and the manufacture and use of synthetic hyaluronic acid in eye surgery.

The workshop has further developed the friendship between the Korean and Australian rheological communities and has produced a number of direct collaborations between the two countries. The Korean and Australian societies of rheology will be working to establish a confederation of rheological societies in the Asian region. Another meeting is under consideration and could coincide with the World Congress on Chemical Engineering to be held in Australia in 2001.

Exchanges

Korea

Four Australian scientists will visit Korea in 1998 and 1999 under the exchange program between the Australian Academy of Science, the Australian Academy of Technological Sciences and Engineering and the Korea Science and Engineering Foundation.

Dr Louise Goggin, of the CSIRO Division of Marine Research, will visit the Biological Oceanography Division of ANSAN to study the biological control of the introduced seastar, *Asterias amurensis*.

Dr Jiyuan Tu, of the Australian Nuclear Science and Technology Organisation, will visit the Research and Development Centre at the Korea Heavy Industries and Construction Company to investigate modelling industrial multiphase flow and erosion.

Dr Wojciech Szymanski, of the Department of Mathematics at the University of Newcastle, will visit the Korea Maritime University to study subfactors and Hopf algebras.

Dr Afshad Talaie, of the Osaka National Research Institute in Japan, will visit Kyung Hee University to develop an integrated computer/display device.

Taiwan

Three Australian scientists will visit Taiwan in 1999 under the exchange program between the Australian Academy and the National Science Council of China.

Dr Dong-Sheng Jeng, of the Centre for Offshore Foundation Systems at the University of Western Australia, will visit the National Chung-Hsing University to undertake preliminary investigations for a mechanism of wave-seabed-pipe interaction.

Dr Lingxue Kong, of the School of Engineering and Technology at Deakin University will visit the National Taiwan University to study the computational simulation of heat/mass transfer through porous textile materials.

Dr Xia Lou, of the Lions Eye Institute and Centre for Ophthalmology and Visual Science at the University of Western Australia, will visit the National Tsing Hua University to study the surface modification and characterisation of

PHEMA hydrogels for artificial corneas.

Other Australian scientists visited Taiwan for two workshops held in November 1998 (see article on page 10).

England

Ten Australian scientists will visit England in 1999 under the exchange program between the Australian Academy of Science, the Academy of Technological Science and Engineering, and the Royal Society of London.

Dr Jon Bell, of the Mount Stromlo and Siding Spring Observatories will visit the Nuffield Radio Astronomy Laboratories at the University of Manchester to undertake a square kilometre array and pulsar survey.

Associate Professor John A Carver, of the University of Wollongong, will visit Oxford University to ascertain the mechanism of small heat-shock chaperone protein function.

Dr Matthew Colless, of the Mount Stromlo and Siding Spring Observatories, will visit the University of Cambridge to take part in the 2dF galaxy redshift survey.

Dr David Dall, of CSIRO Entomology, will visit Imperial College to study factors controlling the occlusion process of insect poxviruses.

Dr Christopher Davies, of Monash University, will visit the University of Sheffield to examine intelligent materials processing through coupling simulations of microstructural evolution with finite element analysis for the hot rolling of metals.

Dr Paul Foster, of the John Curtin School of Medical Research, will visit the Imperial College School of Medicine at the National Heart and Lung Institute to study the relationship between interleukin-5 and eotaxin for the regulation of eosinophilia.

Dr Michael Lee, of Department of Biological Sciences at Monash University will visit the Department of Zoology at the Natural History Museum to study the co-evolution of genes, anatomy, and behaviour in a case study involving lizard relationships.

Dr Andrei Rode, of the Research School of Physical Sciences and Engineering at the Australian National University, will visit the University of Southampton to study light-induced structural phase transitions in

confining gallium films produced by ultrafast laser ablation and their optoelectronic applications.

Dr Phillip Schmidt, of CSIRO Exploration and Mining, will visit the Department of Earth Sciences at the University of Oxford to study the low-temperature demagnetisation of granites.

Dr Alan Vaughan, of Macquarie University, will visit the Institute of Astronomy at the University of Cambridge to undertake test measurements of first-epoch southern-sky survey plates using the APM facility.

Japan

Ten Australian scientists will visit Japan in 1999 and 2000 under the Japan Society for the Promotion of Science postdoctoral program.

Dr Ka Yan Lee, of the University of Sydney, will visit the Department of Quantum Engineering and Systems Science at the University of Tokyo to study online inverse analysis using distributed computing for robotic systems.

Dr Mark Prandolini, of Katholieke Universiteit Leuven in Belgium, will visit the Department of Physics at Niigata University to undertake a study of the exchange coupling in magnetic multilayers.

Mr David De Wit, of the Department of Mathematics at the University of Queensland, will visit Kyoto University to study graded fermionic realisations for gl (mln).

Ms Alecia Bellgrove, of the Department of Biological Sciences at Monash University, will visit the University of Tsukuba to undertake an examination of the dispersal abilities of macroalgae.

Mr Bruce D Yabsley, of the Falkiner High Energy Physics Department at the University of Sydney, will visit the Institute of Particle and Nuclear Studies in Ibaraki to undertake a search for mixing between neutral D-mesons in the BELLE experiment.

Mr Vladislav Fridkin, of the School of Mathematical Sciences at the Australian National University, will visit Kyoto University to study the mathematical structures of solvable models with boundaries and their applications.

Mr Thomas Andrews, of the John Curtin School of Medical Research at the Australian National University, will

visit the National Institute of Genetics in Mishimoto to study paleochemistry and detection of natural selection at the molecular level.

Dr Colin Taylor, of the Department of Physics at the University of Western Australia, will visit the University of Tokyo to study cryogenic mirrors for application in gravity wave detection.

Mr Matthew Boreland, of the Photovoltaic Special Research Centre at the University of New South Wales, will visit the Toyota Technological Institute at Nagoya to study the growth and characterisation of thin film microcrystalline silicon for photovoltaic devices.

Mr Vikas Sudesh, of Macquarie University, will visit Tohoku University to study the growth and characterisation of novel fluoride single crystals for efficient VUV and mid-IR laser generation.

Six Australian scientists will visit Japan in 1999 and 2000 with Australian Academy of Science and Japan Science and Technology Agency postdoctoral fellowships.

Dr Saman Seneweera, of the University of Western Sydney, will visit the Tohoku National Agricultural Experimental Station to study the influence of low temperatures on developmental responses of rice to rising atmospheric carbon dioxide partial pressure.

Mr Abdellah Rababah, of the Centre for Water and Waste Technology at the University of New South Wales, will visit the National Institute for Resources and Environment to study the nutrient film technique treatment of waste water.

Mr Kean Wang, of the University of Queensland, will visit the National Institute of Materials and Chemical Research to study the analysis of gas and vapour sorption and diffusion mechanism on molecular sieving carbon membranes.

Dr David Smith, of the University of Southern Queensland, will visit the National Aerospace Laboratory to study flow computation around a supersonic transport aircraft.

Mr Kamal Kant Gupta, of the University of Melbourne, will visit the Kansai Advance Research Centre at the Communication Research Laboratory to design and develop an active harmonically mode-locked fibre ring

laser for the generation of ultra-stable and short optical pulses.

Mr Cenk Kocer, of the University of Sydney, will visit the National Institute for Research in Inorganic Materials to study the subcritical limit of fracture in new materials.

Seven Australian scientists will visit Japan in 1999 and 2000 with Australian Academy of Science and Japan Science and Technology Agency short-term fellowships.

Dr Graeme J McCrabb, of CSIRO Tropical Agriculture, will visit the National Institute of Animal Industry to investigate ways to reduce methane emissions of livestock industries of Japan and Australia.

Dr Nihal Vitharana, of the Civil Engineering Department of the Hydro-Electric Corporation in Tasmania, will visit the Civil Engineering Research Institute of the Hokkaido Development Bureau to study numerical analyses and centrifuge modelling of dam-foundation rock interaction incorporating weak joints.

Associate Professor Jann Conroy, of the University of Western Sydney, will visit the National Institute of

Agroenvironmental Sciences to study the nitrogen and carbon dynamics of rice grown under different carbon dioxide partial pressures.

Dr Anatoli Kheifets, of the Research School of Physical Sciences and Engineering at the Australian National University, will visit the Institute of Physical and Chemical Research to study the double ionisation of atomic targets by photon and electron impact.

Dr Frank Stagnitti, of Deakin University, will visit the National Institute for Environmental Studies to study the risk of groundwater contamination from surface-applied agrochemicals and burial of wastes.

Dr Kiyong Lee, of the Queensland University of Technology, will visit the National Institute for Environmental Studies to investigate the development of a database on the health effects of diesel exhaust.

Professor Richard Lambrecht, of the University of Wollongong, will visit the National Institute of Radiological Sciences to study radiopharmaceuticals for psychoneurological diseases and for staging cancer treatments by PET and heavy ion particle radiation therapy.



Growth in Japanese science funding

The Academy's Foreign Secretary, Professor Michael Pitman, left, with Mr Naoki Saito from the Embassy of Japan, Ms Thérèse Lewis from the Academy, Mr Yoichiro Otsuka and Dr Alex Zelinsky. Mr Otsuka, the Director of the International Affairs Division of Japan's Science and Technology Agency, visited the Academy on 25 September and discussed Japan's increasing science budget and the expansion of his agency's international exchange program.

International workshops

The Academy is supporting the participation of Australian and overseas scientists in a number of international workshops. Some of these activities are being organised in conjunction with the Australian Academy of Technological Sciences and Engineering.

The Academy supported two Australian scientists to attend the second symposium of the Australian and Korean ceramic societies in September 1998.

The fourth international joint seminar on the regional deposition processes in the atmosphere was held in Melbourne from 18 to 24 October. The purpose of this seminar was to exchange information among neighbouring countries and set up collaborative research into new technologies which reduce the emission of environmental pollutants and their deposition back onto the surface of the earth. The Academy sponsored five South Korean researchers.

Following the decline in the wild fish catch, aquaculture has become increasingly important, contributing 22 per cent of the world's aquatic food in 1995. The second joint Taiwan–Australia aquaculture and fisheries resources and management workshop was held in Taiwan from 1 to 8 November. This followed up a joint workshop on the same subject held in Brisbane in August 1996. The Australian Coordinator was Dr Joe Baker.

A workshop on marine science will be held in Hobart, Townsville and Canberra from 16 to 20 November. The workshop is being jointly sponsored by the Academy and the Japan Society for the Promotion of Science.

The Australian Academies will support a joint Australia–Taiwan environmental management symposium in Taipei in November. The symposium will explore how science and policy can work together in catchment management. The

Australian coordinator will be Dr Brian Finlayson of the Department of Geography and Environmental Studies at the University of Melbourne.

The joint Australia–Indonesia biotechnology workshop will be held in Jakarta on 9 December. The workshop is being funded by the Australian Department of Industry, Science and Resources and managed by the Academy.

The 24th annual conference in protein structure and function will be held in Lorne, Victoria, from 7 to 11 February 1999. In 1995 the Academy supported eight Taiwanese scientists to attend the conference and hold another meeting with Australian scientists. In 1999 the Academy will again support five Taiwanese scientists to attend the conference and a follow-up meeting. This is expected to foster collaborative programs of mutual benefit.

A joint Australia–Korea manufacturing workshop will be held in Seoul in April 1999.

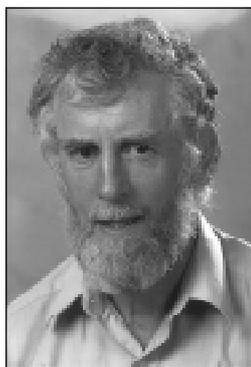
Malaria research in India

The Australia–India Council has provided funding to the Academy to promote the exchange of medical scientists between Australia and India. Two Australian scientists, Dr Robin Anders of the Malaria Laboratory at the Walter and Eliza Hall Institute of Medical Research and Dr Leann Tilley of the Department of Biochemistry at La Trobe University, will travel to India in 1998–99 to study antimalarial drugs and vaccines.

Dr Anders has established contact with several malaria research groups in India including the International Centre for Genetic Engineering and Biotechnology (ICGEB) in New Delhi and the Central Drug Research Institute (CDRI) in Lucknow. Dr Anders and his team are currently collaborating with the ICGEB in the study of the disulphide-bond structure of malaria antigens that are being assessed as vaccine candidates. During his visit, Dr Anders will be able to investigate the possibility that candidate proteins for a subunit malaria vaccine could be made in India under conditions of good manufacturing practice for early malaria vaccine trials in human

volunteers. The CDRI has a large animal facility and Dr Anders has arranged to carry out vaccine immunogenicity studies in rhesus monkeys at the Institute.

Dr Tilley will also visit the ICGEB and the CDRI and will undertake collaborative studies on the development of novel antimalarial drugs. Members of Dr Tilley's laboratory at La Trobe University are currently studying the mode of action of the antimalarial drug, chloroquine, and are attempting to design novel drugs that overcome the problem of drug resistance. The CDRI has set up related studies using animal models of malaria which Dr Tilley hopes to examine. Dr Tilley will also discuss a collaborative project with the ICGEB on the use of phage peptide libraries to develop novel antimalarial strategies.



Dr Robin Anders

International activities expand

Most of the Academy's international activities are funded by the Commonwealth Government. On 2 June 1998, the Academies of Science and of Technological Sciences and Engineering signed an agreement with the Department of Industry, Science and Resources to deliver the international science and technology networks component of the Technology Diffusion Program. Under this agreement, the Academy will receive \$714 000 annually for three years. In line with the agreement, the Academy will expand its international activities to include exchange programs with the USA, Canada, Mexico and Europe.

The Academy has also been negotiating agreements with the Academy of Sciences Malaysia, the Israel Academy of Sciences and Humanities and the Philippines National Academy of Science and Technology.

Professor Brian Kennett, from the Australian National University, has been appointed Deputy Chairman of the Academy's International Committee. The Academy's Foreign Secretary, Professor Michael Pitman, is Chairman.

Sir Alan Walsh



Sir Alan Walsh

Sir Alan Walsh, originator and developer of atomic absorption spectrophotometry (AAS), died in Melbourne on 3 August 1998.

Born on 19 December 1916 in Darwen, Lancashire, and educated at Darwen Grammar School, Walsh studied physics at Manchester University. During 1939–43 and 1945–46, he worked for the British Non-Ferrous Metals Research Association in London and in 1944 for the Ministry of Aircraft Production. In 1946, he was recruited to join the newly created Chemical Physics Section of the CSIRO Division of Industrial Chemistry in Melbourne, under the late Dr Lloyd Rees.

Walsh's initial research at CSIRO (later CSIRO) involved atomic emission methods of spectrochemical analysis and infrared absorption studies of the structures of small molecules. In the latter work, he demonstrated his inventive skills by devising a simple but elegant modification of the infrared spectrometer, which doubled the resolution of the instrument and improved its signal-to-noise ratio dramatically. This led to patent coverage and subsequent manufacture of the double-pass monochromator by Perkin-Elmer under licence to CSIRO. This experience had significance for future events since it involved Walsh personally with the commercial aspect of scientific investigation.

With his wide experience in both emission and absorption spectroscopic

methods, Walsh came to a striking conclusion in 1952: there appeared to be no good reason for the almost universal neglect of atomic absorption spectra in spectrochemical analysis. Indeed, on examination, there were compelling theoretical reasons indicating significant advantages over the then existing atomic emission methods. His subsequent realisation of atomic absorption as a practical procedure was achieved by characteristic elegant solutions. He used a light source giving a sharp line, allowing measurement of the peak atomic absorption, and was able to reject unwanted emission from the flame absorber by modulating the light source and using synchronous detection. This classical work on AAS was undoubtedly Walsh's principal scientific achievement, culminating in 1955 with his landmark paper *The Application of Atomic Absorption Spectra to Chemical Analysis*.

The concept and subsequent development of AAS as a simple, rapid and inexpensive method for the analysis of minute traces of metals (and some non-metals) is one of the major triumphs of analytical science. From a starting point based on three small companies in Melbourne, which manufactured the various components, Walsh worked tirelessly in establishing a local Australian manufacturer of the atomic absorption spectrophotometer. The eventual company was Techtron Pty Ltd, which subsequently grew into Varian Australia. AAS quickly found important world-wide application in areas as diverse as medicine, agriculture, mineral exploration, metallurgy, food analysis and environmental monitoring and has since been described as 'the most significant advance in chemical analysis of this century'. Australia's economic growth during the mineral boom of the 1970s was enormously enhanced by the contribution of the atomic absorption spectrophotometer. AAS essentially led to the birth of the scientific instrument industry in this country.

Walsh's success as a scientist and an inventor arose from a rare combination of skills and interests. First and foremost, he was blessed with an extraordinarily creative and fertile mind, forever generating new ideas –

for Walsh the important thing was not problem-solving but rather asking the right questions. Second, he grew up in a small family firm, acquiring an acute sense of business and accountability. Third, he always displayed great zest and enthusiasm, which infected those around him, backed up by a perseverance to follow his convictions through to the end.

Walsh was elected a Fellow of the Australian Academy of Science in 1958, served on the Council from 1966–69, and was the Matthew Flinders Lecturer for 1980. He was elected a Fellow of the Royal Society of London in 1969, and a Foreign Member of the Royal Swedish Academy of Sciences in 1969. In 1977 he was created a Knight Bachelor for services to science.

Peter Hannaford FAA
CSIRO Division of Manufacturing Science and Technology, and
Sandy Mathieson FAA
La Trobe University

New Nova topics

Looking down the track at very fast trains assesses the merits of different kinds of fast trains. Topic sponsored by the Commonwealth Department of Industry, Science and Resources.

Wind power gathers speed looks at the increasing importance of wind power as a means of generating electricity. Topic sponsored by Pacific Power and the Department of Industry, Science and Resources.

Pointing the bone at osteoporosis is about the bone disease. Topic sponsored by Milk Marketing (NSW).

Mobile phones – communications on the go explains how mobile phones work. Topic sponsored by the Department of Industry, Science and Resources.

Nova: Science in the news can be found at www.science.org.au/nova/.

Supported by the Australian
Foundation for Science

Managing wild populations

While a country as densely settled as England may not be noted for its wilderness, it does have a number of eminent experts in the dynamics of wildlife populations, including the Australian scientist, Sir Robert May.

Dr Jim Hone, an ecologist from the University of Canberra, travelled to England in July 1998 as the Academy's Graeme Caughley Travelling Fellow. Dr Hone explored population analysis for wildlife management mainly at the Centre for Epidemiology of Infectious Diseases at the University of Oxford.

Reasons for changes in wildlife abundance can be found by studying animals in nature or in the laboratory. The latter, called life table response experiments, have been used at the University of Reading to study the effects of pesticides on invertebrates. Such analysis could help build a model for the control of vertebrate pests, including rabbits, foxes and mice in Australia or brushtail possums in New Zealand. Modelling should be extended by experiments to determine the effects of potential control methods.

Conventional models of population dynamics recognise the effects of food and predators on numbers but do not take account of the availability of breeding sites or shelter. Birds and

mammals need nesting hollows or burrows and turtles nest on particular beaches. Recent English experiments with birds have shown the importance of breeding sites.

Wildlife numbers can also be greatly influenced by diseases such as myxomatosis in rabbits or rabies in foxes. Study of bovine tuberculosis in badgers in Britain has led to a major rethink of how to study and test models of the disease. Other disease research at Oxford indicates the level of vaccination or chemotherapy needed to achieve a particular management goal.

In Britain most wildlife reserves are privately established. Dr Hone met ecologists from the Royal Society for the Protection of Birds to discuss how this large charity selects and manages its 150 reserves.

Dr Hone feels that the Caughley Fellowship has given him a better understanding of his field of research and improved his links with individual scientists and institutions. Since returning to Australia, he has presented seminars at the University of Canberra and the CSIRO Division of Wildlife and Ecology on his findings and their application to Australian problems.

Earthquake engineering in Taiwan

A civil engineer from Monash University in Melbourne, Dr Barry Li, has found new research directions and established collaborative projects following a visit to Taiwan.

The visit was part of the exchange program between the Australian Academies of Science and Technological Sciences and Engineering, and the National Science Council of Taiwan. The program is sponsored by the Commonwealth Government.

Dr Li visited the National Taiwan University and the National Centre for Research on Earthquake Engineering during November and December 1997. He introduced Monash University and its work in civil engineering and gave a seminar on structural durability. At the National Taiwan University he learnt about the theory of structural dynamics, the analysis of dynamic reliability, load calibration, concrete deterioration and steel corrosion.

At the National Centre for Research on Earthquake Engineering he worked with researchers on structural control, stochastic modelling and time-dependent reliability. They wrote a computer program for the dynamic analysis of buildings.

Dr Li is pursuing collaborative projects on the deterioration of concrete structures due to steel corrosion and on the random vibration of timber I-beams with trellis webs. His contact with consulting engineers led to an Australian company, Maunsell, bidding for a Taiwanese project on bridges for high-speed trains.

He found Taiwanese science and technology well resourced. Salaries are higher than Australian counterparts while food and university-subsidised accommodation is cheaper. Funding from the National Science Council and industry is widespread and facilities are equal to the best in the world. Engineering research, particularly in the field of earthquakes, is world class.



Text books in China

Associate Professor John Nicholas, right, of the University of Canberra, presents greetings on behalf of the Academy to Professor Wu, left, at Peking University. Professor Wu is the director of a project team writing an adaptation of an American Biological Sciences Curriculum Studies (BSCS) text book for use by high school biology students in China. Dr Nicholas was the first teacher in Australia to use the BSCS material 30 years ago and will work with the Chinese team to help Chinese teachers use the new materials.